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CONTENTS

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Editorial

Behavioral causes of diseases

by Paul C. Y. Chen

DISEASE STATES are often the consequences of multiple factors which include exogenous factors, both biotic (e.g. micro organisms and parasites) and non-biotic factors (e.g. air pollution) as well as endogenous factors (e.g. genetic), and behavioral factors namely psychological factors (e.g. stresses) and socio-cultural factors.

Behavioral factors play an important part in the causation of diseases particularly among mothers and children. In fact human behavioral patterns not only contribute to the causation of diseases but also to the perpetuation of many disease states particularly in relation to maternal health, nutritional diseases, both communicable and non-communicable diseases and to the pattern of medical care that persists in any community.

Behavioral patterns in relation to maternal health

In many societies, early teenage marriage is culturally encouraged and legally permitted (e.g. in Latin America the legal minimum age of marriage is 12 years for the bride). In many Asian and African countries early marriage is not only culturally encouraged but also enforced upon young girls just past puberty (e.g. 40% of the scheduled castes (lowest social castes) in India, and 29.4% of Muslim girls in Iran were married when each was 10 to 14 years of age, WHO, 1976).

In cultures where early marriage is encouraged, the teenage mother is exposed to a higher risk of maternal mortality. The teenage mother is often unable to cope with the problems of marriage and motherhood with the result that divorces tend to be high (e.g. in traditional Kelantan and Trengganu during the period 1948–1957, the per cent of divorces against marriages were 71% and 60% respectively, Gordon, 1964).

In many cultures, the inability to conceive is an embarrassment particularly to the wife. Among some Kadazan of Sabah, a couple who have no children are not considered as adults. In some cultures, pregnancy is thought to be a "dangerous" period when taboos must be carefully observed to avoid ill-health, difficult labour, or a malformed child.

Maternal mortality in the developing world is extremely high. Among the several factors, the standard of obstetrical care is perhaps one of the most important. In many developing countries 50–90% of births are managed by untrained individuals. These traditional birth attendants are known by a variety of names such as *ambuya* (Rhodesia), *bidan kampung* (Malaysia), *dai* (India), *hilot* (Philippines) and *mohtamyae* (Thailand).

In many cultures, this is believed to be a period when both the new mother and her infant are believed to be very vulnerable and many precautions are advocated. In some cultures, the mother must gorge herself with foods. In others, she carefully avoids all "cold" foods. Thus among rural Malays these restrictions often mean that the new mother eats only rice, pepper, chillies, dried and salted fish, and coffee. Such restricted diets have been found to result in low serum levels for folic-acid, carotene and iron (Wilson *et al.*, 1970).

Behavioral patterns in relation to nutritional diseases

Each culture has evolved over the centuries a series of cultural beliefs concerning foods. Not all edible materials are eaten, some foods being classified as non-foods, others as cultural super-foods, "heating" and "cooling" foods, yet others as medicinal foods, ceremonial foods, prestige foods, communication foods, sympathetic magic foods and taboo foods (Chen, 1977a).

Man has thus not only learnt to eat some edible materials in order to stay alive but has also in a number of varied ways given symbolic meaning to many of these foods. As long as there is an abundance of food, these idiosyncrasies will probably be of little significance from the point of view of protein-calorie malnutrition. Obesity could be a problem if there is too much food available. On the other hand, behavioral patterns in relation to foods in many areas of the developing world are a major contributary factor to the prevalence of protein-calorie malnutrition.

In Malaysia, traditional beliefs concerning the causation of vitamin A deficiency, tied in to the belief that papaya, a rich source of beta-Carotene, is a "cooling" food that predisposes to night-blindness, is an example of one behavioral pattern that leads to a nutritional disease. Health education to change this behavioral pattern would have far more important long term effects than any amount of chemotherapy (Chen, 1972).

Behavioral patterns in relation to communicable diseases

The behavioral patterns of many cultures predispose to the development of communicable diseases. For example, dengue haemorrhagic fever is spread by the mosquito vector *Aedes aegypti* which in turn owes many of its breeding places to man himself. Rain water stored in large drums, in Shanghai jars and buckets, form common breeding places. Water found in ant-traps, flower pots, discarded tin cans, bottles, and old tyres are favourite breeding places of the *Aedes aegypti*. The latex cup on the rubber tree is a common breeding place of another vector *Aedes albopictus*.

Filariasis transmission and control are dependent on human behaviour and activities. For example, man-made breeding sites of its vectors are an expression of human behavioral activities (Dunn, 1974). Thus, in rural filariasis, caused by *Brugia malayi* transmitted by *Mansonia* mosquitoes, the larvae of these *Mansonia* mosquitoes are harboured by aquatic plants such as the water cabbage, *Pistia stratiotes*, which are often specially cultivated by farmers in ponds as food for pigs. Urban filariasis caused by *Wuchereria bancrofti*, which recently has been increasing in incidence in the slums of many large Asian cities such as Jakarta, is transmitted by the *Culex fatigans* which breeds in the highly polluted gutters of such slums. Man-made rice-fields are the breeding sites of *Culex tritaenorhyncus* that transmits Japanese B Encephalitis.

These are just three of the many communicable diseases that are related to human behavioral patterns. Others would include venereal diseases, cholera, typhoid, amoebiasis, gastroenteritis from bottle-feeding, helminthiasis and many other parasitic diseases.

Behavioral patterns in relation to non-communicable diseases

Human behavioral patterns have for a long time been linked to a number of non-communicable diseases. Osteomalacia is seen in the Bedouin of the Negev Desert where the women do not receive sufficient sunlight (Groen *et al.*, 1962). Cancer of the cervix is known to be associated with sexual activity (Martin, 1967). Cancer of the lung as well as coronary artery disease have been associated with smoking. Cancer of the tongue and buccal mucosa is associated in some Indians with the habit of placing the lighted end of the cigarette into the mouth. Cirrhosis of the liver is often caused by alcoholic consumption which itself is often an important part of social behaviour in many cultures.

To illustrate this link between human behaviour and a non-communicable disease, the problem of accidents can be briefly looked at. Dangerous electrical fittings, poisons, hot water, boiling oils, and firearms carelessly placed within the reach of young children are man-made death-traps. Swimming pools, bathtubs, buckets of water and wells regularly claim the lives of young children. On the streets, man-made death-traps (vehicles) often driven carelessly by individuals under the influence of alcohol or too exhausted to stay alert are a regular and important cause of injury and death in many parts of the world particularly in the developed countries.

Behavioural patterns in relation to medical care

Practically every culture has deviced its own system of medical care to cater to its sick. Some systems such as modern scientific medicine have much to offer particularly from the point of view of physical ill-health, while other systems are relatively ineffective from the physical point of view. But

such systems often have their own merits particularly from the point of view of the psychological well-being of the patient and his family.

In many rural areas in the developing world, for cultural, social and psychological reasons, the sick individual is very much tempted to retain the familiar traditional system that he knows so well even when it would seem to us to be hopelessly inadequate for his needs. Perhaps the answer is for the two systems to work together to provide the patient with the best from both worlds (Chen, 1975).

In the maternal care of the rural Malay mother, we now combine the technological skills of the trained modern midwife with the gentle reassuring touch and personality of the old traditional birth attendant, the two working together as one team (Chen, 1977b). The trained midwife conducts the actual delivery and cuts the umbilical cord while the traditional birth attendant is there to provide the traditional home-care, wash soiled linen, bury the placenta in the culturally accepted manner, massage the body of the new mother, and assist her in establishing breast feeding (Chen, 1976).

Health education

Human behaviour and activities, as indicated earlier, often contribute to the causation of diseases. In fact many diseases can be described as man-made. Obviously the control and management of these man-made disease problems will have to be based to a large extent upon efforts directed at the contributory behavioural patterns themselves. To this extent, much research as well as health education needs to be directed at the behavioural aspects of disease problems.

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Med. J. Malaysia Vol. XXXII No. 2, December, 1977

Filariasis in Negri Sembilan – A follow-up study

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Introduction

TWO YEARS after the initial filariasis blood survey in a Negri Sembilan rubber plantation made by the Filariasis Research Division, Institute for Medical Research, Kuala Lumpur, in May 1970 (Ramachandran *et al.* 1971), another team from the same Division carried out a re-survey in August 1972 to assess the epidemiology of filariasis in and around the same area i.e. Sua Betong Estate (shaded area, inset Fig. 1). Hetrazan had been given to the positive patients in 1970. The estate management was divided and sited (Fig. 1) as:

1. South Division or Hospital Division
2. Domum
3. Sungei Ujong Division
4. Factory and
5. Labuan Bileh (a new division)

Sungala Estate was a small estate nearby, under a separate management but was included because cases had been suspected there.

Entomological studies to incriminate the vectors were then outside the scope of that particular survey. The present study includes entomological and parasitological studies in both the estates of Sua Betong and Sungala.

The general geography of the site had been described by Ramachandran *et al.* (1971). At the time of this blood survey, a change from rubber planting to oil palm planting, had been initiated and was expected to be expediated.

The estimated population in the area was 2533 at the time of survey with age groups ranging from 6 months to 72 years.

Survey methods

The IMR research team of 7 was assisted clerically by 4 public health inspectors assigned by the Chief Medical and Health Officer, Seremban. They were divided into 4 units who functioned simultaneously between 1900–2200 hours on four successive nights.

Thick blood films of 20 c.mm. peripheral blood from the finger were made using a graduated capillary pipette fitted with a simplified non-breakable Sinton pipette (Sivanandam & Dondero, 1971). Dried overnight, the films were stained with diluted Revector Giemsa (35 drops of 7.6% concentrate per 100 ml. buffered distilled water, pH 7.2).

With the co-operation of the management, as many of the former positive patients in the 1970 survey as possible were each given their own 1970 survey numbers to identify themselves during the re-survey.

In a period of five months in the last and first quarter of the year several visits were made to the two estates to conduct human baited trap, bare leg and a few cattle shed catches using 2 men and 3 men respectively throughout the night. All catches were identified and dissected for infections. The num-

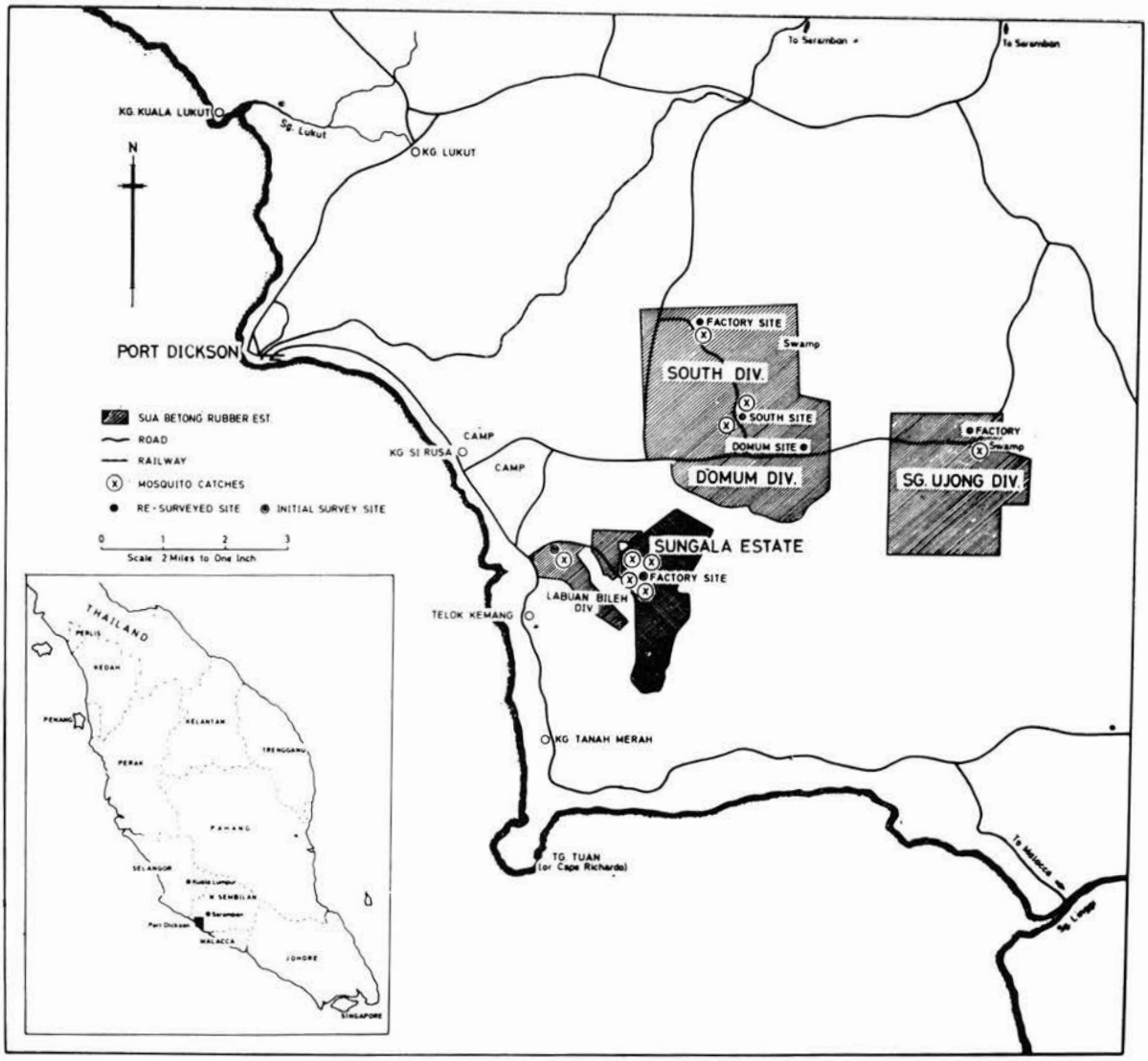

Fig. 1. Map showing filariasis survey sites in Negri Sembilan.

bers of anophelines were so small that except for three specimens they were disregarded from the examinations.

A total of 13 cats belonging to the families of the Hospital Division were also examined for microfilariaemia.

Periodicity and clinical studies were not made.

Results

A total of 2,154 blood films representing 85% of the population was obtained. The results of the distribution of microfilarial carriers in 1970 and 1972 are given in Table I.

Re-surveyed areas

In the 4 re-surveyed areas of Dumum, Factory, Sungei Ujong and South Division, a total of 1696 subjects were examined. Of these, 810 were males and 886 were females (Table II).

38 of them had microfilaria of the subperiodic strain of *Brugia malayi* in their blood. This indicated that the microfilarial rate was 2.3%. Of the 38 that were positive, 28 were males and 10 were females. This represented 3.4% of the males and 1.1% of the females (Table II).

Table I

Distribution of microfilarial carriers in the two survey areas carried out in 1970 and 1972.

	Sub-Divisions	1970			1972		
		No. Exam.	No. Positive	%	No. Exam.	No. Positive	%
Re-surveyed areas	Domum	327	31	9.5	275	4	1.4
	Factory	314	6	1.9	343	4	1.1
	S. Ujong	588	33	5.6	499	16	3.4
	Hospital (South)	637	26	4.1	579	14	2.4
	TOTAL:	1866	96	5.1	1696	38	2.3
New Areas	Labuan Bileh				110	2	1.8
	Sungala				348	24	6.9
	TOTAL:				458	26	5.7
	Total for area	1866	96	5.1	2154	64	3.02

Carriers of microfilaria were found in all age groups above one year (Table II). 19 infants below one year of age were examined but they were all negative. The 2 youngest carriers were a 3-year old Chinese boy from the Sungei Ujong area and another 3-year old Indian girl from the South Division. The oldest was a 72-year old unemployed Indian who was away in India during the 1970 survey. There was no difference in the proportion of microfilarial carriers in the 4 male and 4 female children below the age of 10 years.

In the population above the age of 10, it was found that only 4 non-Indians were carriers of microfilaria. All the other 26 carriers were all Indians, of which 22 were males and only 4 were females.

Table III shows the occupations of the population in the re-surveyed areas. 8 of the younger non-schooling children were infected with microfilaria; 2.2% (6/270) of the Indians and 1.3% (2/154) of the Chinese. Of the 11 infected students, 4% (10/246) of the Indians were positive for microfilariae but only 0.8% (1/121) of the Chinese were so. 3% (8/268) of the Indian tappers and 0.6% (1/163) of the Chinese tappers were found to be carriers. The group of "others" were personnels who were mainly indoor workers during the day e.g. office workers, shopkeepers, peons, and sweepers. 4.6% (7/152) of these Indians and 6% (1/17) of these Malays were positive. None of the Chinese in this group were positive.

Of the 173 unemployed personnels, only one Indian and one Chinese were infected. All the housewives were negative.

New Areas

In the new areas of Labuan Bileh and Sungala, 458 subjects were examined, 250 males and 208 females (Table II). Microfilaria was found in the blood of 26 people, this meant 5.7% of the group. 19 of them were males and 7 females.

41 children below the age of 5 years were found to be negative. The youngest carrier was a 7 year old Indian male student belonging to a family of 8, where the father, a 43 year old tapper and 2 other brothers aged 11 and 13 years were also positive. The oldest positive subject was a 47 year old tapper who had worked in Sungala Estate for more than 20 years.

Tables II and III also show that in the 5–9 year old age group, 2 Indian boys and 1 Indian girl were positive. Above the age of 10 years, only 5 non Indian were positive, 1 Chinese male tapper, 2 Malay school-boys, 1 Malay male and 1 Malay female tappers. The rest of the 21 positive population were Indians, 15 of them male and 6 of them female. 4 of them were non-schooling children, 10 were students, 6 were tappers and 1 was a peon. All the housewives and unemployed were negative.

35 of 96 former (1970) patients with microfilaria were followed-up successfully. 6 of these were positive and 29 were negative, (Table IV).

Table II

Distribution of microfilarial carriers by race, age and sex groups.

		INDIANS				CHINESE				MALAYS				TOTAL			
	Age group in years	No. Exam. 1109		No. Pos. (%) 32(2.8)		No. Exam. 492		No. Pos. (%) 5(1.0)		No. Exam. 95		No. Pos. (%) 1(1.0)		No. Exam. 1696		No. Pos. (%) 38(2.3)	
		541	568	24(4.4)	8(1.4)	231	261	3(1.3)	2(0.8)	38	57	1(2.6)	–	810	886	28(3.4)	10(1.1)
Re-surveyed Areas	1	7	4	–	–	2	5	–	–	–	1	–	–	9	10	–	–
	1–4	54	67	–	1(1.5)	34	37	2(6.9)	0	2	9	–	–	91	113	2(2.2)	1(0.9)
	5–9	105	96	2(1.9)	3(3.1)	53	50	–	–	6	10	–	–	164	156	2(1.2)	3(1.9)
	10–14	86	95	6(6.9)	3(3.1)	50	37	–	1(2.7)	8	10	–	–	144	142	6(4.1)	4(2.9)
	15–19	81	86	3(3.7)	1(1.1)	11	16	–	–	5	8	1(20.0)	–	97	110	4(4.1)	1(0.9)
	20–29	62	73	6(9.6)	–	22	44	–	1(2.2)	5	8	–	–	89	125	6(6.9)	1(0.8)
	30–39	48	58	1(2.0)	–	28	32	–	–	7	7	–	–	83	97	1(1.2)	–
	40–49	44	42	3(6.9)	–	17	24	–	–	3	2	–	–	64	68	3(4.7)	–
	50–59	29	36	–	–	5	11	–	–	1	2	–	–	35	49	–	–
	60	25	11	3(12.0)	–	9	5	1(11.0)	–	–	–	–	–	34	16	4(11.7)	–
	Age group in years	No. Exam. 380		No. Pos. (%) 21(5.9)		No. Exam. 40		No. Pos. (%) 1(2.5)		No. Exam. 38		No. Pos. (%) 4(10.0)		No. Exam. 458		No. Pos. (%) 26(5.7)	
		208	172	15(7.2)	6(3.4)	25	15	1(4)	–	17	21	3(17.6)	1(4.7)	250	208	19(7.6)	7(3.3)
New Areas	1	3	3	–	–	–	–	–	–	–	–	–	–	3	3	–	–
	1–4	24	12	–	–	2	2	–	–	–	1	–	–	26	15	–	–
	5–9	44	22	2(4.5)	1(4.5)	6	1	–	–	1	5	–	–	51	28	2(3.9)	1(3.6)
	10–14	46	31	7(15.2)	2(6.4)	5	4	–	–	5	–	1(20.0)	–	56	35	8(14.3)	2(5.7)
	15–19	28	32	3(10.7)	1(3.1)	3	1	–	–	4	3	1(25.0)	–	35	36	4(11.4)	1(2.9)
	20–29	15	24	–	1(4.1)	4	1	1(25.0)	–	1	5	–	–	20	30	1(5.0)	1(3.3)
	30–39	17	26	–	1(3.7)	2	5	–	–	3	5	–	–	22	36	–	1(2.9)
	40–49	15	12	3(20.0)	–	2	1	–	–	1	2	1(100)	1(50)	18	15	4(22.2)	1(6.6)
	50–59	10	7	–	–	–	–	–	–	1	–	–	–	11	7	–	–
	60	6	3	–	–	1	–	–	–	1	–	–	–	8	3	–	–
	Entire Survey	1489		53(3.6)		532		6(1.1)		133		5(3.7)		2154		64(2.9)	

Table III

Distribution of microfilarial carriers by occupational groups.

		INDIANS		CHINESE		MALAYS		TOTAL	
		No. Exam.	No. Pos. (%)	No. Exam.	No. Pos. (%)	No. Exam.	No. Pos. (%)	No. Exam.	No. Pos. (%)
Re-surveyed Areas	Non-students	270	6(2.2)	154	2(1.3)	37	–	461	8(1.7)
	Students	246	10(4.0)	121	1(0.8)	17	–	384	11(2.9)
	Tappers	268	8(3.0)	163	1(0.6)	16	–	447	9(2.0)
	Housewives	21	–	7	–	8	–	36	–
	Others	152	7(4.6)	26	–	17	1(6.0)	195	8(4.1)
	Unemployed	152	1(0.6)	21	1(4.7)	–	–	173	2(1.1)
		1109	32(2.8)	492	5(1.0)	95	1(1.0)	1696	38(2.3)
New Areas	Non-students	87	4(4.6)	11	–	3	–	101	4(3.9)
	Students	100	10(10)	11	–	11	2(18.1)	122	12(9.8)
	Tappers	94	6(6.3)	16	1(6.6)	10	2(20)	120	9(7.5)
	Housewives	9	–	–	–	2	–	11	–
	Others	149	1(2.0)	2	–	11	–	62	1(1.6)
	Unemployed	41	–	–	–	1	–	42	–
		380	21(5.9)	40	1(2.5)	38	4(10)	458	26(5.7)

Table IV

Follow-up Positives of 1970

No. of successful follow-up cases	35
No. of 1970 positives and 1972 negatives	29
No. of 1970 positives and 1972 positives	6

As shown in Table V the 5 subjects who were positive both in 1970 and 1972 had microfilarial densities lower in 1972. 5 of them were tappers, 4 males and 1 female, of which 1 had his microfilaria count almost unaltered i.e. from 9–8 mf per 20 cubic millimetres blood. The other 4 had their microfilarial densities reduced to 11–25%. The last positive subject was an unemployed Chinese with microfilarial densities of 2 mf per 20 cubic millimetres in 1970 and 1 mf per 20 cubic millimetres in 1972.

Of the 29 who were positive in 1970 and negative in 1972, 18 had densities of 1–9 mf per 20 cubic millimetres, 2 with 50–59 mf per 20 cubic millimetres; and the rest with 10–30 mf per 20 cubic millimetres.

Table VI compares the distribution of microfilaria densities in the 1970 and 1972 population. In the re-surveyed areas, the density distribution has fallen from 60 to 31 subjects with 1–9 mf per 20 cubic millimetres; 19 to 6 subjects with 10–19 mf per 20 cubic millimetres and only 1 with microfilarial density above 20–29 mf per 20 cubic millimetres.

In the new areas, microfilarial densities were spread out; 14 with 1–9 mf per 20 cubic millimetres, 7 with 10–19 mf per 20 cubic millimetres, 2 with 20–29 mf per 20 cubic millimetres and 3 with more than 30 mf per 20 cubic millimetres.

At Sua Betong Estate 3,723 mosquitoes of 24 species were collected in the equivalent of 30 nights catches (see Table VII). Again members of the *Mansonoiodes* and *Culex* were in abundance. Out of the 3,158 specimens examined five infections were observed, four in two species (*M. bonneae* and *C. gelidus*) with *Setaria* type and one with the early stage II larvae of *Brugia malayi* in *M. bonneae*. The specimen was taken in the bare leg catch. This gives a crude infection rate of 0.035% in *Mansonia bonneae* in both estates.

Table V

Microfilarial density-change from 1970 to 1972

Patient No.	mf density change	% Change	Race	Age	Sex	Occu.
1113	2–1	50%	Ch.	67	male	None
2374	39–6	16%	Ind.	23	male	Tapper
3158	4–1	25%	Ch.	22	female	Tapper
3187	9–8	88%	Ind.	21	male	Tapper
3495	9–1	11%	Ind.	42	male	Tapper
3527	7–1	14%	Ind.	40	male	Tapper

Table VI

Microfilarial Density (per 20 c.mm.). Distribution in 1970 and 1972.

Microfilaria Density per 20 cubic millimetre	1–9	10–19	20–29	30–39	40–49	50–59	60
No. of Subjects in 1970	60	19	8	3	1	2	3
No. of Subjects in 1972 Resurveyed Areas	31	6	–	–	1	–	3
No. of Subjects in 1972 New Areas	14	7	2	1	–	1	1

Table VII

Sua Betong rubber estates, Port Dickson
Total number of filaria mosquitoes caught, dissected and examined for filaria infections

Mosquitoes (24 spp.)	No. Caught	No. Dissected	With *Brugia malayi*	With *Setaria* spp.
Anopheles (2 spp.)	2	2	–	–
Aedes (4 spp.)	57	17	–	–
Mansonia (9 spp.)	3229	2995	1(0)	1(0)
Culex (8 spp.)	400	136	–	3(0)
Armigeres (1 sp.)	35	9	–	–
Total	3723	3158	1(0)	4(0)

At Sungala Estate a total of 3,002 mosquitoes of at least 37 species were collected in the equivalent of 58 night catches in total (see Table VIII). The largest numbers taken were members of the *Mansonoiodes* followed by the *Culex* group. Six members of the *Mansonoiodes* and seven of the *Culex* were found in the area. 2,597 specimens were examined with six infections seen in four species. However, five of the infections, three in *M. uniformis* and one each in *M. crassipes* and *Culex gelidus* were of the *Setaria* type measuring 1165 u – 2300 u in length and 23 u – 26 u in breadth. 44 specimens collected were mainly stage III found in the head, thorax and abdomen. The other infection was that of *Brugia malayi* with 7 stage I larvae in the thoracic muscles. The specimen was taken in the human bait trap.

Discussion

From the two surveys done in 1970 and 1972 (Table I), it was encouraging to note that the microfilarial rate had fallen from 5.1% to 2.3%. However, the newly surveyed areas had a microfilaria rate of 5.7%.

Table VIII

Sungala and Labuan Bilek rubber estates, Port Dickson
Total number of filaria mosquitoes caught, dissected and examined for filaria infection

Mosquitoes (37 spp.)	No. Caught	No. Dissected	With *Brugia malayi*	With Setaria species
Anopheles (6 spp.)	11	1	–	–
Aedes (9 spp.)	346	119	–	–
Mansonia (10 spp.)	1835	1760	1(0)	–
Culex (9 spp.)	681	492	–	–
Armigeres (2 spp.)	127	90	–	–
Uranotaemia (1 spp.)	2	2	–	–
Total	3002	2597	1(0)	–

As had been significant before, the 1972 survey also proved that almost three times more men than women were infected. Children below the ages of 10 years again showed no difference in having the infection.

Tappers and students were the most susceptible personnel. In the resurveyed areas, 2.9% of the students and 2% of the tappers had the infection and in the new areas, it was 9.8% of the students and 7.5% of the tappers. Though *Mansonia* mosquitoes are outdoor biters, about 20–25% of them can be found indoors by 7.00 a.m. Students awake early to prepare for school before 7.00 a.m. during which time some of the vector *Mansonia* mosquitoes were still lurking indoors. They would also be outdoors before 7.00 a.m. walking to school. Tappers began work as early as 4.00 a.m. out in the estate where the *Mansonia* vectors bite outdoors, (Wharton 1962). Higher prevalence relating to more chances of exposure to mosquitoes was also found in the tapping areas of Sungala Estate, Domum, Sungei Ujong and South Divisions as compared to the Factory workers who worked indoors and during the day.

Ethnically, the Indians proved to be the more susceptible group with a microfilarial rate of 2.8% in the resurveyed areas and 5.9% in the new areas. This could be related to their attire. (Wharton 1962) observed that *Mansonia* mosquitoes has a preference for the lower parts of the human body. The Indian tappers wore shorts while tapping; the Malays wore sarongs and the Chinese wore long trousers. A high microfilarial rate could also be observed in students (9.8% in Sungala & Labuan Bileh) who wore shorts or skirts.

35 of the 96 former (1970) positive patients remembered to bring along their identification numbers given to them by the Estate management. 6 or 16.6% of them were again positive for microfilaria (Table IV). Though the microfilarial density of 4 subjects had fallen to less than 25%, of their 1970 densities two others had almost no change. A personal interview with 12 subjects prompted us to feel that the mass treatment given in 1970 was not satisfactorily supervised.

It should be realised and emphasized at this point that treatment of microfilarial carriers should be carried out more strictly. Hetrazan is a very difficult drug to accept as it requires 6 doses given at weekly intervals. Some of the side effects of the drug include fever and vomiting especially after the first dose in those subjects with early and symptomless infections. Hence firm personnels should be posted to supervise the complete administration of the dosage. In 1970, Ramachandran had recommended that because of the irregular attendance at Control Centres, it was necessary for Control Team members to visit the settlement 8 to 10 times to achieve these results.

As most of the findings of the nocturnal habits of the population were done verbally at the time of blood sampling, many of them gave unconvincing answers about whether they use mosquito nets or not. For example, members of a same family often gave untallying reports as to whether they used nets or not. Generally, it was the children who told us that they did not have nets at night, while their mothers claimed that they did. Except for the toddlers, the folks slept after 8.00 p.m. They all closed their doors and windows throughout the night.

From the previous results showing the youngest infection to be in a one year old child it seems very likely that there was active transmission going on and although the Sua Betong area has been reportedly

mass treated with hetrazan in 1971 (Ramachandran *et al.* 1971), the infections still persists in the four main areas with an average microfilaraemia of 2.1%.

Although mature larvae were not taken, upon epidemiological grounds, we could say with some confidence that the primary vector in the area is undoubtedly *M. bonneae*. The areas are heavily surrounded by swamps though not so obvious in the Labuan Bilek area of Sungala estate. Although more nights were spent in Sungala estate fewer mosquitoes on an average were taken per night both in the bare leg catches and especially in the human bait trap. When compared to the bare leg catches at Sua Betong there seem to be roughly twice as many mosquitoes there; possibly the mosquitoes moved from the Sua Betong area swamps across to the Sungala, Labuan Bilek area. The last named itself is rather close to the developed main road and rather coastal thus less conducive for *Mansonia* breeding with three times less positive cases.

Thus, the impression gathered from the verbal investigations was that most of the personnel did not use mosquito nets. They closed up their doors and windows when they sleep. This did not prevent the mosquitoes from coming in because the ventilation grits above their doors and windows permitted entry.

The survey in cats showed no microfilaria in their peripheral blood. Unfortunately, the number surveyed here was small, only 12, even though they were from the families with microfilaraemia. A more complete coverage of the prevalence in the domestic cat is recommended for future re-surveys.

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Moniliformis moniliformis Bremser (Moniliformis dubius, Mayer) and its prevalence in Rattus spp. in Penang, Malaysia

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Introduction

MONILIFORMIS MONILIFORMIS which was formerly included in the Nemathelminthes is now recognised as a separate phylum, which is placed in immediate sequence to the Cestoidea, to indicate that the Acanthocephala are more closely related to the tapeworms than to any other group in the Animal Kingdom (Van cleave in Faust and Russel, 1964).

Though *Moniliformis moniliformis* is cosmopolitan in its distribution till now there is no publication pointing out its existence in Malaysia, though the parasite Acanthocephala has been reported (Dunn *et al* 1968; Sandosham, 1953, 1957) in Malayan rats. There has been no attempts made to describe the various species.

In the present paper the author presents the first record of the parasite namely *Moniliformis moniliformis* in this country.

Materials and methods

The parasites were obtained from rats caught on the Island of Penang. A total of 180 host animals were examined. Most of the parasite were found in the anterior region of the small intestine. The parasites were removed carefully from the small intestine without damaging the proboscis. The parasites were placed in tap water for at least 2 hours until the proboscis were fully extended without retraction. Later the parasites were fixed in 10% formalin. Some were stained with Acetocarmine and Creosote before mounting in Canada balsam. Drawings were made from stained and fresh specimens with the aid of micro-slide projector. Measurements were made from 50 females, 25 males and 100 eggs.

Description of the parasites

Adult Worms

The body is whitish or creamy-white in colour, attenuated at both extremities. The worm is elongated, cylindrical with pseudocoel. The body of the worm is divided superficially into a series of pseudosegments, except at anterior and posterior ends (Fig. 1).

The size is variable, the male is smaller than the female. The male measures 32–89 mm (mean 60.5) in length with a maximum width of 0.6 – 1.2 mm (mean 0.9) and have a capsulated bursa while the female measures 100–183 mm (mean 142) in length and a maximum width of 0.99 – 2.7 mm (mean 1.8). The cylindrical proboscis is protrusible, slightly spindle shaped, armed with 12 longitudinal rows of curved hooks, 9–11 hooks to each row, each measuring 0.018 – 0.024 mm. The proboscis measures from 0.503 – 0.635 mm, and maximum diameter of 0.095 – 0.108 mm (Fig. 1B and C). The proboscis is connected to the proboscis receptable, which is a closed muscular sac. Its wall contains two layers of diagonally arranged muscle fibres showing a spiral pattern. This structure measures 0.738 – 1 mm by 0.297 mm. The retractor muscle runs from near the base of the proboscis through the receptable and is inserted on the trunk wall. Near the base of the receptacle the nerve ganglion is vaguely visible as a dense spot and measures 0.476 mm by 0.214 mm from which the two retinacula originate.

There are two elongated structures of unknown function called lemnisci (Fig. 1) which lie in the body cavity and measures 3.3 – 5.5 mm long by 0.130 – 0.150 mm wide.

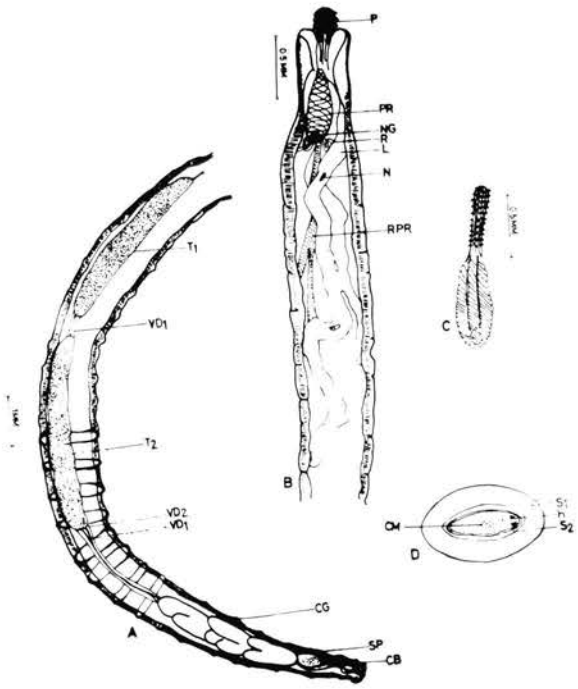

Fig. 1 *Moniliformis moniliformis,* **Bremser**
A. Posterior end of male; B. Anterior end; C. Proboscis and proboscis receptacle; D. Egg; CB. Copulatory bursa; CG. Cement glands; CM. Central nuclear mass; H. hooks; L. Lemnesci; N. Giant nucleus; Ng. Nerve ganglion; P. Proboscis; PR. Proboscis receptacle; R. Retinaculum; R.P.R. Retractor muscle; S1. Outer shell; S2. Inner shell; SP. Saefftigen's pouch; T1. and T2. Testes; VD1 and VD2. Vasdifferens.

The males have two testes. The testes which are long and bean shaped, deposited one behind the other and measures 3 – 4 mm by 0.75 mm. The testes are connected by vasdeferens.

Posterior to the testis are found 8 cement glands which are grouped together and forms a syncytial mass. Immediately after the cement glands are found the Saefftigens pouch through which run the sperm ducts and ducts from the cement glands before they unite at the posterior end. The posterior end is furnished with a bursa.

Eggs

The eggs are ellipsoidal and provided with three characteristic envelopes; the outer shell, inner shell and the middle layer. The egg is embryonated and the embryos possess rostella hooks. The eggs measure 0.102 – 0.119 mm (mean 0.111) by 0.046 – 0.065 mm (mean 0.055) (Fig. 1D).

Discussion

The description of the species *Moniliformis moniliformis* was obtained from the rats collected in Penang, the measurements fits closely the description of Chandler's material (Chandler, 1941; Petrochenko, 1971).

The proboscis is a diagnostic feature of the group. The proboscis is spindle shaped and the number of hooks 12 in longitudinal rows and 9–11 in each row points out that those specimens belong to the species *Moniliformis moniliformis*. This species was obtained from rats and *Moniliformis moniliformis* is a parasite primarily of rodents, (Golvan, 1964).

Slight variation in measurement is expected as Chandler (1941) stated that body size is enormously influenced by the age of the worm, the worm load, presence of worm from prior infection, the position of worm in the intestine of the host and the host itself.

The shape of the egg and measurements tally with that of Chandler's description. Thus this species is confirmed as *Moniliformis moniliformis*.

The prevalence of this parasite on Penang Island is relatively high. The city rat (predominantly *Rattus norvegicus*) carried about 7.3% infection rate while in the field rats (predominantly *Rattus argentiventer* and *R. diardi*) the rate of infection was 21.4%, Table I. The intermediate host of this worm is cockroaches and cockroaches are very commonly found in Penang. Human infections have been reported in some parts of the world (Beck, 1959; Faust and Russell, 1964). As such the existence of a suitable intermediate host and the high prevalance of the worm among the field rats could pose a threat to human health. This also confirms the finding of Khairul Anuar and Paran (1976) that the roaches in the field had a high infection rate of cystacanth.

Table I

Prevalence of Acanthocephala (*Moniliformis moniliformis* Bremser) among City and Field rats in Penang.

PARASITE	No. Infected			
	City Rat		Field Rat	
	No.	%	No.	%
Acanthocephala:				
Moniliformis moniliformis	8 (110)	7.3	15 (70)	21.4

*Number in Parenthesis show the total number of rats examined in the particular area.

Thus there can be little doubt that the materials obtained from *Rattus sp.* in Malaya by previous researchers was also *Moniliformis moniliformis*.

Acknowledgement

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Purulent meningitis in childhood

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Introduction

SPECIFIC ANTIMICROBIAL THERAPY has dramatically improved the outcome in bacterial meningitis. However, mortality and morbidity rates for this infection are still considerable (Fraser *et al.*, 1973; Dawson and Hammond, 1976; Public Health Lab. Service, 1974). Children with purulent meningitis in developing countries are reported to have a less favourable outcome compared to those from the industrialised nations (Seriki, 1970). The reasons for this are not clear and there is little published data on this serious infection in the local community. This is a study of pyogenic meningitis in infants and children admitted to the University Hospital, Kuala Lumpur, during the period between June 1970 and June 1977. Our experience with neonatal bacterial meningitis, where there are special problems in diagnosis and management, has been reported elsewhere (Lee *et al.*, 1977) and will be omitted from this review.

Study Population

All children between the ages of one month and twelve years admitted to the Paediatric Unit of the University Hospital during the 7-year period were included in the study if analysis of the cerebrospinal fluid (CSF) revealed a minimum of three of the following findings:

1. leukocyte count $\geqslant 100$ cells per cu.mm;
2. sugar $\leqslant 50$ mg per 100 ml;
3. protein $\geqslant 50$ mg per 100 ml;
4. positive direct smear for micro-organisms;
5. positive bacteriological culture.

Patients with meningitis caused by *Mycobacterium tuberculosis* were excluded. Fifty-nine patients fulfilled the above criteria and their records were reviewed.

Clinical Features

A breakdown of the major symptoms and signs is presented in Table I.

Table I
Frequency of Clinical Findings among 59 Children with Purulent Meningitis

Male sex	...	...	38 (64.4%)
Female sex	...	...	21 (35.6%)
Fever	...	...	58 (98.3%)
Anorexia	...	...	51 (86.4%)
Convulsion	...	...	46 (80.0%)
Listlessness	...	...	35 (59.3%)
Irritability	...	...	23 (39.0%)
Vomiting	...	...	21 (33.8%)
Headache	...	...	6 (10.1%)
Neck stiffness	...	...	37 (62.7%)
Tense fontanelle	...	...	29 (49.1%)
Kernig's sign	...	...	16 (27.1%)
Semicoma/coma	...	...	13 (22.0%)
Focal neurological deficit	...	...	9 (15.1%)
Opisthotonus	...	...	4 (6.8%)
Skin rash	...	...	1 (1.7%)

There was a male preponderance and 73% of the patients were below 12 months of age at presentation. The duration of symptoms before diagnosis ranged from 1 to 7 days (mean 3.7 days). The most consistent complaints were fever, anorexia, listlessness and irritability. The latter was often described by the mother as resentment on the part of the child to being handled or nursed, contrary to its normal behaviour. Convulsions were present in 80% of the patients during the course of the illness but was the presenting symptom in less than 30 percent. A bulging fontanelle was so impressive in some young infants that a few observant mothers commented upon this point in the history. In children above 2 years of age, vomiting and headache were additional features. Symptoms suggestive of respiratory infection were the initial complaints in about 45% of the cases and these frequently caused a delay in diagnosis. Over 50% of patients had received some form of chemotherapy from general practitioners prior to admission.

In those infants under 12 months of age, an increased tension in the anterior fontanelle was the most useful sign and this was present in 64% of cases. Signs relating to meningeal irritation are generally regarded as being uncommon in childhood meningitis; neck stiffness was in fact present in 63% of patients but Kernig's sign was demonstrated in less than 20 percent. The presence of opisthotonus was of grave prognostic significance; this was noted in 4 children and indicated a fulminating or neglected infection. Focal neurological abnormalities were observed in 15% of patients at admission; the most common of these were sixth nerve palsy and hemiparesis. Papilloedema was observed in only two patients, one with a ruptured cerebral abscess consequent on a cyanotic congenital heart defect; in the other, meningitis was complicated by a massive subdural effusion.

A surprisingly high proportion (61%) of patients had significant anaemia (haemoglobin <10 gm per 100 ml) at admission. Leukocytosis (cell count $>12{,}000$ per μ) with predominance of neutrophils was encountered in 39 patients (66.1%). There was no correlation between these haematological findings and the duration of symptoms before diagnosis, nor did they reflect the severity or influence the outcome of the illness.

CSF Findings

The CSF was either turbid or frankly purulent in the majority of cases. Protein levels were elevated beyond 50 mg per 100 ml in all patients and the glucose values were lower than 50 mg per 100 ml in 51 cases. A centrifuged specimen of the CSF was subjected to Gram-stain in all cases and this demonstrated micro-organisms in 53 cases. Cultures of the CSF revealed bacteriological growth in 52 patients. In addition, blood cultures were positive in 36 out of 53 patients in whom they were performed. In two infants, *Haemophilus influenzae* was isolated from the blood whereas the CSF was sterile. Prior antibiotic administration reduced the likelihood of isolating the causative organisms. All 7 patients with sterile CSF and blood at admission had received antibiotics but in 25 patients cultures of the CSF were positive despite previous chemotherapy.

Table II

Causative Organisms in 59 Children with Purulent Meningitis. The causative agents in 25 patients with neonatal meningitis diagnosed during 1972–1977 are included for comparison.

Organisms	Childhood meningitis 1 month–12 years	Neonatal meningitis 0–1 month
H. influenzae	26	0
Strep. pneumoniae	18	0
Staph. aureus	2**	1
Staph. albus	2*	0
Flavobacterium meningosepticum	0	13
Esch. coli	1*	5
Proteus mirabilis	0	2
Klebsiella sp.	1***	2
S. paratyphi	1	0
Strep. faecalis	1	1
No growth	7	1
Total	59	25

* meningitis due to colonised ventriculo-atrial shunts.
** meningitis due to ruptured cerebral abscess and infected dermal dural sinus, respectively.
*** meningitis due to infected indwelling intravenous catheter.

The most common organisms isolated were *H. influenzae* and *Strep. pneumoniae* (Table II). All cultures of pneumococci were highly sensitive to penicillin as determined by disc agar diffusion method; isolates of *H. influenzae* (type b in 24 of 26 isolates) were all susceptible to ampicillin, chloramphenicol and trimethoprim-sulphamethoxazole. Meningitis due to other bacteria should alert to the possibility of a distant focus of infection. Retrograde spread of infection from colonised ventriculo-atrial

shunts was responsible for ventriculitis in 3 children with hydrocephalus. In one child, the infection extended from a septic focus arising in a congenital lumbar dermal dural sinus, and in another meningitis resulted from a ruptured cerebral abscess. An infected indwelling intravenous catheter was the source of infection in an infant with a congenital heart defect.

In approximately two-thirds of the cases treated, repeat examinations of the CSF were performed. Cultures were invariably negative within 72 hours of institution of appropriate chemotherapy but CSF pleocytosis, increased protein values and diminished sugar concentrations persisted for 1 to 7 weeks after bacteriological cure. The decision to suspend antibiotic treatment was based on bacteriological and clinical recovery; mild abnormalities of the CSF cytology and chemistry were not regarded as indications for continuation of chemotherapy.

Treatment

Once a diagnosis of meningitis was confirmed by lumbar puncture, parenteral chemotherapy was initiated. Chemotherapeutic regimes were variable but usually included a penicillin (Penicillin G, ampicillin or cloxacillin) in association with chloramphenicol or gentamicin. In about one-third of the patients, additional antibiotic support was provided via the lumbar thecal or intraventricular route. Chemotherapy was adjusted once culture and sensitivity results were known. Every effort was made to reduce high fever by antipyretics, exposure, sponging and occasionally by parenteral chlorpromazine. Implanted catheters were removed when these were suspected to be septic foci and pockets of infection received appropriate surgical treatment. Oral or nasogastric feeding was initiated as soon as this could be tolerated. Clinical response as judged by defervescence, increased alertness and improved appetite was usually evident within 48 hours unless complications or death occurred.

Complications

Convulsions occurred so frequently that they may be regarded as an integral part of the disease. The most common seizure pattern observed was the generalised tonic or clonic fit of short duration and low frequency. These fits were readily controlled by intermittent intravenous diazepam (valium: 0.1 – 0.3 mg/kg) or intramuscular paraldehyde (0.3 ml/kg). Less frequently, focal or generalised seizures of a recurrent and prolonged nature were encountered. In addition to diazepam, diphenylhydantoin 6–8 mg/kg per day or phenobarbitone 5–8 mg/kg/day was prescribed for these very ill patients but the fits were frequently resistant to anticonvulsive therapy. In these children, the underlying aetiology was frequently multiple and included uncontrolled infection, cortical venous thrombophlebitis and arteritis (Fig. 1), cerebral oedema and subdural effusion. This situation usually demanded a repeat lumbar or ventricular puncture to evaluate the bacteriological response to chemotherapy and bilateral subdural taps to exclude the presence of effusion.

Figure 1: Post-mortem specimen of the brain of a child with purulent meningitis. Note extensive infarct of the left hemisphere from arteritis and thrombophlebitis of the cortical vessels.

Cerebral oedema is present in almost every case of meningitis and is believed to be at least partially responsible for the increase in intracranial pressure, disturbance of consciousness and convulsions. Provided adequate antibiotics are administered, mild degrees of brain oedema should subside within

48 hours. In severe brain swelling, the immediate hazard is that of tentorial herniation with brain stem compression and death. In 15 patients, the clinical manifestations of cerebral oedema, viz. incessant convulsions, hyperpyrexia, tense fontanelle, high pitch cry, irregular respirations, unequal pupillary size, opisthotonus and deepening coma were severe enough to warrant treatment with intravenous mannitol (1–2 gm/kg over 10–15 minutes) and/or dexamethasone (1–2 mg intravenously 6 hourly). Water retention, consequent on an inappropriate secretion of anti-diuretic hormone, undoubtedly contributed to the cerebral oedema in at least 5 patients. This condition was diagnosed if the child voided a hyperosmolar urine in the presence of hypotonic extracellular fluid. Treatment was by fluid restriction until the serum sodium concentration returned to normal. Cerebral oedema was considered a major contributory cause of death in at least five of the nine patients who succumbed to the infection.

Subdural effusion was suspected in any child with persistent fever, lethargy, irritability or recurrent convulsions; with focal neurological signs; or with a bulging fontanelle or an increasing head circumference. Transillumination of the skull as a diagnostic tool was not found to be useful. In the presence of the above manifestation, diagnostic taps were performed over both parasaggital subdural spaces. Significant amounts of subdural fluid (1–50 ml) were found in 25 patients and the effusion was bilateral in 16 cases. The subdural fluid was characteristically xanthochromic with a protein level in excess of 500 mg per 100 ml. In an unexpectedly high proportion of cases (35%), the fluid revealed organisms on culture. Conservative tapping of the subdural space with a 21 gauge needle whenever symptoms recurred, was successful in controlling the effusion in all but two patients. The number of subdural taps required ranged from 1 to 12. In the 2 infants where conservative treatment failed, surgical removal of the subdural membranes was performed in one and a subdural-peritoneal shunt was inserted in the other.

In young children, bacterial meningitis is frequently part of a systemic infection. Bronchopneumonia was the most frequent associated illness noted and occurred in 10 patients. In 2 patients with *H. influenzae* meningitis, septic arthritis involving the hip and the knee joint respectively, was responsible for the persistent fever. One desperately ill infant also with *H. influenzae* infection developed a concomitant purulent pericarditis and improved dramatically after pericardial drainage.

Outcome

Fifty children survived the infection. One child with *Salmonella* meningitis relapsed one week after suspension of antibiotics but responded to a second course. The overall mortality rate was 15 percent. Mortality was much higher with pneumococcal meningitis (33%) as compared to that due to *H. influenzae* (4.5%). Six of the total deaths occurred within 48 hours of admission. Septic shock, a gross disturbance of sensorium, opisthotonus and uncontrollable convulsions were pointers to a poor prognosis. It was not possible to reach conclusions regarding the efficacy of any particular antibiotic as many different regimens were employed in treatment. Forty-seven of the 50 survivors had at least one follow-up examination after discharge from hospital. In the neurological evaluation particular attention was paid to the detection of gross auditory and visual impairment, head circumference, intellectual and developmental retardation, behaviour problems, focal neurological defects and the occurrence of seizures. The results of the examinations revealed that 30 patients were within normal expectations or were left with no detectable residual damage. There were 8 subjects with significant neurological findings which included spastic hemiparesis, spastic quadriplegia, poor vision, partial hearing loss, hyperkinetic behaviour and epilepsy. Nine patients were left with severe brain damage and were incapable of an independent existence. The age of onset, interval between onset and therapy, previous administration of antibiotics and CSF cell count did not seem to influence mortality or morbidity.

Discussion

Bacterial meningitis is a medical emergency and although this disease is well known, it still poses a formidable diagnostic challenge. When the presenting features are with convulsions, opisthotonus and coma, the diagnosis is easy but therapeutic response is likely to be disappointing. In the early stages of infection symptoms are likely to be vague and non-specific and clinical signs may be equally subtle. A high index of suspicion is important; the presence of fever, lassitude, drowsiness and irritability in a young child should bring to mind the possible diagnosis of meningitis. Empirical antibiotic therapy should be avoided and there should be no hesitation in performing a lumbar puncture if the diagnosis is in any doubt. At the University Hospital, approximately 3.5% of 1,850 lumbar punctures performed in children during a 4-year period allowed a diagnosis of bacterial meningitis and we would consider this an acceptable risk-benefit ratio.

A prompt and careful examination of the CSF will in the vast majority of cases yield a definitive diagnosis. While an increased CSF cell count with predominant polymorphonuclear leukocytosis, a

diminished glucose concentration and an elevated protein level offer corroborative evidence (Menkes, 1969), the diagnosis is confirmed by the demonstration of micro-organisms on a stained film and on culture. Blood culture will often provide additional confirmation and is occasionally positive when the CSF is sterile. The typical CSF findings may be obscured and the chances of obtaining positive cultures prejudiced by previous antibiotic therapy. Thus, when organisms cannot be demonstrated in the CSF the physician is confronted with the problem of distinguishing aseptic viral meningitis from partially treated bacterial meningitis. The problem may partly be resolved by performing a repeat lumbar puncture a few hours later while antibiotics are withheld (Smith, 1973). The recent introduction of immuno-electrophoresis to detect bacterial antigens (Edwards *et al.,* 1972) and of limulus lysate to detect endotoxin in the CSF (Nachum *et al.,* 1973) has helped overcome some of the problems. Whenever doubt exists, the safest course is to institute parenteral antibiotics at full dosages for 10 days. In this series, positive cultures were obtained from the CSF in 83% of patients. The predominant organisms, *H. influenzae* and *Strep. pneumoniae* were responsible for 85% of all cases where bacteria could be isolated. The conspicuous absence of *Neisseria meningitidis* as a causative agent is at variance with reports from Western countries. Surveys of oropharyngeal flora in the local population also confirm the rarity of this micro-organism as a commensal. Beyond the neonatal period. Gram-negative enteric organisms are rarely implicated in the aetiology. When these and other unusual bacteria are isolated from the CSF in an older child, a careful search should be made for anatomical defects in the central nervous system, for distant foci of infection, and for impaired immunity in the host.

The choice of chemotherapeutic agents for initial treatment is still controversial. In many institutions, intravenous ampicillin has been advocated. Because ampicillin achieves a CSF concentration which is 5–30% of the simultaneous blood concentration, depending on the degree of meningeal inflammation, and because of the gradual development of anti-microbial resistance, the current recommendation is to administer ampicillin at a dose of 400 mg/kg/day for 10–14 days (Haltalin and Smith, 1971). The practice of reducing the dosage after a few days is irrational. Even with this regime treatment, failures have been described and these have subsequently responded to chloramphenicol (Shakelford *et al.,* 1972). The other favoured combination is penicillin (benzylpenicillin 1 mega unit, 4–6 hourly, I.V.) with chloramphenicol (100 mg/kg/day) for 10–14 days. Both these drugs penetrate the blood – CSF barrier in sufficient quantities to attain a satisfactory CSF concentration, regardless of the degree of meningeal inflammation (Roy *et al.,* 1952). The risk of haematological toxicity accompanying the use of chloramphenicol has reduced its popularity but this must be very small compared to the seriousness of meningeal infection. Other centres have reported success with the use of trimethoprim-sulphamethoxazole combination (Roy, 1971). The role of intrathecal and intraventricular administration of antibiotics to provide additional therapeutic support is still uncertain. While intraventricular therapy has significantly reduced the mortality in gram-negative neonatal meningitis (Lee *et al.,* 1977), further evaluation is necessary before its routine administration can be recommended in the older child. The duration of antibiotic therapy depends on the clinical response. In our experience, it is safe to suspend chemotherapy once the patient has remained a febrile for 7 days. As CSF abnormalities may persist for 3 or more weeks after bacteriological cure, it is unnecessary to continue chemotherapy until the CSF returns to normal.

Supportive measures are about as important as appropriate antibiotic therapy and must not be neglected. The goal is to maintain the child's homoeostasis by providing adequate oxygenation, correcting metabolic derangements (acidosis, hypoglycaemia, hypo- or hyper-osmolarity) and ensuring a satisfactory cerebral blood flow. Maintenance of these physiological parameters will require accurate monitoring of blood pressure, fluid balance, haematocrit, and frequent determinations of blood sugar, electrolytes, PO_2 and acid-base status. Hyperpyrexia and prolong seizures will further compromise the oxygen demands of the brain and must be promptly brought under control. Subdural effusion cerebral oedema and other complications should be identified early and treated appropriately.

The mortality rates in this series are comparable to those described in the West; 4.7–19% for *H. influenzae,* and 25–37% for *Strep. pneumoniae* (Fraser *et al.,* 1973; Weiss *et al.,* 1967). Murray *et al.* (1972) was able to reduce the overall case fatality to 2.9% and attributed this improved result to the intensive supportive therapy their patients received. The incidence of long-term sequalae of this disease is distressingly high. Only about half of our patients with left with no apparent neurological deficit. Detailed psychometric and audiometric evaluations were not performed on these children, so that the incidence of more subtle brain damage is probably higher. Sell *et al.* (1972) reported that 43% of their patients with *H. influenzae* meningitis were free from detectable defects. When more extensive psychological testing was subsequently performed

on these post-meningitis 'normal' children, it was found that they were functioning at considerably lower levels than their peers (Sell *et al.*, 1972). A more aggressive approach to diagnosis and therapy will clearly be required if the mortality and morbidity risks are to be reduced.

Summary

This is a review of 59 cases of purulent meningitis in children between the age of 1 month and 12 years. The clinical features at presentation are often non-specific and diagnosis frequently masked by previous antibiotic administration. *H. influenziae* and *Strep. pneumoniae* are the two most common causative organisms. The overall mortality rate of 15% is similar to most published figures. However, only 50% of children escaped demonstrable brain damage. Currently, penicillin with chloramphenicol or ampicillin alone are recommended for initial therapy. If results are to be significantly improved, the infection must be detected in its early stages by the liberal use of lumbar puncture while antibiotics are withheld. The goal in chemotherapy is to ensure an adequate concentration of the appropriate antibiotic in the CSF. In addition, treatment must be directed towards the prevention and prompt management of the metabolic derangement and other complications accompanying the disease.

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Serodiagnosis of parasitic infections

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Introduction

DETECTION OF the characteristic stages of parasites in the blood, tissues, stools, other excretions and secretions of the host is the proof of parasitic infections. Negative results, however, do not exclude the presence of parasites especially if they have been altered by drugs, or when they are present at subpatent levels as often is the case in very light, early or in late infections. At times, microscopic examination is impossible or impractical due to the location of the parasites in the deep tissues. Diagnostic techniques may be laborious and time-consuming. Tissue biopsy or aspirations for parasites may be traumatic and also may give negative results. Under such conditions, diagnosis is often made from the clinical history, symptoms and signs alone. The clinical picture of most parasitic infections is highly variable.

Serodiagnostic techniques have been found useful in supporting the clinical observation or to rule out these diseases. Although serological techniques have been used for diagnosis of parasitic infections from the early years of this century, only in the last few years have these tests received general acceptance. At present the interest in the serological diagnosis is fast increasing and such techniques are available for at least 24 parasitic infections (Kagan, 1976a).

Many reviews on the recent advances in the immunodiagnosis of parasitic infections are available (Miller and Brown, 1969; Kagan and Norman, 1970; Denham *et al.,* 1971; Singh and Yap, 1971; Fife, 1971; 1972; Kagan, 1974; 1976a; 1976b and Sadun, 1976). A number of serodiagnostic techniques both quantitative and qualitative, are employed for serodiagnosis of parasitic infections. However, none of these is universally accepted as the best single method. Each method has its uses, advantages and limitations. A combination of several tests and antigens are recommended for more accurate results (Kagan, 1974). This paper discusses briefly the serodiagnostic techniques that are commonly used for parasitic diseases, their applications and limitations.

Application

Serological techniques may be useful in diagnosing individual cases, particularly those infections where parasites are not readily detected by other methods as in toxoplasmosis, extra-intestinal amoebiasis, trichinellosis, hydatid disease, visceral larva migrans etc. These are also invaluable in the epidemiology of parasitic infections. These techniques have also been found useful in screening blood donors and to exclude infections like malaria and other parasitic infections in patients with manifestation such as pyrexia of unknown origin, hepatosplenomgaly, anaemia and nephrotic syndrome.

Limitations

Inspite of the great progress made in recent years, serodiagnosis of parasitic infections, still has many limitations. Most of the methods are laborious, time-consuming and difficult to perform. Only specially trained serologists can perform the tests, and expert knowledge is required for interpretations of the results. Certain tests require expensive equipment and reagents.

So far, no tests are available for the detection of early infections before production of detectable levels of antibody and as a result false negatives are common when dealing with early stage of infections. None of the available tests become negative immediately after an infection has been terminated, although in some infections like malaria and amoebiasis, titres generally decrease shortly after treatment. Therefore, a positive reaction may not indicate whether an infection is present or past, acute or chronic, primary or secondary. It may however, be possible to differentiate, an acute infection by rising titres over a few days or weeks. Often there is little or no correlation between severity of symptoms and level of antibodies. The results can be interpreted only with a thorough knowledge of the clinical picture and epidemiological data. Cross-reactions are often found among related species or at times even unrelated parasites.

Antigens

The most important prerequisite in serodiagnostic tests is the availability of sufficient quantities of specific antigen. Fife (1971) emphasized the fact that no serological test is better than the antigen used. The source, nature, purity, and specificity of the antigens are important factors in determining the specificity, sensitivity and reproducibility of the tests. Most parasitic antigens presently used are mixtures of specific and non-specific componants which have been specially prepared for use in one or more tests. These complex mixtures may contain antigens that are shared by other related or even unrelated parasites which results in cross-reactions. The cross-reactions have been shown (Kent, 1963) to be due to similarities in antigenic constituents that may be present in different organisms or due to the molecular rearrangement of antigens due to treatment during their preparation. Other factors that may further influence the suitability and efficiency of the antigen are the particular stages of the life-cycle of the parasite that are used for antigens and the procedures which are employed for preparing, quantitating and testing. Best results are obtained when pure antigens prepared from homologous species are used.

Although various developmental stages of a parasite can be used as antigen, the stages in the life cycle which are available in large quantities are often used. Due to the biochemical and structural alterations that occur in the parasite during its life cycle, these stages vary in their antigenicity as has been shown in trematodes (Sadun and Gore, 1967) and nematodes (Williams and Soulsby, 1970). Most of the serodiagnostic investigations have been done using sematic antigens prepared from whole or part of the various stages of the parasite. Wienstein (1959) has shown that antigens present in the secretions and excretions of living helminths evoke a considerably higher degree of protective immunity in laboratory animals than do somatic antigens. However, isolation and purification of sufficient quantities of excretary and secretory antigens are difficult and therefore, only very few studies have been made using these antigens.

Antigens used are mainly of two types, the soluble and the particulate antigens. The soluble antigens have been used in complement fixation tests, precipitation test, and to sensitise various particles such as erythrocytes, bentonite, latex, cholesterol-lacithin complexes, charcoal-particles, etc., which may then agglutinate or flocculate in the presence of specific antibodies. Soluble antigens are also used in skin tests. Whole or parts of parasites or particulate antigens are used in Indirect fluorescent antibody (IFA) and direct antibody (FA) tests.

Among the many serological techniques that are available for detection of antibodies to parasitic infections three test types are of greater importance and these are, the complement fixation (CF) tests, the indirect haemagglutination (IHA) tests and fluorescent antibody (IFA) tests. For many parasitic infections it is a question of choice, which test is employed and the reliability of the results may depend more on the quality of the antigen rather than on the particular test used.

Complement fixation

Among the serodiagnostic techniques used for parasitic diseases, complement fixation is the oldest and one of the more widely used techniques. When performed under strictly standardized and optimum conditions, it is one of the most reliable, reproducible and sensitive tests. This test, now uses the 50 percent haemolysis end point instead of 100 percent haemolysis and employ spectrophotometer instead of somewhat emperical procedures for standardization of various reagents. The modified techniques are far superior to the earlier ones. However, different laboratories use different techniques devised within the accepted concepts of immunehaemolysis and complement fixation. At least some of the variations of the CF tests, can be performed as a microtitration procedure.

The use of CF tests is, however, limited by the very delicate techniques and complicated test systems which need precise standardization. It is a very laborious technique which can be performed only by competent and experienced serologists. The tests

cannot be used under field conditions. Unless the sera are rapidly transported to the laboratory and stored under optimum conditions, a larger percentage of the specimens develop anticomplementary properties which make them unsuitable for testing (Sadun, 1976). Buck *et al.,* (1970) have shown that a large number of sera from donors with nutritional deficiencies and infectious diseases may have low serum albumin and high gamaglobulin levels which may be anticomplementary and unsuitable for CF tests. The results obtained from different laboratories are not often comparable and may be due to the differences in the quality of the antigens and the variations in techniques used.

The CF tests have been successfully employed for serodiagnosis of amoebiasis (Kessel *et al.,* 1965), toxoplasmosis, malaria, trypanosomiasis, filariasis, schistosomiasis, paragonimiasis and echinococcosis (Kagan, 1974).

Indirect haemagglutination

Today IHA test is one of the preferred routine tests in the serodiagnosis and seroepidemiological investigations of many parasitic diseases. Its procedures are simpler and easier than those of most of the serological tests and no specialised equipment is required for performing or reading the tests. The introduction of microtitre plates has facilitated easy reading and has reduced considerably the volume of reagents required. Large numbers of sera can easily be tested and these tests can be performed even under certain field conditions. The test is very sensitive and reasonably reproducible when performed under standardised conditions. A serious problem encountered in the IHA technique however, is its lack of specificity which may be due to it high degree of sensitivity (Fife, 1971; Sadun, 1976). Various workers treat the erythrocytes with different chemicals such as tannic acid, formalin, other aldehydes or chromium chloride before the antigen is absorbed on the cell surface. Variation in reproducibility of the tests therefore, may be due to the differences in the erythrocytes used and the variations in the reagents and techniques used to sensitise and stabilise these cells. It may be possible to overcome these problems by strict standardization of all reagents and the use of pure antigen.

This test has been used statisfactorily in serodiagnosis of malaria (Stein and Desowitz, 1964); amoebiasis (Kessel *et al.,* 1965); toxoplasmosis (Jacobs and Lunde, 1957); filariasis (Kagan, 1963); visceral larva migrans (Kagan *et al.,* 1959); trichinellosis (Kagan and Bargai, 1956); schistosomiasis (Kagan and Oliver-Gonzalez, 1958) and echinococcosis (Garabedian *et al.,* 1959).

Indirect fluorescent antibody

The IFA technique is considered as the most sensitive of the standard serodiagnostic procedures (Fife, 1971, 1972). It can be performed on serum or on blood collected by finger prick and dried on filter paper (Anderson *et al.,* 1961). This makes the collection of the samples much easier and enhances its value as a tool in the seroepidemiological studies. It is a relatively rapid and simple test where particulate antigens are used. The preparation of comparable batches of antigen is relatively simple (Sulzer, 1965; Sulzer *et al.,* 1969; WHO, 1974; Thomas and Ponnamapalam, 1975).

In spite of these advantages, the IFA procedure has a few inherent limitations and great care must be taken in performing, reading and interpreting the reactions. The quality of the conjugate and the degree of conjugation of the antiserum influence the result and therefore care must be taken to standardise these factors. The microscopist must have considerable competence and experience in the fluorescent microscopy. The readings are subjective and are interpreted in relation to known positive and negative controls. Due to a higher sensitivity, this technique tends to give more false positive reactions than other less sensitive techniques. This can, however, be minimized by selecting a higher dilution as diagnostic titre. The test occasionally gives false negative reactions especially in early infections in children.

The IFA seems to be the preferred technique for the diagnosis of malaria (Wilson *et al.,* 1971, 1975, Collins and Skinner, 1972); toxoplasmosis (Miller and Brown, 1969; Remington *et al.,* 1968); leishmaniasis (Duxbury and Sadun, 1964) and trypanosomiasis (Fife, 1972). This technique has also been used in infections like amoebiasis (Ambroise-Thomas and Truong, 1969); visceral leishmaniasis (Araujo and Mayrink, 1968); schistosomiasis (Kagan *et al.,* 1965); facioliasis (de Azevedo and Rombert, 1965); trichinellosis (Sadun *et al.,* 1962) and filariasis (Mantovani and Sulzer, 1967).

In recent years, the availability of immunoglobulin class specific conjugate for use in the diagnosis of parasitic infections has greatly increased the usefulness of the immunofluorescent test. In addition to its use for serodiagnosis, the IFA procedure has the unique potential for basic studies on the immune response to parasitic infections. It has been shown (Reminton and Miller, 1966 and Remington *et al.,* 1968) that the IgM fluorescent antibody test is useful in diagnosis of acute acquired and congenital toxoplasmosis. Similar investigations

may be useful for other parasitic diseases and would possibly improve the pathognomonic value of immunodiagnostic technique. However, the specificity and the purity of the immunoglobulin class-specific conjugate must be insured for reliable results.

The IgM class-specific tests for toxoplasmosis, however, is not always disease specific and false positive results were obtained for patients with rheumatoid factor (Camargo *et al.*, 1972) and with antinuclear antibodies (Araujo *et al.*, 1971).

Enzyme-linked immunosorbent assay

Enzyme-linked immunosorbent assay (ELISA) is a newly developed procedure which is a modification of IFA technique. In this technique, fluorescein isothiocyanate is replaced by alkaline phosphatase enzyme or horse-radis-hperoxidase in the anti-immunoglobulin conjugate. After the interaction between antigen, serum and enzyme conjugate has taken place, a suitable substrate is added which causes the enzyme in the antigen-antibody complex to become coloured. The colour change can be measured by a colorimeter or by eye. The intensity of the colour is directly related to the amount of antibody in the test serum. The assay has been used in Chagass disease (Ferreira *et al.*, 1975; Voller, 1977) toxoplasmosis (Ourth *et al.*, 1974); amoebiasis, filariasis and hydatid disease (Bout *et al.*, 1975) and trichinellosis (Ljungstrom *et al.*, 1974). The application of enzyme-linked immunosorbent assay has been discussed by Voller *et al.*, (1976).

Soluble antigen fluorescent antibody

The soluble antigen fluorescent antibody (SAFA) procedure developed by Toussaint and Anderson (1965) and Toussaint (1966) is a recent advance in the serodiagnosis of parasitic infections. This test is also a modification of the indirect fluorescent antibody technique and the soluble antigen is fixed on an artificial matrix (cellulose acetate filter paper disc) and the tests are read on a fluoremeter. The SAFA technique has certain inherent advantages over the IFA procedure in which intact organisms are used as antigen. The procedures are much simpler to perform and the fluorometer reading of the results eliminates subjectivity. In addition there is no "fade out" during reading of the tests. This test seems satisfactory for the serodiagnosis of a number of parasitic diseases like American trypanosomiasis (Toussaint *et al.*, 1965), amoebiasis (Gore and Sadun, 1968a); filariasis (Duxbury and Sadun, 1967; Schistosomiasis (Toussaint, 1966); echinococcosis (Gore *et al.*, 1970); and trichinellosis (Gore and Sadun, 1968b). The specificity and sensitivity of the SAFA tests for these infections are reported to be equal or superior to those of other standard serologic tests.

Flocculation

Flocculation tests have been used for the routine diagnosis of a few parasitic infections. Flocculation tests are similar to the IHA technique except that inert particles such as latex (Fischman, 1965), bentonite (Kagan *et al.*, 1963) or lecithincholesterol crystals (Anderson, 1960) are used as antigen carriers instead of intact red blood cells. These are simple tests which can be formed within a few minutes and need no special equipments. The antigen-sensitized particles can be stored for a few weeks without deterioration. However, false negative reactions are common, a one way cross-reaction between schistosome antigen and trichinella antibodies is known to exist (Anderson *et al.*, 1963).

Flocculation tests are extensively used in the routine serodiagnosis of schistosomiasis, trichinellosis and echinococcosis (Fife, 1971).

Preciptin and immunodiffusion

Precipitating antibodies are often shown in a gel diffusion system in which antibodies and antigens are allowed to diffuse towards each other from wells cut in slides or plates coated with agar. The reactants diffuse in all directions and only the small amounts meeting in the area between the wells can form precipitation lines. This method is thus very slow and insensitive. The test is relatively inexpensive and technically simple to perform and requires very little special equipments. This procedure has been successfully used for the serodiagnosis of anoebiasis (Maddison *et al.*, 1965) and other parasitic infections.

Counter-current immunoelectrophoresis (CIE) is a recent development in which both antigens and antibodies move towards each other when an electric current passes through the slide or plate. This increases the sensitivity and speed of the reaction. A double system in which the specimen for the test is placed in a central well with the antiserum on the anodal side and the antigen on the catodal side. The equipment needed for a CIE test system are simple and cheap. This test has been found to be more sensitive than simple gel diffusion to detect antibodies in amoebiasis (Kaupp, 1974). Its use in other parasitic infections has been discussed by Draper (1976).

Methylene-blue dye test

This is one of the oldest and most useful serodiagnostic methods for toxoplasmosis. It is based on the principle that when live *Toxoplasma gondii*

trophozoites are exposed to immune serum in the presence of an "accessory factor" they fail to stain with alkaline methylene blue (Sabin and Feldman, 1948).

Trophozoites and Toxoplasma are harvested from the peritoneal exudates from mice infected intraperitoneally 3 days earlier. Standard numbers of the washed trophozoite are mixed in serial dilutions of the test sera in the presence of an optimum concentration of accessory factor. The accessory factor is a heat-labile substance found in antibody free sera of certain donors. The organisms are incubated for 1 hour in a water-bath at 37°C. Alcoholic methylene blue at pH 7.0 is added after incubation.

In the presence of specific antibody in the test serum and the accessory factor, the cytoplasm of the *Toxoplasma* trophozoite becomes modified and partially lysed and does not stain blue. In this test the alkaline methylene blue does not take part in the reaction but is used as an indicator to distinguish between unmodified parasites modified organisms modified by antibody. It is a quantitative test and the highest dilution of the test serum which modify 50% of the *Toxoplasma* is considered the end point. The test can be done on slides and end points determined with the help of a microscope. It is a very sensitive and specific test for toxoplasmosis and cross-reaction with other protozoa are minimal.

However, the test has certain draw-backs. It requires the use of live organisms which make the test dangerous and this test is difficult to perform and laborious to read. Special care has to be taken by those who handle the parasites for the test. Very careful attention must be paid to many technical details including standardization of the "accessory factor" and the number of parasites per dilution.

Intradermal tests

Intradermal tests have been used for diagnosis of a variety of parasites especially for helminthic infections. These tests, however, are subject to serious inherent draw-backs which limit their value. Although sensitive, these tests are among the least specific of the immunodiagnostic techniques and show cross-reactions and false positive reactions. Therefore, these have limited value of the diagnosis of individual cases although these tests are still used for epidemiological surveys of infections such as filariasis (Sawada *et al.,* 1962), echinococcosis (Kagan *et al.,* 1966), trichinellosis (Kagan and Zaiman, 1964) paragonimiasis, colonorchiasis (Sadun *et al.,* 1959a and 1959b), schistosomiasis (Anderson and Naimork, 1960) and leishmaniasis (Imperate and Bradrick, 1969). Immediate hypersensitivity reactions are employed for the diagnosis of helminthic infections and delayed hypersensitivity reactions for protozoan diseases.

In conclusion, it must be stressed that serodiagnosis of parasitic diseases is far from being perfected and standardized. Although for diagnosis of certain diseases like toxoplasmosis, chagas disease, amoebiasis, trichinellosis and schistosomiasis are accepted, the serodiagnostic techniques for other infections are still in developmental stages. These require further evaluation and standardization before they are universally accepted for routine serodiagnosis of parasitic disease.

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Treatment of hypertension with acebutolol*

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Summary

OF 28 patients included in a trial of oral Acebutolol for the treatment of hypertension, 23 were eligible for assessment. Acebutolol alone was successful in controlling the blood pressure in 17 patients (74%), mild and moderate cases showing the best response, Combination therapy with chlorothiazide did not improve the response rate appreciably. The five treatment failures had had severe hypertension with mean arterial pressure exceeding 140 and had all been previously unresponsive to other antihypertensive agents.

Tolerance throughout the trial was good. The commonest side effect noted was weight gain which was unrelated to fluid retention. Giddiness, lethargy, drowsiness and increased sweating occurred occasionally and transiently. Two patients with chronic obstructive airway disease tolerated the drug without developing bronchospasm, thus confirming the cardioselective property of the drug. Cardiac decompensation occurred in two patients with cardiomegaly necessitating digoxin and diuretic therapy. Despite its intrinsic sympathomimetic activity, the drug should be used with caution in patients with impaired myocardial contractibility.

Introduction

Since Prichard (1964) first described the antihypertensive effect of beta blockers, there has been tremendous progress in this field of therapeutics. Today there are well over 30 beta blocking compounds available, all of which display more or less marked anti-hypertensive properties. Experience in the use of beta blockers as treatment for hypertension in countries all over the world suggests that preference for any preparation is often decided not by its anti-hypertensive activity, but by its safety, tolerability and liability to produce untoward side effects.

The purpose of this study is two fold: firstly, to study the efficacy of Acebutolol as an anti-hypertensive agent in the local patients, and secondly, to evaluate its acceptability from the standpoint of safety and tolerability.

Patients and methods

This trial was carried out in the District Hospital, Segamat, commencing in March 1976 and ending on December 1st 1976, when the last patient in the trial had completed 6 months of continuous therapy with Acebotolol.

Two groups of hypertensive patients were selected for the trial:

(a) New cases: Any patient with three separate blood pressure recordings greater than 150 mm Hg (systolic) and 90 mm Hg (diastolic) taken after 10 minutes rest and at the same visit.

Exclusions:
1. Pregnant women.
2. Patients with drug induced hypertension.
3. Patients with a pulse rate of below 60/min.

(b) Established cases where the blood pressure remained uncontrolled with existing therapy or where there was intolerance to antihypertensive drugs used.

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All previous antihypertensive drugs were terminated for at least one week prior to entering the study. Blood pressure and pulse rate were recorded in the supine position after 10 minutes lying down and in the erect position after 1 minute standing. Three sets of readings were noted for each position. The level of diastolic blood pressure was indicated by the disappearance of the sounds on auscultation.

Besides a thorough clinical examination to assess the extent of target organ damage, the following investigations were carried out initially and after 3 months of therapy with Acebutolol:

1. Body weight
2. Haemoglobin estimation and white cell count
3. Urine examination
4. Blood urea
5. Liver function tests
6. Electrocardiographs (ECG)
7. Chest X-ray

Other investigations were done when necessary. These included blood sugar, serum electrolytes, serum uric acid, serum cholesterol, serum creatinine, intravenous pyelogram, etc.

Following the one week run-in period, Acebutolol was administered according to a twice daily dosage schedule, the initial dose being 400 mg daily. The dosage was adjusted in either direction weekly until control of blood pressure was achieved. In those instances where control remained unsatisfactory, chlorothiazide (and later other adjuvant drugs) was added to the regime.

All cases were followed up at the physician clinic. Side effects were not specifically asked for but would be recorded if volunteered by the patient or in response to the question: Has the treatment upset you in any way?" The only exception to this rule was made when male patients were specifically asked about impotence, as the author felt that the local patients would be too shy to disclose this information volunteerily.

The severity of hypertension and the response to treatment were classified, based on the mean arterial pressure, which was expressed as:

$$\text{M.A.P.} = \frac{\text{Systolic Pressure} + (\text{Diastolic Pressure} \times 2)}{3}$$

The upper limit of normal mean arterial pressure was taken to be 110 which is equivalent to systolic and diastolic readings of 150/90 or 130/100. Table I shows the criteria used for the grading of severity of hypertension and response to treatment.

Results

Twenty-eight patients were admitted to the trial. Of these 23 were eligible for assessment, 16 being male while 7 were female, and were made up of 6 Malays, 15 Chinese and 2 Indians. Their mean age was 50.5 years and ranged from 35 to 67 years. Twelve had associated conditions (6 with diabetes mellitus, 3 with angina pectoris, 2 with chronic obstructive lung disease and 1 with stroke), and 12 had previous antihypertensive therapy.

Of the 5 patients who did not complete the trial, one had the drug withdrawn upon her request when she became pregnant. The other four defaulted despite repeated attempts to trace them.

By the criteria of grading described earlier, 7 cases were classified as mild hypertension, 7 moderate and 9 severe (Table II). Successful control of blood

Table I

Criteria used for grading severity of hypertension and response to treatment

	Grade	M.A.P.	Equivalent B.P. Readings
Severity of hypertension	Mild	<123.3	up to 170/100
	Moderate	<133.3	up to 180/110
	Severe	133.3 & above	
Response to treatment	Excellent	<106.6	up to 140/90
	Good	<116.6	up to 150/100
	Fair	116.6 & above with fall >20 mm	
	Poor	116.6 & above with fall <20 mm	

pressure (graded as excellent and good) was achieved in 18 patients or 78.3%. The mild and moderate cases had the best results without any failure.

Figure 1 shows the M.A.P. before and after 3 months of Acebutolol for each of these 23 cases.

Table II

Classification and response in the 23 cases of hypertension studied

Severity of Hypertension	No. of Patients	Grade of Response			
		Excellent	Good	Fair	Poor
Mild	7	6	1	0	0
Moderate	7 (2)*	3	4	0	0
Severe	9 (4)	0	4	5	0
Total	23 (6)	9	9	5	0

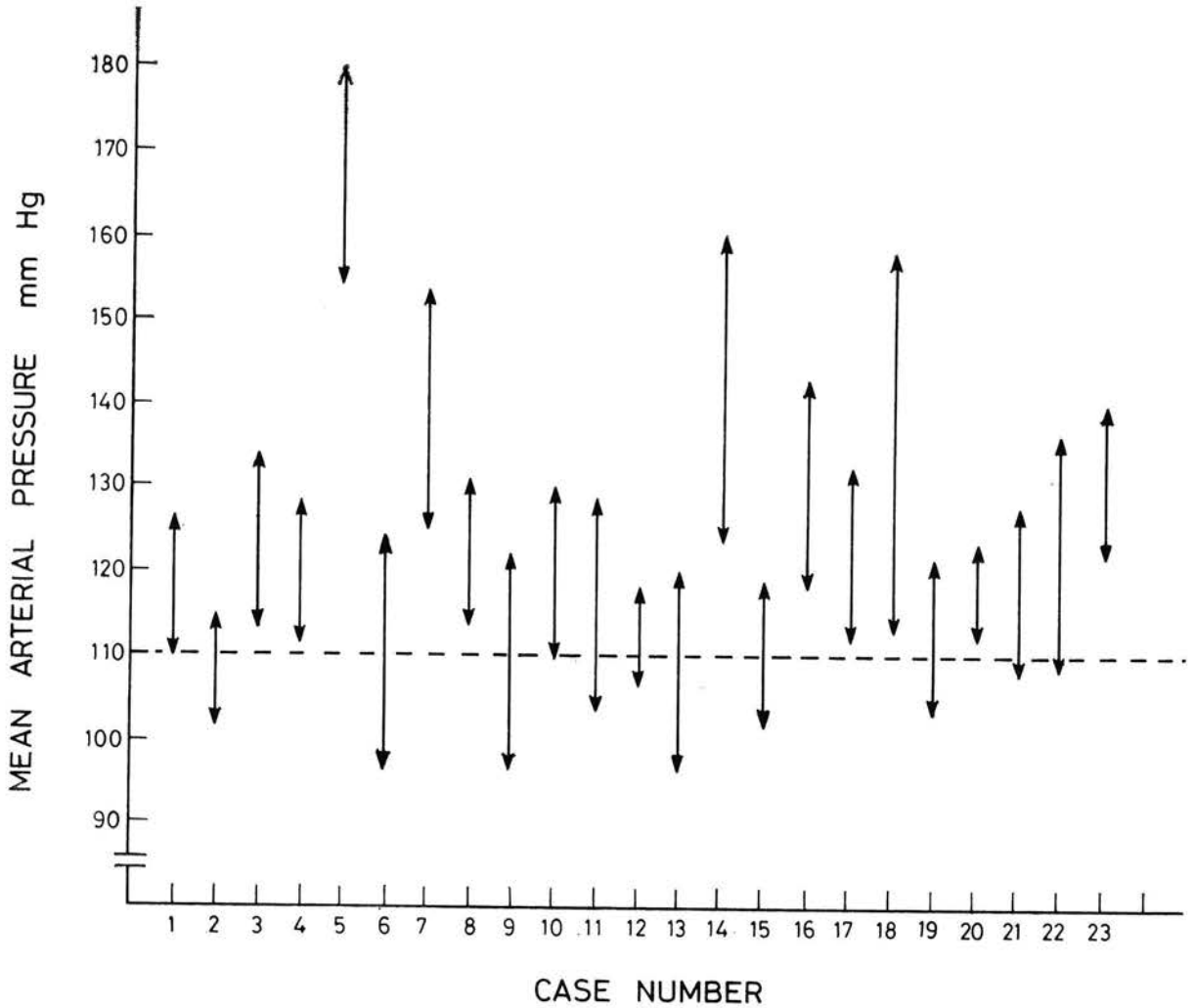

Figure 1: Mean arterial pressure before and after treatment with Acebutolol (23 cases). Dotted line indicates the upper limit of normal mean arterial pressure.

In 17 patients or 74% Acebutolol alone was adequate to control blood pressure, the daily dosage used ranged from 400 to 800 mg. (Table III) Adjuvant drugs were required in 6 patients, with thiazide being the drug of initial choice. The time taken for initial control of blood pressure in the 18 successful cases was variable, the majority taking less than 8 weeks.. (Table IV)

All the 5 failures were from the severe group and had been given combination therapy before. They were given 800 mg Acebutolol per day with one or more of these adjuvant drugs: Chlorothiazide, methyldopa, debrisoquin or guanethidine. The fall in their M.A.P. ranged from 21.7 to 40.0 but the final M.A.P. remained above 116.6 in all cases.

The fall in blood pressure was accompanied by slowing of pulse rate in every case, the majority of patients had pulse rate reduced by 10 to 25 beats per min.

Only one patient showed some biochemical change at the end of 3 month course of Acebutolol. He had a rise in SGOT from 40 i.u./L to 75 i.u./L.

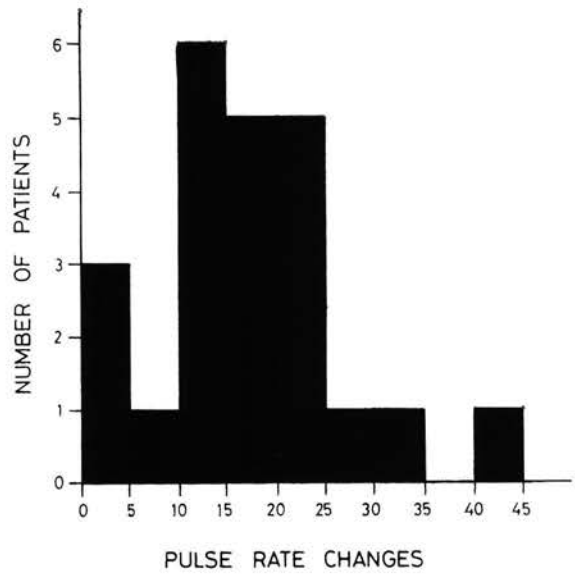

Figure 2: Pulse rate changes following Acebutolol therapy.

Table III

Dosage of Acebutolol used in the 23 cases studied

Dosage of Acebutolol mg/day	Adjuvant Drugs	No. of Patients
400	–	15*
600	–	1
800	–	1
800	Chlorothiazide	1
800	Chlorothiazide + Methyldopa	3
800	Chlorothiazide + Debrisoquine	1
800	Chlorothiazide + Methyldopa + Guanethidine	1

* including two patients given thiazide for heart failure after blood pressure had been controlled.

Table IV

The time taken for initial control of blood pressure in the 18 successful cases

	1 wk	2 wk	4 wk	6 wk	8 wk	10 wk	12 wk	16 wk
mild	3	0	1	2	1	0	0	0
moderate	1	2	1	0	0	0	2	1
severe	0	0	1	1	1	1	0	0
Total	4	2	3	3	2	1	2	1

However, this proved to be a transient phenomenon when SGOT estimation was repeated at 6 months.

Eight patients had significant ECG abnormalities before commencement of the trial. In four the abnormalities remained unchanged after 3 months of treatment. Table V summarises these ECG abnormalities.

Discussion

The antihypertensive effect of beta blockers has been confirmed by so many investigators and in such a large number of patients that it is now universally accepted as proven.

Table V

Summary of significant ECG abnormalities seen in 8 cases prior to commencement of trial

Case No.	Before Treatment	After Treatment
4	LBBB and LVH	No Change
6	LVH with strain	No change
8	Flattened T wave in V5, V6	T wave upright
14	Flattened T wave in II, III, avF, V5 and V6	T wave upright
18	LVH with inverted T wave in I, II, avL, V4 to V7	Reduced amplitude of S in V1 and R in V6
19	QS in V2 and V3	No change
23	LVH with ST segment depression in I, avL, V4 to V6	Reduced amplitude of S in V1 and R in V6 with inverted T wave in II, III, avF, V5 and V6
28	RBBB	No change

LBBB = left bundle branch block
LVH = left ventricular hypertrophy
RBBB = right bundle branch block

Cardiomegaly was seen in the chest X ray films of 11 patients but only two patients showed reduction of cardiothoracic ratio after 3 months of treatment.

Table VI summarises the side effects of therapy as reported by the patients. It is worth noting that of 9 patients who gained weight, 6 had concurrent diuretic therapy. Transient dizziness in all the 3 patients occurred without a demonstrable postural drop in blood pressure. There was no complaint of impotence although one patient admitted loss of libido.

Table VI

Summary of the side effects of therapy reported in 18 patients

Side Effects	No. of Patients
Weight gain (>3 lb. in 3 months)	9 (6 on thiazide)
Transient giddiness	3
Excessive sweating	2
Precipitation of heart failure	2
Poor appetite with weight loss	1
Loss of libido	1

What is the therapeutic efficacy of the beta blockers as a group? Lewis (1974) stated that the response rate of hypertensives to beta blockers alone lies within the range of 50–90% and possibly depends among other things on the initial height of the blood pressure. With propranolol, alone and in combination with diuretics, the effectiveness ranged from 66- to 88% (Prichard & Gillam, 1969). This was confirmed by Zacharias *et al.* (1972). Other beta blockers, including alprenolol, oxprenolol, pindolol, sotalol and timolol, have been shown to be effective in reducing blood pressure to approximately the same degree (Lorimer *et al.*, 1976).

The response rate of hypertensives to Acebutolol as found in this trial was 78.3% comparing favourably with other beta blockers in general and with propranolol in particular.

In clinical practice, beta blockers and diuretics are probably the most common combination used. The enhanced antihypertensive effect of such a combination is very variable as reported by different workers. Brunner (1974) found that the antihypertensive effect of beta blockers could best be compared with that of thiazide diuretics, and that like diuretics, beta blockers exerted a clinically satisfactory reduction of blood pressure in only 20–40%

of cases when prescribed alone. However when employed in combination with diuretics the response rate rose to 70–80%. He therefore concluded that beta blockers were seldom suitable as monotherapy.

However, other workers reported different findings. For example, Dorph & Binder (1969) found that the combined use of oxprenolol and hydrochlorothiazide was not significantly more effective than oxprenolol alone, and Safar *et al.* (1974) obtained similar findings with pindolol and clopamide.

A report from the General Practitioner Research Group in U.K. (Practitioner 1976) found that Acebutolol alone, produced a modest hypotensive effect which was not quite so great as that produced by bendrofluozide alone, although the difference was not statistically significant. The combination of the two drugs produced a more rapid and more effective hypotensive action, which was more than might be expected by a simple summation of the effects of the two drugs together.

In the present trial, the combination of Acebutolol and chlorothiazide did not appreciably increase the hypotensive action of Acebutolol, which alone was effective in 74% of cases. Thus Acebutolol may be regarded as suitable for monotherapy of hypertension. Recently, plasma renin level has been found to be useful in the rapid identification of patients with essential hypertension sensitive to Acebutolol. Lowering of blood pressure after Acebutolol treatment correlated with initial plasma renin activity and reduction in plasma renin activity (Menard *et al.*, 1976).

Beta blockers as a group possess several advantages over the other antihypertensive drugs. Tolerability is good. An enhanced sensation of well being is often experienced by patients taking them. They are effective in controlling blood pressure in both lying and standing position. Coronary complications of hypertension may be reduced by beta blockade therapy. And lastly, abrupt withdrawal of the drug does not result in an immediate rise in blood pressure. In fact, antihypertensive effect of continued treatment can be detected for up to 4 weeks of cessation of therapy. Hence, a missed dose has little therapeutic disadvantage (Taylor, 1976).

Beta blockers vary in their propensity to producing side effects. Propranolol being non-cardioselective and lacking intrinsic sympathomimetic activity may cause bronchospasm and cardiac decompensation. The same may be said for sotalol and timolol. Pindolol has more marked effect on central nervous system. Practolol, which is cardioselective and possesses intrinsic sympathomimetic activity may cause gastro-intestinal upset and oculocutaneous lesion.

Acebutolol has similar pharmacological properties as practolol. It was found to be well tolerated by patients in this trial. Oculocutaneous lesions did not occur. Weight gain was common and was not associated with fluid retention. It could be a result of the metabolic effect of beta blockers on fat and carbohydrate metabolism. Sexual potency was unaffected in all the patients. Although a case of loss of libido was reported, this could not be definitely attributed to Acebutolol therapy. Giddiness, lethargy, drowsiness and sweating disturbances occurred occasionally and could be due to transient central nervous system disturbances. Bronchospasm did not occur in this group of patients although two of them had chronic obstructive airway disease. This is supportive evidence of the cardioselectivity of Acebutolol. However, two patients developed cardiac decompensation necessitating digoxin and diuretic therapy. Thus, although Acebutolol claims to possess intrinsic sympathomimetic activity, it should nevertheless be used with caution in patients with cardiomegaly.

Acknowledgement

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The diagnosis and current treatment of liver abscess

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Introduction

TOPICS ON LIVER ABSCESS have crowded the literature, we appraised old diagnostic and therapeutic measures and assessed new ideas. The problems of diagnosis and evaluation remains a dilemma; the trial carried out here would unpopularise some old concepts and re-emphasize what is known but the debate would nevertheless continue.

To the lay public liver disease is synonymous with jaundice but this functional abnormality is unaccompanied in abscess of the liver; visible hyperbilirubinaemia is rare. From the stand point of early recognition reliance must be based on pain alone.

The incidence at the present time remains 5 per million per year. It carries a mortality in excess of 12.5% and so remains a significant killer.

Materials and methods

Twenty four cases of liver abscess were studied between the period February 1972 and January 1975. The cases were drawn from admissions to the First Surgical Unit, General Hospital, Kuala Lumpur. The clinical findings and available procedures in the treatment were evaluated. Certain outstanding observations were finally made.

Results

Epidimiology

There is abundant evidence that the risk of developing liver abscess lies positively in the third and fourth decades of live, in people who are occupationally active. There has been an awareness of the prevalence of liver abscess among Indians in Malaysia, the minority group out of the three ethnic races. Epidimiological studies have also demonstrated a relationship between the rainy seasons and the incidence of liver abscess, and has provided the measure of the risk of developing the disease during these periods. In the present study 20 (83.3%) of the cases were male while 4 (16.7%) were female.

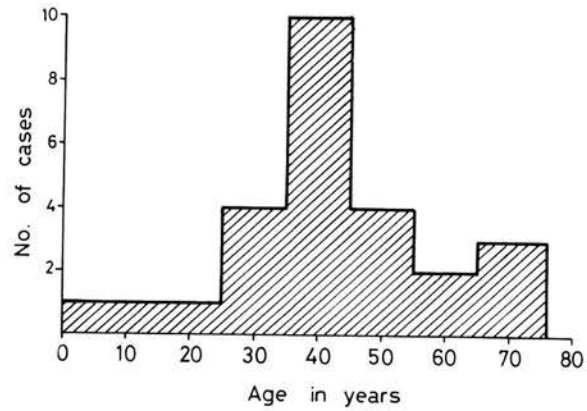

Figure 1. Age and incidence of liver abscess.

Diagnosis:

A synthesis of data: complaints, physical examination and laboratory studies must be evaluated to arrive at a diagnosis. Among the symptoms, right hypochondrial pain was predominant; associated with fever, chills and rigors; anorexia, nausea and

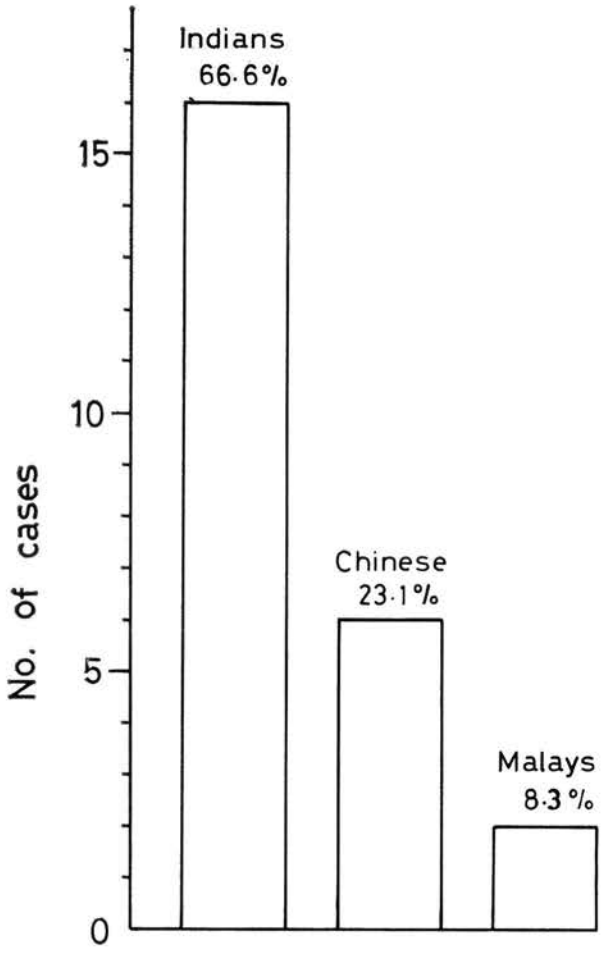

Figure 2. Incidence among the three ethnic groups in Malaysia.

vomiting. Bowel disorders, diarrhoea or dysentery-like symptoms were unusually high in this study (37.5%). Sigmoidoscopy was not done in all these cases to confirm active colitis. A history of drug addiction, chronic alcoholism, dietary imbalance were commonly accompanied. Seventy five per cent of patients had hepatomegaly and liver tenderness; however none had localised tenderness or chest-wall oedema to suggest pointing. In four patients the liver was not palpable and in three the clinical findings were masked by generalised rigidity owing to intraperitoneal rupture of the abscess. Right lung signs were found in a quarter of the total number.

Secondary disturbances, manifested by spider angioma splenomegaly and bleeding oesophageal varices were rare; peripheral oedema, fetor and mental disturbances were manifestations in three

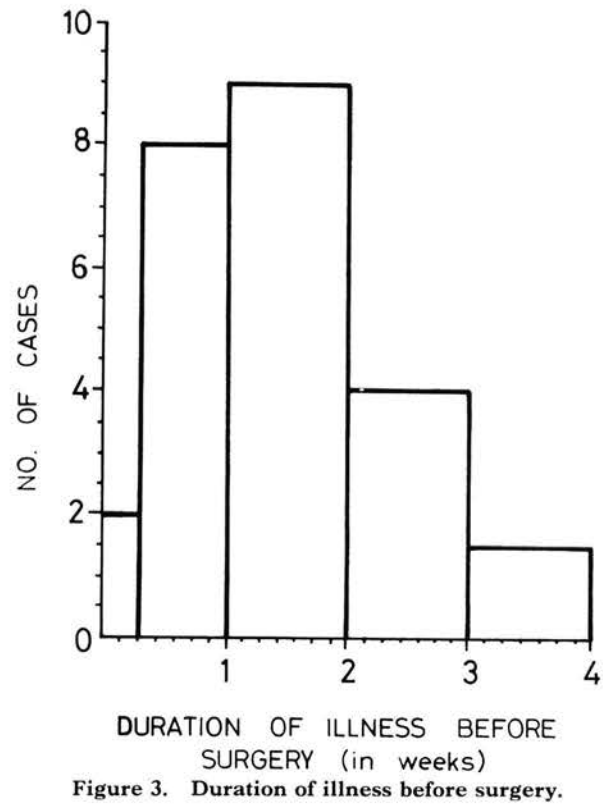

Figure 3. Duration of illness before surgery.

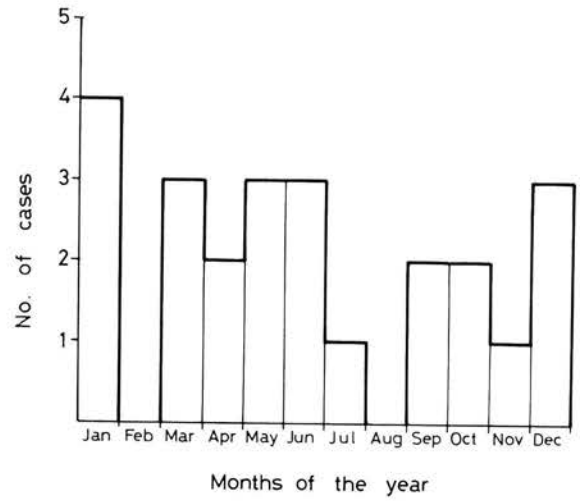

Figure 4. Annual distribution of cases.

patients who were in end-phase hepatic failure. The syndrome of amoebic hepatitis, used to describe fever, mild leucocytosis and tender hepatomegaly that responds dramatically to emetine, seen in a number were excluded from this study.

Table I

Patients' complaints in descending order of frequency

Symptoms	No	%
RHC pain	19	79.1
fever	14	58.3
rigor/chill	9	37.5
nausea/vomiting	9	37.5
gen abd pain	7	29
anorexia	7	29
diarrhoea	6	25
dark urine	4	16.6
jaundice	3	12.5
dysentry	3	12.5
wt loss	2	8.3
dyspnoea	2	8.3

Table II

Frequently seen clinical findings.

Signs	No	%
hepatomegaly	18	75
no hepatomegaly	4	16.6
gen peritonitis	3	12.5
pleural effusion	4	16.6
subdiaphragmatic abscess	2	9.5

Laboratory studies:

1. Anaemia constitutes a common deficiency state. The haemoglobin ranged from 7.1 to 15.3 G, the majority fell in the order of 12 to 14 G.

2. A complete blood count was routinely obtained, white cell count ranged from 4,900 to 50,000 per cu.m.m. The majority had counts above 10,000.

3. We have briefly pointed out below the more striking features found in liver function tests. The tests were done in all patients. The bilirubin was raised in 13, but rarely exceeded 5 mg %. Eleven (45.8%) had some degree of intrahepetic cholestasis manifested by a raised alkaline phosphatase (more than 13 mg %). A marked hypoalbuminaemia (less than 3.5) with the resultant decreased colloidal osmotic pressure was one of the major causes for ascites and oedema and was evidenced in 18 (82%) of the cases. The albumin-globulin ratio was less than 1.0 in 18 (82%) of the cases studied. Absence of clear cut biochemical results does not preclude liver abscess.

Table III

Serum bilirubin levels

s. bilirubin (mg)	No	%
<1.0	9	37.5
>1.0	8	33.3
>2.0	3	12.5
>5.0	2	8.3

Table IV

Serum globulin

s. globulin	No	%
3.5	11	50.0
3.5 – 4.5	10	45.4
5.0	1	4.6

4. Photoscans of the liver was a valuable investigation in the diagnosis and localisation of liver abscess, particularly in patients with non specific physical findings. Gamma-emiting radioisotope (Indium, 0.5 mC) was used for the procedure. Positive results were obtained in all patients and it formed graphic information on the anterior, posterior and lateral aspects of the organ. More than eighty five per cent had a single abscess situated in the right lobe. The left lobe was involved in 6.7%. Both lobe abscess were found in one patient and another had a concomitent lung abscess as a result of supradiaphragmatic rupture.

5. Abdominal Rontgenograms were used to confirm a diagnosis of liver enlargement and a raised right diaphragmatic dome, this was readily done in 23 patients. Pulmonary abnormalities, lower lobe pneumonia with pleural effusion or lung abscess were found in 25% of the patients. No air fluid levels were seen within the liver shadow.

6. The evidence incriminating *Entamoeba histolitica* as the causative factor was seldom proven, in spite of repeated stool examinations in 23 patients. Positive results were obtained in 2 Serological tests and angiography were not employed; the objective was to employ a few, simple, rapid and reliable tests.

Treatment:

Treatment was instituted with the objective of draining the abscess, controlling the aetiological factor and lending support to the multi-organ deficiencies. Improved preoperative and postoperative techniques have increased the success of surgery. Support ranged at an average of 7 days. Efforts were simultaneously made to prevent further liver damage by avoiding exposure to noxious agents.

We appraised single percutaneous aspiration, multiple aspirations and open drainage with saucerisation as available methods of treatment; there was no opportunity to occasion a resection.

Metranidazole used in combination with tetracycline produced an effective response in 22 of the total number of patients. In controlled world-wide multicentre studies the convenient and optimal dosage varies. A predictable response was obtained in this study with 800 mg eight hourly for ten days. With the prescribed regimen, it did not cause side effects. Twenty one patients progressed to eventual complete recovery; three died. Long term follow-up of sixteen patients has been completed and they enjoy continued good health.

Table V

Methods of treatment

treatment	No	%
single percutaneous aspiration	4	16.6
repeated percutaneous aspiration	7	29.0
failed aspiration/open drainage	5	20.8
open drainage as choice procedure	3	12.5

Table VI

Nature of drained pus

pus	No	%
yellow pus	14	58.3
anchovy sauce pus	3	12.3
straw coloured fluid	1	4.1
empty ruptured cavity	2	8.3

Discussion:

Those with experience of liver abscess in other parts of the world will note the particularly high incidence of this disease in the East. At the present time the incidence is 5 per million per year.

Indians in Malaysia form a susceptible population but an independent cause and effect relationship is not evident. Many risk factors have been assumed in the past; some like climate, sex, age and heridity are not controllable, while others, hygiene and an active immunisation campaign are remidiable. Reference has been made to the peak incidence in December/January and May/June (the wet months in Malaysia), but epidemics have not been recorded.

Rarer causes of abscess, ecchinococci, actinomicosis, traumatic and infected congenital cysts were not seen.

In hepatic disorders it is usually desirable to evaluate simultaneously the state of the cardiovascular system and kidney, because of the frequent circulatory derrangements.

Marked jaundice is uncommon, and unusual in amoebic abscess; it usually is an indication of end-stage hepatic failure. Pallor, weight loss and anorexia are frequently seen. Hyperbilirubinaemia, when present, is due to diffuse parenchymal involvement and intrahepatic cholestasis.

The characteristic findings are enlargement and tenderness of the liver in conjunction with altered biochemical tests. A tender, enlarged liver is the hallmark of superficial abscess, this feature was absent in the deep seated ones. Left lobe abscess presented as swelling and tenderness in the epigastrium and left hypochondrium, Abscesses situated in the subdiaphragmatic area and posteriorly were found with referred pain. Cough was a troublesome symptom when the abscess burst into the lung. In fact patients often felt better when their abscess ruptured.

Many laboratory tests have been proposed for clinical study but none is diagnostic in itself. Tests however are useful for a positive correlation. The diagnosis of liver abscess is dependant essentially on abdominal signs. Liver abscess of bacterial origin generates a granulocyte response and amoebic a lymphocytic response (Grisby, 1969). The status of bilirubin, alkaline phosphatase and haemoglobin has been alluded to earlier.

The efforts of much basic and clinical research has provided diagnostic accuracy up to 100% in amoebic abscess when positive results are obtained with indirect haemagglutination test, gel diffusion precipitin test and latex agglutination test; unfortunately these are not available in all centres.

Radiological diagnosis rests in the demonstration of elevation and localised upward bulging of

the right hemidiaphragm, basal consolidation or collapse, pleural thickening and effusion. High cost isotope scanning was a valuable adjunct to clinical diagnosis and it has provided exact location and extent of the abscess.

Abscesses in this series occurred mainly in the right lobe of the liver. This may follow Serge's rule of abdominal visceral drainage: superior mesenteric blood to the right lobe while spleenic and inferior mesenteric blood to the left. Multiple abscesses, found in 30 to 40% of cases by Joseph and Longmire (1968) were not substanciated in this study and was found in 10%. From the aspirate majority appeared to be pyogenic in origin, although this was not proven by culture; this could have been due to anaerobic and microaerophilic organisms that grow poorly in commonly used media.

Haemodynamic derrangements in the hepatic circulatory system due to parenchymal damage may result in pooling of blood, this may accentuate shock and a degree of portal hypertension.

Many forms of treatment have been proposed over the years, some less effective procedures have been abandoned. The current available techniques include, single percutaneous aspiration, multiple percutaneous aspirations, saucerization and segmental resection. The review showed that single aspiration was an ineffective method of emptying cavities, frequently aspiration had to be repeated and this produced complications like: severe pain, pyogenic reactions and haemorrhage. The chief limitation of closed needle aspiration was the frequently missed multi-loculations. Eight patients underwent open drainage, four had earlier aspiration without improvement. Good results obtained by McFadzean, Chang and Wong (1953) with percutaneous needle aspiration was not produced in this series.

The anterior transperitoneal approach was employed to drain superficial abscesses and the posterior 12th rib resecting approach for deep cavities. A dependant drainage was effected where ever possible and intrahepatic and perihepatic drains were placed at the completion of operation.

Hepatic resection and transplantation are technically feacible for management of patients with liver abscess. Selection of patients requires studies to determine the extent of liver damage and its reversability.

The improvement of overall hepatic function is important in reducing mortality and morbidity. To interrupt further injury, corticosteroids, vitamins and fresh blood provide a successful regime.

Ruptured liver abscess carried a high mortality in the series published by Wray *et al.* (1964) and Ostermiller *et al.* (1967); 16.6% of our patients developed this complication, and timely surgery saved all of them. One patient with pulmonary extention of the abscess recovered with conservative management. Intrapericardial rupture was not encountered, but it carries a high mortality (Archampong & Clark, 1973). There were three deaths but all these patients showed clinical and laboratory evidence of non-reversible parenchymal damage.

In the follow-up, liver function and morphological studies provided an index to the success of the treatment. Wound infection, biliary fistulae and ill health were seen from time to time and they disappeared spontaneously in most liver abscess patients who showed liver function improvement in the review.

Summary

The seriousness of liver abscess cannot be overemphasised. Liver inadequacy resulting from the space occupying lesion results in severe metabolic derrangement, compounding the threat to life. Considering the evidence, the following outstanding observations were finally made:

1. The diagnosis of liver abscess is mainly a clinical finding.

2. Abscesses more than 5 cm. in diameter if left undrained produced a 100% mortality. Cavities less than this size often healed spontaneously with supportive regimen alone.

3. Drainage from abscess is most effective if made dependant. Tube drains are essential and may be necessary to be kept in place for weeks.

4. Loculations within an abscess are made to communicate. Strands of connective tissue that span cavities are safeguarded; these are periportal connective tissue that acts as scaffolding for regenerating liver cells.

5. Liver regeneration can be estimated by serial sinograms done through tube drains and also by scanning. Liver regenerates from the periphery and takes more than ten weeks to be complete.

6. Open drainage has reduced mortality from 75% in the pre antibiotic era to about 12.5% in this series. Even with limited facility good results can be obtained.

Acknowledgement:

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The adrenogenital syndrome

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Introduction

IN 1865, de Crecchio (1865) first described a phenotypically male cadaver with hypospadias in whom he found female internal genitalia with bilateral adrenal hyperplasia. Almost a century later, Wilkins *et al.* (1951) and Bartter *et al.* (1951) independently discovered that the excessive androgenic effects of this syndrome could be suppressed by cortisone. It is now well established that the adrenogenital syndrome associated with congenital adrenal hyperplasia (CAH) is the result of inborn errors of steroidal biosynthesis (Bongiovanni and Root, 1963). Currently, five such enzymatic deficiencies in steroidogenesis, producing ambiguous external genitalia are recognised. In order to understand the diverse clinical manifestations of these defects, a knowledge of the synthesis of steroid hormones is essential. The suprarenal glands synthesise 3 main classes of hormones: mineralocorticoids, glucocorticoids and the sex hormones and a simplified scheme of the biochemistry involved is presented in Fig. 1. Any enzymatic block along the biochemical pathway results in compensatory hypertrophy of the adrenal cortex consequent on a feedback mechanism which 'instructs' the hypothalamus and pituitary gland to increase ACTH output. The abnormal quantities of sex hormones thus produced may adversely affect the differentiation of the external genitalia (but not the internal genital structures) of the developing foetus (Jost, 1953). Table I summarises the various clinical syndromes associated with each enzyme deficiency.

The incidence of this genetic disorder ranges from 1 in 490 in the Yupik Eskimos (Hirschfeld and Fleshman, 1969) to 1 in 67,000 in United States (Childs *et al.*, 1956). The actual incidence in this community is not known and during the 6-year period between 1970–76, 12 patients with adrenogenital syndrome (AGS) have been diagnosed at the University Hospital, Kuala Lumpur. It is not sufficiently realised that the AGS is a medical emergency, for delay in diagnosis and treatment may not only cause confusion in sex assignment, but may also result in fatality from Addisonian crisis. This is demonstrated in the following case reports.

Illustrative Case Reports

Case 1: RRI first presented at this hospital at $6\frac{1}{2}$ years of age. She was delivered at term, after an uncomplicated pregnancy and labour. There was no family history of consanguinity. At birth, she was assigned the female sex although the mother noticed that she had an enlarged phallus. Her early childhood was uneventful but from the age of 3 years, her growth accelerated. At 4 years, acne and pubic hair were noted and since then her clitoris had enlarged considerably. On physical examination, the child was 128 cm tall (97th percentile by Singapore standards) (Wong and Tay, 1975), the blood pressure was 100/60 mm Hg., acne was present over the forehead and malar regions, and there was a moderate growth of pubic hair. The voice remained feminine. The external genitalia revealed a large phallus 4 cm in length, separate openings were present for the urethra and vagina, but there was partial fusion of the posterior fourchette. No masses were palpable within the labial pouches. Laboratory findings included a chromatin positive buccal smear, a bone age of 9 years, normal cortisol levels and a

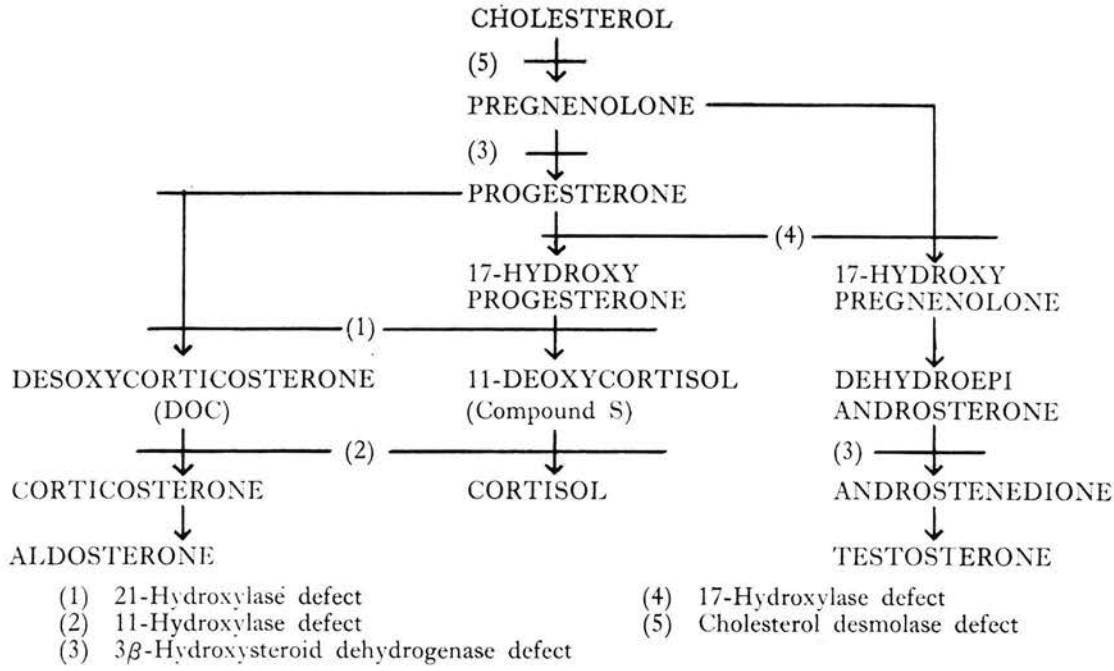

Fig. 1: Inborn Errors of Steroidal Biosynthsis Leading to the Adrenogenital Syndrome.

24-hour urinary 17-ketosteroid output of 9 mg (normal 1.5–2.5 mg for 7 years). She was treated with dexamethasone 0.25 mg b.d. This resulted in suppression of the 24-hour urinary 17-ketossteroid to 3 mg. Subsequently clitoroplasty was performed. During the next 12 months, the child remained well, became free of acne and the growth rate slowed down.

Case 2: RR2, the younger sibling of Case 1 (Fig. 2), was the product of a normal full term spontaneous delivery and appeared normal at birth. His developmental milestones were normal and he suffered no serious illnesses in early childhood. From the age of 4 years, however, his parents noticed that acne had appeared on his forehead, pubic hair had started to grow and his penis was enlarging rapidly. Examination at 5 years revealed a tall muscular boy (90th percentile in height and weight), comedones were present on the forehead, the penis was 6 cm long and there was a fine growth of pubic hair around the base. Both testes remained infantile, blood pressure was normal but skeletal maturity had advanced to 10 years of age. Laboratory studies demonstrated a normal serum electrolyte pattern, normal cortisol levels and a 24-hour urinary 17-ketosteroid output of 9 mg; the latter was readily suppressed by dexamethasone.

Comment: The above 2 cases are examples of simple virilizing adrenal hyperplasia due to a mild 21-hydroxylase deficiency. They displayed the effects of delayed diagnosis and prolonged exposure to endogenous androgenic influence, viz, advanced stature and advanced bone age, acne, pubic hair

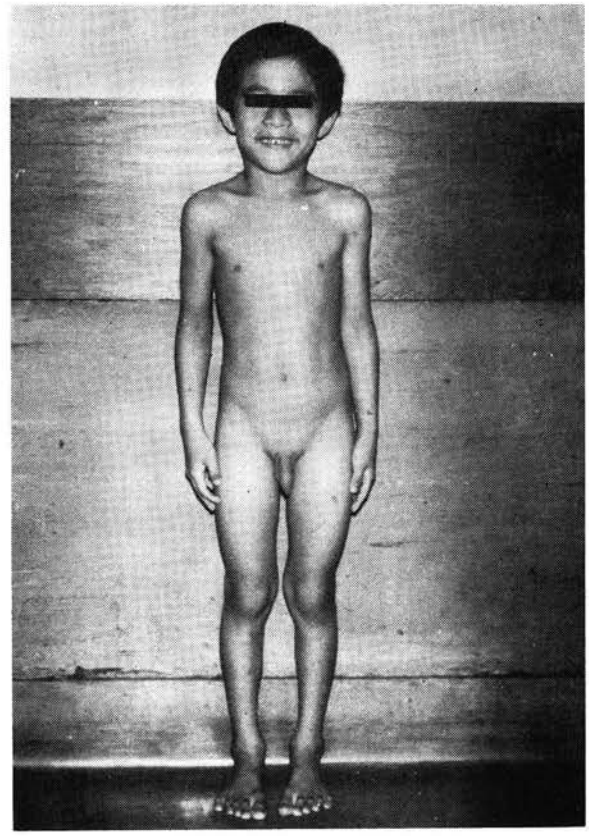

Fig. 2: RR2 (Case 2) at 5 years of age. Note tall stature and increased penile length. He also had a fine growth of pubic hair, and acne over his forehead.

Table I: Clinical Effects and Steroid Alteration in Various Forms of Adrenogenital Syndrome

Enzyme Defect	Blood Hormonal Levels	Clinical Effects	Urinary Steroid Output
21-hydroxylase (mild)	Cortisol normal Testosterone ↑ Aldosterone normal	Virilization of external genitalia in female, somatic and sexual precocity in both sexes, skin pigmentation, ultimate dwarfism in adulthood.	17-ketosteroids ↑↑ Pregnanetriol ↑↑ 17-hydroxysteroids normal or ↓
21-hydroxylase (severe)	Cortisol ↓ Testosterone ↑ Aldosterone ↓	Effects of excessive androgenization: as above. Failure to thrive, Addisonian crises in early infancy, occasional hypoglycaemia.	17-ketosteroids ↑↑ Pregnanetriol ↑↑ 17-hydroxysteroids ↓
11-hydroxylase	Cortisol normal or ↓ Aldosterone ↓ Desoxycorticosterone (DOC) ↑	Virilization as in 21-hydroxylase deficiency. Hypertension.	17-ketosteroids ↑↑ 17-hydroxysteroids (mostly tetrahydro DOC and S) ↑↑
3 β-hydroxysteroid dehydrogenase	Cortisol ↓ Testosterone ↓ Aldosterone ↓	Virilization in female, incomplete masculinization in male. Failure to thrive, marked salt wasting. Often fatal despite treatment.	17-ketosteroids ↑ 17-hydroxysteroids ↓↓
17-hydroxylase	Cortisol ↓ Testosterone ↓ Aldosterone ↓ DOC ↑	Feminization of external genitalia in male. Primary amenorrhoea and sexual infantilism in female. Hypertension.	17-ketosteroids ↓↓ 17-hydroxysteroids ↓↓
Cholesterol desmolase	Cortisol ↓ Testosterone ↓ Aldosterone ↓	Feminization of external genitalia in male. Sexual infantilism in female. Failure to thrive, severe salt wasting. Often fatal despite treatment.	17-ketosteroids ↓↓ 17-hydroxysteroids ↓↓

and an enlarged phallus. Characteristically, the gonads remain infantile and thus excludes true precocious puberty. Generally, the gonads fail to develop so that affected individuals may be expected to be infertile without therapy. In the absence of any salt losing crisis, the condition is usually not recognised in the male at birth, however, the presence of this disorder in a family should prompt a biochemical evaluation in all other siblings. It must be emphasised that these patients are unable to increase their cortisol output and are susceptible to Addisonian crisis in times of stress. This form of AGS is the most common in many reported series (Hamilton, 1972, and Jailer *et al.*, 1955). Five patients with this disorder have been diagnosed in this hospital, and all are doing well on therapy.

Case 3: C.S.J. presented at this hospital at the age of 2 months. He was the only child in the family and was delivered normally at term after an uneventful pregnancy. During the first 2 weeks of life, he thrived well and had gained 0.5 kg in weight. From the third week of life, however, he began to refuse feeds, became irritable and lethargic and had episodes of vomiting and frequent loose motions. Several changes of milk formulae were made without improvement. Physical examination revealed a marasmic infant with mild dehydration and hypothermia. His external genitalia were those of a normal male and both testes were descended. Serum electrolytes were: sodium 100 mEq/l., potassium 6.9 mEq/l., and Astrup studies revealed moderate metabolic acidosis. Soon after hospitalisation, he developed hypovolaemic shock and was resuscitated with parenteral hydrocortisone, desoxycorticosterone acetate (DOCA) and saline infusion. The electrolyte pattern returned to normal after 4 days. On the presumptive diagnosis of AGS, oral cortisone acetate, 9 α-fluorocortisone were initiated and 1 gm of salt was added to the milk each day. The baby thrived well on this regime and gained 1.3 kg over the next 3 weeks. Subsequently, he withstood common childhood illnesses without difficulty and his growth progressed along the 25th percentile. At 8 months of age, he was hospitalised for biochemical evaluation. Both steroids were withdrawn, and on the eighth day he developed fever, vomiting and diarrhoea and lost 5% of his body weight, The urinary 17-ketosteroid output at this stage was 6.9 mg per 24 hours and this was readily suppressed once the steroids were resumed. He has remained well when last examined at 3 years of age.

Case 4: I.T. (Fig. 3) was born at term in a private maternity clinic after an uncomplicated labour. She was referred at the age of 30 hours as a 'male' with hypospadias and undescended testes. Family history revealed that she was the fourth child; the

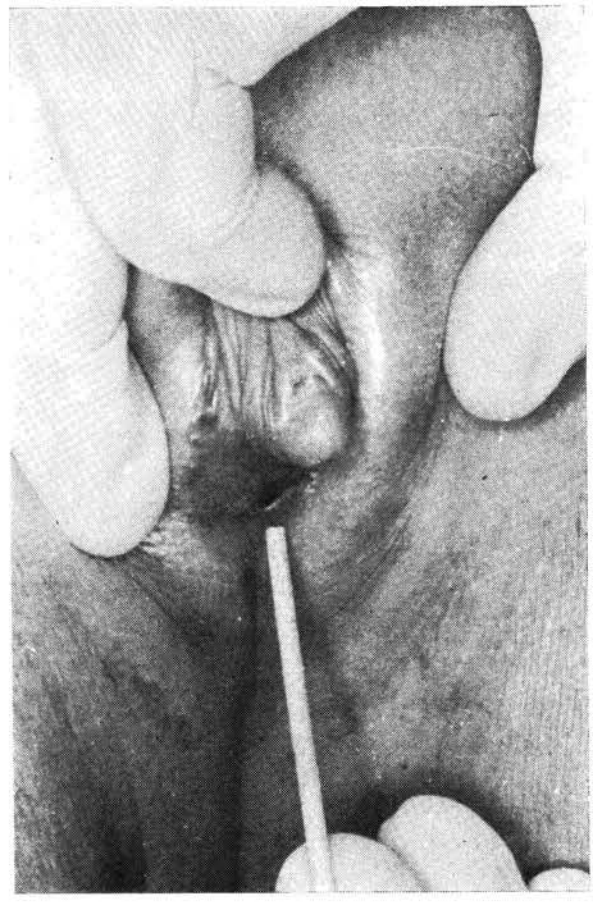

Fig. 3: The external genitalia of I.T. (Case 4). Note hypertrophic phallus, empty labio-scrotal folds and single perineal opening. Buccal smear was chromatin positive.

first, a male, had died of an unknown cause at the age of one week; the second offspring was also born with ambiguous genitalia and had succumbed to diarrhoea and vomiting at 6 weeks of age; the third child, a boy, is currently well. At the time of admission, I.T. was an alert infant weighing 3.2 kg. She had a hypertrophic phallus 3 cm long, a single perineal meatus and bifid rugose labioscrotal folds which contained no palpable masses. There was hyperpigmentation of the genitalia and the axillae. The blood pressure was 60 mm Hg. systolic and the remainder of the physical examination was normal. Buccal smear was chromatin positive and urinary 17-ketosteroids were markedly elevated. At the age of 13 days, poor feeding, lethargy and a loss of body weight were noted. There was further deterioration the next day, although serum electrolytes had remained normal. She was treated with intravenous fluids, cortisone and DOCA with good response and

discharged at 7 weeks on glucocorticoids and 9 α-fluorocortisone. Over the subsequent 4 months, the infant had 3 hospital admissions for intercurrent illnesses and for steroid dosage readjustment as her growth rate was slow and she had developed mild hypertension.

Comment: Both cases 3 and 4 demonstrate the classical features of the salt-wasting form of 21-hydroxylase defect. Symptoms of adrenal insufficiency may not appear till the second or third week of life and the diagnosis is less obvious in the male infant. Case 4, in addition, illustrates that identification of sex is frequently not possible on clinical grounds alone. Dosage schedule in these patients needs frequent adjustment. Close supervision, periodic bone age determination, and biochemical monitoring are often required to achieve optimal therapy. Three additional patients in this series had this disorder. One infant, who was on treatment died of septicaemia at the age of 4 months.

Case 5: J.A. was the product of a normal full term spontaneous delivery. She had thrived well at home but was referred at 3 weeks of age because of ambiguous genitalia. Examination revealed an active child with a blood pressure of 110/70 mm Hg. There was an enlarged phallus with a single perineal opening and the partially fused labioscrotal folds were empty. No abnormal pigmentation was noted over the genitalia or nipples. Investigations demonstrated a vagina and normal female internal genitalia on radiography, a chromosome positive buccal smear, normal serum electrolytes and a significantly elevated 17-ketosteroid and 17-hydroxysteroid output in the urine. Therapy with cortisone suppressed the urinary 17-ketosteroids and diminished the blood pressure to 80/50 mm Hg. Surgery is planned for in later infancy. The family history revealed that the child's parents are first cousins. There are five elder siblings, one of whom, a normal female, had died at the age of 15 months of bronchopneumonia. The remaining members of the family were examined and the third child, M.A., was found to be abnormal.

Case 6: M.A., (Fig. 4), a girl was already 7 years of age. At birth, the mother discovered that her

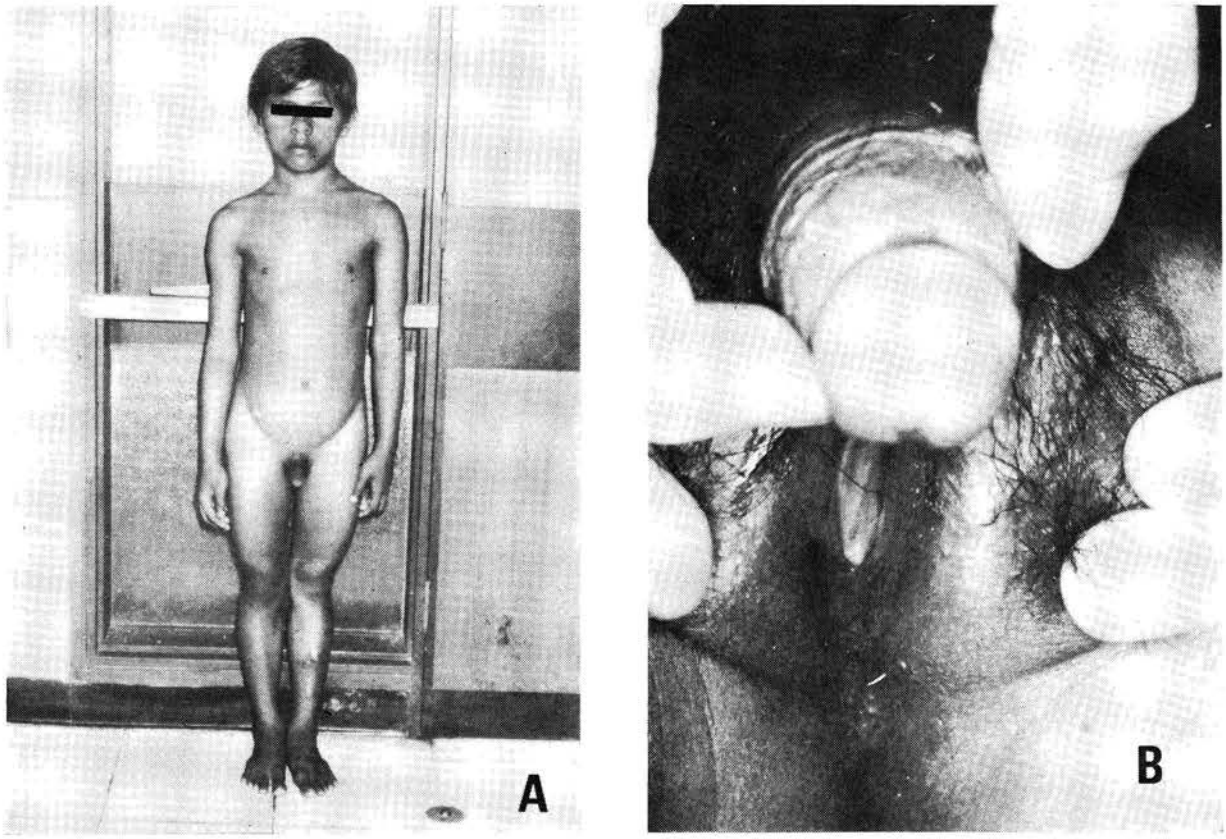

Fig. 4: M.A. (Case 6) at 7 years of age. Note (A) tall stature, masculine physique and apparently male external genitalia. Closer examination (B) revealed separate openings for the urethra and vagina. In addition, she was hypertensive.

genitalia were similar to those of J.A. She was assigned the female sex by the village midwife and was reared as a female. Over the years, however, the parents noticed that her phallus had gradually increased in size. Facial acne and pubic hair appeared at 3 years of age and her voice became increasingly hoarse from 4 years. She attended a girls' school and because of her tall stature, masculine physique and voice, she was subjected to constant teasing. In their confusion about her real sex identity, her parents dressed her in boy's jeans at home. On physical examination, her height age was 12 years, she was muscular, dark, hirsuit and had acne on her face and upper chest. Her clitoris was 7 cm long, there was a profuse growth of pubic hair, the labioscrotal folds were fused but there were separate openings for the urethra and vagina. Her blood pressure ranged from 140/110 mm Hg to 150/120 mm Hg. Nuclear sexing confirmed that she was a female, the serum electrolytes were normal, her bone age had advanced to 15 years and the urinary 17-ketosteroid and 17-hydroxysteroid excretions were markedly elevated. Three months after institution of glucocorticoids, the blood pressure and urinary 17-ketosteroids dropped to normal levels. Clitoridectomy and vulvoplasty were subsequently performed. She is now attending a different girls' school and is receiving psychological guidance to reinforce her psychosexual orientation.

Comment: In both cases 5 and 6, the diagnosis of 11-hydroxylase defect was made on the basis of elevated 17-ketosteroids, 17-hydroxysteroids and hypertension. This enzymatic defect is much rarer than the 21-hydroxylase deficiency and the history of consanguinity is thus significant (Hamilton, 1972). The somatic effects of both 11 and 21-hydroxylase deficiencies are similar and definitive diagnosis is dependent on qualitative urinary steroid determination. The problems of delayed diagnosis and confusion in psychosexual orientation are seen in Case 6. It is unfortunate that treatment at this stage will not result in any alteration of her voice. Furthermore, she is unlikely to achieve her growth potential because of the extremely advanced epiphyseal ossification.

Discussion

The diagnosis of adrenogenital syndrome is not difficult if the condition is suspected in any child presenting with ambiguous genitalia, with dehydration and salt wasting in the early weeks of life or with signs of sexual precocity. Sex chromatin determination is essential in these situations. A summary of the various disorders to be considered in the differential diagnosis of a child with indeterminate genitalia is given in Table II. The definitive diagnosis is a matter of some urgency as the correct sex will have to be assigned early to allay parental anxiety and embarrassment and to prevent psychological damage arising from confused gender role.

Table II: Differential Diagnosis of Ambiguous Genitalia

Disorder	Karyotype	Internal Genitalia	Urinary 17-KS	Laparotomy Findings
		Sex Chromatin Positive		
Virilizing AGS	XX	Female	Elevated	Not indicated
Virilization from exogenous or endogenous maternal androgens	XX	Female	Normal	Not indicated
Klinefelter variant	XXXXY, etc.	Male	Normal	Infantile hypoplastic testes
True hermaphroditism	XX, XX/XY, etc.	Mixed Wolffian and Mullerian structures	Normal	Ovary, testis, ovotestes mixed internal genitalia
		Sex Chromatin Negative		
Feminizing AGS	XY	Male with blind vaginal pouch	Absent or low	Not indicated
Incomplete testicular feminization syndrome	XY	Male with blind vaginal pouch	Normal	Testes, with vas deferens present
Mixed gonadal dysgenesis	XO/XY, etc.	Mixed	Normal	Streak gonad, testis, mixed internal genitalia
True hermaphroditism	XY, XX/XY, etc.	Mixed	Normal	Ovary, testes, ovotestes
Simple hypospadias with cryptorchidism	XY	Male, no vaginal pouch	Normal	Not indicated

There is no doubt that female infants with the AGS should be brought up as females whatever the degree of virilization of the external genitalia. Their internal organs are entirely female, they are potentially fertile and appropriate plastic repair can be performed (Mason, 1961). The converse situation of male infants with feminization is less commonly encountered, but their sex of rearing is determined largely by the morphology of the external genitalia. In the infant with a rudimentary phallus and genitalia simulating a female, no amount of reconstructive surgery will allow the child to adequately function as a male, regardless of the gonadal or chromosomal sex. It is fortunate that the 5 children who presented to us in late childhood had been assigned their appropriate sex, for any attempt at reversal of sex of rearing at that stage would have resulted in serious psychological maladjustment.

The child with CAH will, of course, require glucocorticoids for replacement therapy; the equivalent of hydrocortisone 20–30 mg per kg per day in 2–4 divided doses is recommended (Brook *et al.*, 1974). In principle, the aim is to administer the smallest dose which is sufficient to suppress androgen synthesis without producing cushingoid features and at the same time allowing for optimal growth. Thus, the dosage must be carefully adjusted with increasing age. This will require periodic monitoring of the height and weight age, skeletal maturity and the 17-ketosteroid output in the urine. Parents must be warned that therapy is life long and that under conditions of stress, such as during infection, injury or surgery, additional glucocorticoid therapy must be provided. About 30–65% of persons affected will exhibit a salt losing syndrome, with first symptoms usually appearing between the second and eighth weeks of life (Marks and Fink, 1969) as illustrated in Cases 3 and 4. Neonates with AGS should thus have regular electrolyte determinations in the early weeks of life so that this complication can be promptly diagnosed and treated. During an Addisonian crisis, urgent rehydration with intravenous saline solutions, correction of metabolic acidosis and administration of parenteral glucocorticoids and mineralocorticoids are life-saving procedures. Once the crisis has been overcome, these children need not only cortisol replacement but also salt-retaining hormones (Kenny and Vazquez, 1972) such as DOCA or 9 α-fluorocortisone and additional salt in their diet.

Surgical reconstruction of the genitalia should be performed in early childhood, preferably before the child becomes aware of the abnormality. Radiological demonstration of the internal genital structures and their relationship to the lower urinary tract is often extremely helpful in the preoperative evaluation. Completion of surgical repair does not constitute termination of therapy. Perhaps, in no other disorder is continuing tactful psychological guidance more important both for the family and the child. These aspects have been extensively discussed by Money (1975).

The AGS is inherited as an autosomal recessive trait, males and females being equally affected within sibships. The severity of the defect, with few exceptions, is consistent within one family (Rosenbloom and Smith, 1966). Prenatal detection is now possible by determination of steroid metabolites in the amniotic fluid so preventing delay in postnatal treatment (Nicols, 1970). Provided treatment is adequate, the prognosis is excellent in most cases, and is compatible with a healthy life, normal sexual function and fertility. Only one patient in our present series has succumbed to this disorder.

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Med. J. Malaysia Vol. XXXII No. 2, December, 1977

Cardiac arrest following an intravenous urogram – a case report

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"HOW SAFE is an intravenous urogram examination?" This is a question often asked by the patient undergoing this examination and less so by the doctor requesting the examination. It is a pertinent question as a foreign agent is introduced into the patient's body for a period of time and reactions in various degrees of severity can occur. The following case report and a short review of the recent literature in the discussion hopefully will provide a satisfactory answer to the above question.

Case Report

W. W., a 43-year-old, obese woman was admitted to the University Hospital on 10/6/77 with the chief complaint of abdominal pain for 6 months. The pain was localised in the epigastrium, "cutting" in nature and was not related to food or posture. The pain came on and off and was associated with vomiting occasionally. A barium meal done showed a duodenal ulcer for which she was treated with magnesium trisilicate 15 mg six times a day and probantine 15 mg qid. The patient had some emotional problems and had been depressed. A psychiatric examination showed much of the patient's symptoms had an emotional overlay. She was prescribed valium 5 mg tds and mogadon 20 mg nocte. The patient is also diabetic. She was stabilised on diabenase 500 mg daily, metformin 500 mg qid, and diet control. No history of bronchial asthma or any other form of allergy was present.

The following relevant investigations were done:- Hb. 12.5 gm %, Wbc 7,200, urine FEME – nad, blood urea – 48 mg %. Oral cholecystogram showed no abnormality. Plain abdominal film showed a doubtful density at the level of the first segment of the coccyx. A urogram was requested as the abdominal pain persisted.

Intravenous Urogram done on 26/4/77

50 ml. of contrast media was given intravenously within a minute. There was no complaint during the injection However, 2 minutes after the injection, she complained of a generalised tingling sensation No rash was visible. She became restless and sweaty. At the same time, her radial pulse faded and she developed periphery cyanosis. Respiration was noted to have stopped. Cardiac arrest was established.

Immediate resuscitation was instituted. The patient was intubated and external cardiac massage applied. 200 ml. of sodium bicarbonate (8.4 meq./l) was given intravenously, together with isoprel 0.8 mg/ 500 ml at 20 dpm. The patient was resuscitated and extubation was carried out after 20 minutes. The intravenous urogram was cancelled.

A chest x-ray did not reveal any rib fracture or lung changes. The ECG done after the resuscitation was within normal limits. Further management of the patient was taken over by the ward staff. In the ward, she was maintained with isoprel and intravenous hydrocortisone and recovered fully.

Discussion

The above patient who developed a cardiac arrest following a urogram examination is the first case of this nature in the Department of Radiology, University Hospital. An average of 25 intravenous urograms per week are carried out in the depart-

ment. Intravenous urograms probably still remain the commonest procedure to give rise to complications in the X-ray Department. Ansell (1968) who conducted a national survey of radiological complication reported that severe reactions during intravenous urography was estimated to be in the region of 0.02%. 4 deaths were reported and the main feature of these cases appear to be hypotensive collapse with cardiac arrest. Patients with known history of allergy is a relatively high risk group. Shehadi (1975) recorded 11 deaths, 6 of which followed intravenous urogram. He noted that the incidence of reactions in patients who were not pretested and in patients with negative results to pretesting was the same as that of the general population. There were even 2 deaths following pretesting. In addition, there were 5 other patients in whom the reaction to the pretest dose was sufficiently severe that the scheduled examination was cancelled. Again, rapid injection rate in urography is accompanied by fewer reactions than a slow injection rate. The reverse is true for intravenous cholangiography.

The higher incidence of fatalities beyond the age of 50 is suggested to be due to the greater myocardial sensitivity in this age group but autopsy analysis of contrast media death has often been nonspecific. A commonly accepted explanation for contrast media reactions does not exist. Protein binding, histamine release, allergy, iodism, inhibition of cholinesterase and chemotoxicity along with idiosyncrasy have been the mechanisms discussed to explain the unusual responses to contrast media.

Lalli (1973) noted that reaction can occur without apparent relationship to previous exposure to the same or other contrast media. A given individual may have no reaction today and yet experience one next week and vice versa. Hence, history of reaction to previous examination is not an absolute contra indication to re-examination. Moreover, premedication had no significant effect in decreasing the overall incidence of adverse reactions.

Conclusion

An attempt is made to give a satisfactory answer to the degree of safety for patients undergoing intravenous urogram examination. Fatal or near-fatal reactions are rare but do occur. The patient presented had no past history of bronchial asthma or other allergy and it would not be possible to have prevented the near-fatal contrast reaction. No pretesting was done as its value is doubtful. Ansell & Ansell (1964) and Barnhard & Barnhard (1968) agreed that the most hopeful means of lowering the death rate is to ensure that resuscitative drugs and equipment are available and that all staff understand their use. Finally, it will not be overemphasising the point that all contrast media examination requests must be carefully considered as to their indications and value in the overall management and prognosis of the patients.

Acknowledgement

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Paroxysmal nocturnal haemoglobinuria: Atypical presentation in a 13-year old Chinese and a Malay adult.

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Introduction

PAROXYSMAL NOCTURNAL HAEMOGLOBINURIA (PNH) is a rare acquired disorder of red cells, the cause of which is unknown. These cells have an intrinsic red cell membrane defect resulting in a shortened life span, and show increased sensitivity to lysis by complement, activated probably through the alternative pathway of the complement sequence resulting clinically in a chronic haemolytic anaemia and haemoglobinuria occurring during sleep. Additional characteristics of these cells include excessive antibody binding, and low or absent acetylcholinesterase activity. Red cell survival studies using 51Cr isotope in this condition show a double population of red cells (Dacie, 1967).

Though a few cases have been diagnosed in Malaysia, there have been no documented cases in the literature so far. We describe here two such cases.

Case Reports

Case 1 – C.W.S., a 13-year old Chinese boy was admitted into hospital on 16.5.77 with fever, chills and rigors of a few days duration. There was no associated sternal, abdominal or lumbar pains. The fever persisted for 4 days when he started to have polyuria, the urine passed being uniformly reddish-brown in colour. There had been no similar episodes before though he had noticed a gradual deterioration in his effort tolerance in the past 2 months.

On examination, he had a low grade fever and was pale and mildly jaundiced. There was no lymphadenopathy. The liver was enlarged to 2 cm. below the costal margin. The spleen was not palpable. Other systems were normal.

The peripheral blood showed a pancytopenia. The bone marrow was normocellular, with increased erythropoiesis. The iron stores were depleted. The urine was noted to be very dark in colour and was later found to be positive for haemosiderin and haemoglobin. Bile was absent but urobilinogen was present in increased quantities. The serum bilirubin was 4.0 mg/100 ml with a predominance of the indirect form. LE cells was negative on three occasions. Blood film for malaria was negative on six occasions. VDRL and anti-human globulin tests were negative. Red cell G.6.P.D. activity was normal. Haemoglobin analysis showed normal components of Hb.A, Hb.A_2 (2.5%) and Hb.F (1.7%). Ham's (Acidified Serum) test and the sucrose lysis test were positive. Leucocyte Alkaline Phosphatase Score was 10 while serum haptoglobin was 17.5 mg/100 ml (30 – 200 mg% normal). RBC acetylcholinesterase activity was 50% of normal.

The patient was initially observed in the ward. Later he complained of blurring of vision and abdominal pain. Funduscopy showed bilateral retinal haemorrhages. His haemoglobin dropped from 5.0 gm/100 ml to 2.1 gm/100 ml. He was given a short-course of prednisolone for his retinal haemorrhages which cleared up quite well. Two units of washed red cells brought up his haemoglobin to 12.9 gm/100 ml (Table I) and resulted in a temporary improvement of the patient's clinical status. He was readmitted into hospital on 21.8.77 with a further complaint of abdominal pains. The blood picture again showed pancytopenia (Table I). He also had fresh bilateral retinal haemorrhages. He was subsequently started on oxymethalone 60 mg daily.

Table I

Haematological Investigations of Case I

	17/5/77	25/6/77	29/6/77	12/7/77	3/8/77
Hb. Gms%	5.0	2.1	7.4	12.9	5.5
Platelets/cu.mm.	2020	8080	14,140	51,510	11,110
Reticulocytes %	2.1	4.0	1.8	0.5	4.8
Total White Count/cu.mm.	2750	2582	3706	4549	2897
Neutrophils Count/cu.mm.	2007	749	2483	1820	1014

Case 2 – A.I.R., a 36-year old Malay male was admitted on 1.6.77 with a history of high fever and cough with white sputum for 4 days. He also complained of left sided chest pain for 2 days and yellowing of skin.

On examination, he was febrile and toxic. He was very pale and markedly jaundiced and had a tachycaria of 100 beats/min. Auscultation of the heart revealed an ejection systolic murmur all over the praecordium. Examination of the chest revealed signs of left lung consolidation. There was a tender liver enlarged to 4 cm. below the costal margin, but the spleen was not palpable, and there was no lymphadenopathy.

Urinalysis showed only a trace of urobilinogen. ESR was 120 mm/1st hr. Blood film for malaria was negative. The serum bilirubin was 5.5 mg/100 ml with a predominance of the indirect component. The other parameters of the liver function tests were normal. A chest Xray showed a wedge shaped opacity in the left upper lobe. The peripheral blood showed a pancytopenia, details of which are shown in Table II. A bone marrow aspiration on 5.6.77 revealed a hypercellular marrow with increased erythropoiesis and adequate iron stores. Blood cultures on 3 occasions were negative.

The patient was given a short-course of ampicillin resulting in rapid improvement. He was put on oral iron and vitamins supplements and his haemoglobin steadily rose to 7.7 gm/100 ml. However, the patient remained persistently jaundiced and his peripheral blood still showed a pancytopenia. A repeat bone marrow aspiration on 8.7.77 revealed a normocellular marrow with depleted iron stores.

Haemoglobin analysis was normal and LE cells were negative on three occasions. VDRL and anti-human globulin test were negative. Red cell G.6.P.D. activity was normal. Ham's (Acidified Serum) test and the sucrose lysis test were positive. LAP score was 0. Serum haptoglobin was 15 mg/100 ml (normal 30 – 200 mg/100 ml). Red cell acetylcholinesterase activity was 25% of normal. Urine haemosiderin and urine haemoglobin were positive. There were no red cells in the urine.

On 2.9.77, he was readmitted because of epigastric pain. His blood counts are given in Table II. Two units of washed red cells were given. His Hb. then improved to 10.4 gm/100 ml and platelets to 111,100/cu.mm. blood.

Discussion

Both patients presented with symptoms not readily recognized initially as manifestations of PNH. Case 1 was diagnosed as iron deficiency anaemia from the bone marrow examination which showed depletion of iron stores. As severe iron deficiency is unusual in a young Chinese male, the manifestations were reviewed and further investi-

Table II

Haematological Investigations of Case II

	2/6/77	21/6/77	13/7/77	8/8/77	2/9/77	8/9/77
Hb. Gms%	3.3	5.8	8.3	7.4	6.8	10.4
Platelets/cu.mm.	45,450	<83,830	104,030	88,880	–	111,100
Reticulocytes %	7.3	23.5	16.5	20	–	18
Total White Count/cu.mm.	2409	2372	4073	4809	–	4579
Neutrophils Count/cu.mm.	1807	1660	2688	3510	–	3892

gations were carried out. The significant abnormalities in the urine together with a pancytopenia in the peripheral blood suggested PNH which was confirmed by a positive Ham's acidified serum and sucrose lysis tests. The low alkaline phosphatase score and low acetylcholinesterase activity provided further evidence of this disorder. The recurrent bleeding in the fundi was probably a manifestation of the thrombocytopenia.

Case 2 on the other hand presented with high fever, chest symptoms and jaundice. The chest Xray appearance of a wedge shaped consolidation suggested an infarct. Investigations showed a pancytopenia in the peripheral blood with active erythropoiesis in the marrow suggesting a response to haemolysis. A month later the bone marrow showed depletion of iron stores. Urine examination at this stage was found to be strongly positive for haemosiderin. Other investigations then confirmed diagnosis of PNH.

As illustrated by these two cases, the typical symptomatology of PNH – haemoglobinuria occurring particularly in the morning on waking and haemolytic anaemia, may be masked by other features. However both manifested the chronic intermittemt course of this condition probably precipitated in Case 2 by a fairly severe infection.

In this disorder, the severity of the haemolysis is correlated with the degrees of abnormality of the PNH erythrocytes and the proportion of the sensitive abnormal cells present (Hinz *et al.,* 1956). Haemolysis is easily precipitated by infections, surgery, inoculation and parenteral iron therapy (Dacie, 1967). Whole blood transfusions because of complement activation initiated probably by the serum factor properdin (Hinz *et al.,* 1956) and the acid pH of the anti-coagulant can cause an immediate haemolytic episode.

Venous thrombosis and thromboembolism occur frequently (Dacie, 1967). The abdominal pain which both of the patients experienced and the lung complication in Case 2 may have been caused by thrombosis. Haemorrhages due to thrombocytopenia or recurrent infections associated with granulocytopenia can also occur. These features were noted particularly in Case 1. Hypoplastic anaemia or even aplastic anaemia is not infrequently encountered in PNH cases either at the onset or later in the course of the illness. Both our patients showed a pancytopenia but the bone marrow was either normocellular or hypercellular. It has been postulated that the change (? a somatic mutation) leading to PNH is particularly likely to occur when haemopoietic regeneration takes place in a marrow which has undergone aplasia or hypoplasia, leading to its partial repopulation by a clone of abnormal haemocytoblasts. It has therefore been suggested that PNH is a stem cell disorder (Lewis and Dacie, 1967). It has also been suggested that leucocytes are also probably affected in the same way as shown by the low alkaline phosphatase score (Lewis and Dacie, 1967), which is usually normal in typical cases of aplastic anaemia.

The management of this disease can be a difficult problem. Frequent transfusions of washed red cells may be required to sustain life and improve anaemia. When an iron deficiency state develops, due to loss of large amounts of haemosiderin in the urine, as in the two cases described, the loss must be replaced with oral iron. Steroids may be useful under certain circumstances (Firkin *et al.,* 1968). In one of the two patients described, fundal haemorrhages improved with steroid therapy. Oxymethalone was given to the same patient whose anaemia was a serious problem, as it has been reported that high dose, long term androgen therapy may be beneficial (Hartman *et al.,* 1966).

Summary

Two patients, one a 13-year old Chinese male and the other an adult Malay male, presenting with a typical features of paroxysmal nocturnal haemoglobinuria are described. The first patient was initially diagnosed as iron deficiency anaemia. The second presented with a haemolytic anaemia, fever and a lung infarct. The complications and management in these two cases are discussed.

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Med. J. Malaysia Vol. XXXII No. 2, December, 1977

Pathway for pain – some anatomical and clinical considerations

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Introduction

PAIN has been aptly described by Sherrington as the "psychical adjunct of an imperative protective reflex". Associated with it is a strong emotional component, and a "built-in" unpleasant affect. This paper attempts to analyse the anatomical pathway involved in pain sensation, and some common clinical applications of this basic knowledge.

Receptors for pain

The end-organs for pain are free, naked, or unencapsulated nerve-endings found in almost every tissue of the body. These endings are believed to be concerned in the perception of other modalities of sensation, like temperature, also. It is pertinent to note that both pain and temperature have protective functions; giving warning of real or potential injury, and hence are known as nociceptive (noceo; to injure) senses. They are phylogenetically old sensory modalities, and share a common pathway in the central nervous system.

Fibers transmitting pain impulses

White and Sweet (1965) showed that transmission to the central nervous system occurs through two fibre systems. The first are small, Type A fibres, with a thin myelin sheath; an average diameter of 2–5 microns; and conduction velocities of around 12–30 metres/second. These fibres conduct "fast-pain" which is first perceived, and is sharp and localised. The second type of fibres are Type C fibres. These are unmyelinated, with an average diameter of 0.4–1.2 microns, and conduction velocities of around 0.5–2 metres/second. Impulses travelling along these fibres produce "slow-pain" which is diffuse, disagreeable, and of a dull and acting character.

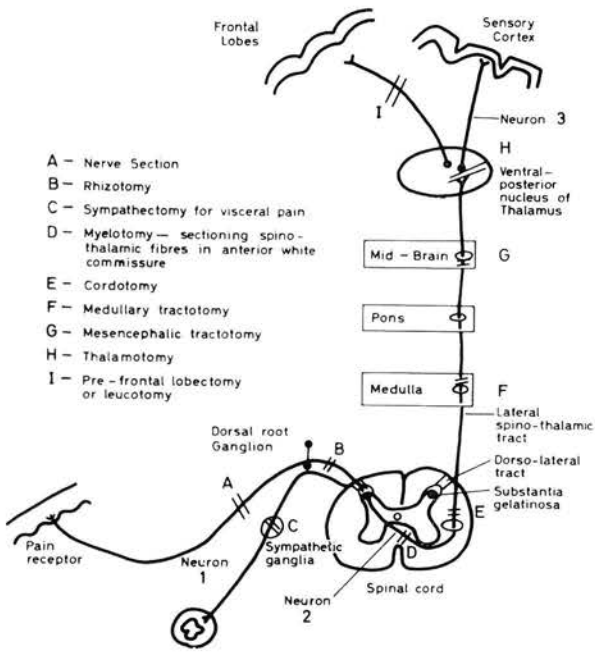
Pathway for the body

(a) *First order neurons*

The first order neurons of the Type A and C fibres have their cell bodies in the dorsal (posterior) root ganglion. The neurons are pseudo-unipolar, of moderate size, with their peripheral processes (Type A and C fibres) bringing in pain formation, and their central processes entering the spinal cord. The central processes enter the dorso-lateral fasciculus (zone of Lissauer) where they give rise to ascending and descending branches which travel for one or two spinal segments only. Finally, they end in the substantia gelatinosa of Rolandi, which is mainly made up of Type II Golgi neurons. The axons of the Type II Golgi neurons are confined to this nucleus, or may ascend in the dorso-lateral fasciculus, connecting adjacent regions of the substantia gelatinosa.

(b) *Second order neurons*

The second order neurons are located in the nucleus proprius or the chief sensory nucleus of the dorsal (posterior) horn of the spinal cord. Pearson (1952) found that most of the Type C fibres relay their impulses through the Golgi Type II neurons, of the substantia gelatinosa, to cells of the nucleus proprius. Type A fibres bypass the substantia gelatinosa and end directly on neyrons of the nucleus proprius. The axons of cells of the nucleus proprius (tract cells) cross the mid-line of the spinal-cord, passing through the anterior white and grey com-



Pathway for pain for the Body and some anatomical sites for surgical relief of pain.

missure, and then turn upwards in the antero-lateral funiculus of the opposite side. The tract thus formed is the lateral spino-thalamic tract (for pain and temperature), and as this tract ascends up the spinal cord, there is some spatial and temporal organisation within it. Information from the sacral and lower limb areas lies dorso-laterally, and from the cervical region and upper-limb ventro-medially, with the lumbar and thoracic areas in an intermediate position.

The lateral spino-thalamic tract ascends in the medulla, in a position near its lateral surface (Monakow's area), lying between the inferior olivary nucleus and the nucleus of the spinal tract of the trigeminal nerve. Proceeding upwards in the dorsal pons, its position is again ventro-lateral. In the mid-brain, the tract lies close to the tegmentum, and eventually it terminates in the ventral-posterior-lateral (VPL) nucleus of the thalamus.

Some fibres of the lateral spino-thalamic tract cross in the posterior commisure to end in the contralateral VPL nucleus of the thalamus. Thus, there is bilateral representation of pain at the thalamic level (Bowsher, 1957). Only a small percentage of fibres in the lateral spino-thalamic tract reach the thalamic relay stations, and a large number stop at lower levels in the reticular formation of the medulla, pons, and mid-brain, and are called spino-reticular and spino-tectal fibres.

(c) *Third order neurons*

The cell bodies of these neurons lie in the ventral-posterior-lateral nucleus of the thalamus. In this nucleus, the lower limb and sacral areas are again represented dorso-laterally, and the upper limb and cervical regions ventro-medially. This thalamic nucleus has connections with other thalamic nuclei, but its main projection is to area 3 of the sensory cortex which is located in the post-central gyrus. Area 3 lies in the posterior wall of the central (Rolandic) sulcus. Some authors consider cortical representation as very minor and less significant than thalamic representation. It is certain that crude appreciation of pain can occur at the thalamic level, but cortical analysis is necessary for more meaningful and discriminative interpretation, like locating the precise source of the pain, its severity and quality. In the post-central gyrus, the contra-lateral half of the body-form or homunculus is represented in an inverted form. The sequence is the head, neck, upper-limb, and trunk, followed by representation of the leg, foot, and ano-genital areas on the medial surface of the hemisphere. The cortical areas for some parts of the body, like the hand, is unusually large, providing for maximum sensory discrimination.

Some recent concepts

The spino-thalamic tract contains fibres proceeding to the thalamus, and also has spino-reticular and spino-tectal fibres ending in the reticular formation of the brain stem. This long-fibre system can thus be sub-divided into the polysynaptic system and the paucisynaptic system. The polysynaptic system is a phylogenetically old pathway and concists of chains of short neurons ending in the reticular formation and the thalamus. The paucisynaptic system is a more recent evolutionary development and consists of three orders of neurons having their cell bodies in the dorsal root ganglia, nucleus proprius, and the sensory nuclei of the thalamus, respectively. If the paucisynaptic system is interrupted, pain impulses can still be transmitted by switching onto the polysynaptic system.

In addition, a short system has been described, though anatomical demarcation of this system is scanty. It probably consists of short relays at a spinal level.

Some spino-thalamic fibres end in other thalamic nuclei as well, such as the mid-line nuclei and the reticular nuclei, and constitute the diffuse projection system of the thalamus. The polysynaptic pathway which ends in the reticular formation also contributes to this diffuse projection system of the thalamus. This entire complex is referred to as the spino-

reticulo-thalamic system, and has the property of transmitting diffuse, poorly-localised pain that persists for a long time even after the stimulus is removed. This concept has been accepted by workers dealing with the treatment of pain by stereo-tactic surgery.

Pathway for the head

The peripheral fibres are found in the branches of the ophthalmic, maxillary, and mandibular divisions of the trigeminal nerve. A small part of pain sensation from the head (Fig. 2) is carried through the facial, glosso-pharyngeal, and vagus nerves from the tongue, pharynx, oesophagus, larynx, external auditory meatus, middle-ear cavity and Eustachian tube. The cell-bodies of the first order neurons lie in the trigeminal ganglion, and the sensory ganglia of the facial, glossopharyngeal, and vagus nerves. The central processes from all these ganglia enter the pons and medulla, and then run caudally. These descending fibres constitute the spinal tract of the trigeminal nerve. The fibres terminate in the nucleus of the spinal tract of the trigeminal nerve (nucleus caudalis) which lies in the lateral medulla and the upper three cervical segments of the spinal cord. The second order neurons have their cell-bodies in this nucleus, and their axons cross the mid-line and run upwards in the trigemino-thalamic tract (trigeminal lemniscus). This tract terminates in the most medial part of the ventral-posterior nucleus of the nucleus, which has been variously labelled as the ventral-posterior-medial (VPM) nucleus, the arcuate or the semilunar nucleus. Third order neurons from this thalamic nucleus relay via the internal capsule to the area for the head in area 3 of the sensory cortex.

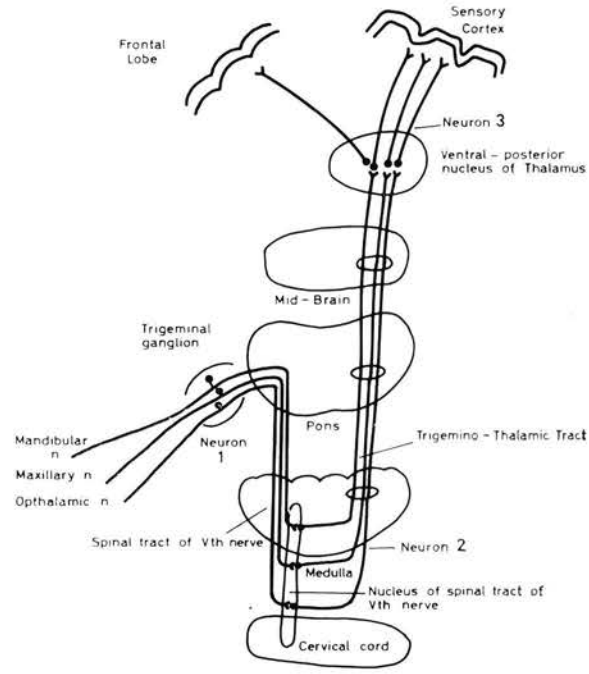
The trigemino-thalamic tract is now believed to have a bilateral distribution ending in the VPM nucleus and also in the diffuse thalamic system. A polysynaptic pathway has also been described with a bilateral projection to the reticular formation of the brain-stem and the diffuse thalamic system.

Pathway for visceral pain

The pain-receptors lie in the walls of hollow viscera. The afferents travel through sympathetic and parasympathetic nerves, and pass through the sympathetic chain before entering the dorsal roots. They travel the same path as somatic sensation. The cortical area for visceral pain are intermixed with somatic areas.

Stimuli causing pain

A wide variety of stimuli can cause pain receptors to be activated. Electrical, thermal, mechanical, and chemical agents are believed to cause the liberation of a chemical agent, possibly a kinin, which then



Pathway for pain for the Head

stimulates the free nerve endings. Histamine probably acts by causing local release of kinins. Muscle pain, e.g. in angina pectoris and intermittent claudication, is believed to arise from local ischemia caused by pathological obliterative changes in blood vessels supplying the area concerned. The chemical agent released in response to ischemia was identified as "Lewis P substance", which is probably again a kinin. Deep pain, arising from ligaments or bone, is poorly localised, has a nauseating effect, and is associated with spasm of overlying skeletal muscles. The resultant ischemia from this spasm causesthe release of chemicals which stimulate pain-receptors in muscle. It is accompanied by autonomic changes, like sweating and a fall of blood pressure.

Visceral pain

It tends to be poorly localised and can be of a severe intensity, Other visceral afferents may be stimulated at the same time as pain-receptors, and associated phenomena like nausea and vomitting can thus be accounted for. In inflammatory conditions of viscera which involve the parietal peritoneum, there is reflex spasm or "guarding" of the overlying muscles of the anterior abdominal wall.

Referred pain

The classical examples are that of cardiac pain being referred to the inner aspect of the left arm, and diaphragmatic pain from irritation of the central

tendon of the diaphragm being referred to the tip of the right shoulder. Usually, the area where pain is referred to shares the same spinal segment for its sensory nerve supply as the area from where the pain originally arises. By convergence, the first order neurons from the two areas could synapse upon the same second order neuron in the nucleus proprius; and pain impulses coming in from the primary area may be interpreted as coming from the referred area.

Gate control theory of pain – after Melzack and Wall

It is believed that the rate of incoming impulses via the Type A and C fibres are controlled by the cells in the cerebro-spinal ganglia, and these cells can transmit only a certain number of impulses per unit time. The substantia gelatibosa acts as another "gate", and can be facilitated or inhibited by impulses reaching it along collaterals for other sensory modalities. Proprioceptive fibres, which travel in the dorsal columns, send collaterals to the substantia gelatinosa, and can cause inhibition of pain transmission. Thus, vigorous shaking of the hands, as after a burn, causes a volley of proprioceptive impulses to travel in the dorsal columns of the spinal cord, and their collaterals can cause inhibition of the substantia gelatinosa, thereby reducing the severity of pain.

The "gate" in the substantia gelatinosa is also under the influence of higher centres, and can be inhibited by impulses coming from the cerebral cortex. Such inhibitory influences from higher centres can explain why pain during combat and sport is not felt as intensely as under normal circumstances. The gate-control theory of pain has been used to explain the basis for acupuncture being successfully used for pain-relief. It is believed that a volley of impulses travelling to the spinal cord from rapid stimulation of acupuncture needles, inserted at appropriate points, wound tend to block impulses from a painful area because the hypothetical "gate" can only transmit a certain number of impulses per unit time.

Clinical considerations

1. Pain fibres can be stimulated by inflammatory lesions in peripheral nerves (peripheral neuritis) or in the dorsal roots (radiculitis). Pressure on the nerve root, as by a herniated intervertebral disc, causes stimulation of both pain and temperature fibres, thus explaining the pain and burning sensation in the area supplied by the affected nerve roots.
2. In syringomyelia, where there is progressive cavitation of the central canal of the spinal cord, the decusating pain and temperature fibres are progressively encroached upon. The disease process is usually limited to the cervical segments of the spinal cord, and there is loss of pain and temperature in the hands, arms, and shoulders on both sides producing "yoke-like.' anaesthesia. However, touch sensation is preserved because it partly travels, on the same side, through the dorsal white columns, and this phenomenon is referred to as dissociated anaesthesia.
3. Spinal hemisection causes loss of pain and temperature, below the level of the lesion, on the opposite side of the body, because of the crossing-over of the second-order neurons in the spinal cord.
4. In infarction of the brain-stem, produced by occlusion of the posterior inferior cerebellar artery, the lesion affects the lateral medullary area where the lateral spino-thalamic tract ascends and where the spinal tract of the trigeminal nerve descends. There is contralateral loss of pain and temperature in the body, and ipsi-lateral loss over the face. The resulting syndrome is known as Wallenberg's syndrome, and includes other features like bulbar palsy, and ipsilateral cerebellar signs.
5. The thalamic syndrome, produced by vascular lesions involving the sensory nuclei of the thalamus, causes exaggerated, perverted, and disagreeable responses to minor cutaneous stimulation.

Surgical relief of pain

An anatomical knowledge of the pain pathway enables one to understand clearly the various surgical procedures that have been devised for the relief of intractable pain. In Fig. 1, one can see that this interruption of the pain pathway can be done by peripheral section or avulsion of the nerve; dividing the dorsal nerve roots (rhizotomy) will also cause loss of touch and proprioception but will produce no motor deficits; or by sympathectomy for the relief of visceral or cardiac pain. In the spinal canal, the nerve roots can be blocked by extradural or subarachnoid injections of phenol or alcohol. In the spinal cord, medulla, or mid-brain, the lateral spinothalamic tract can be divided by the operations of cordotomy, medullary tractotomy or mesencephalic tractotomy respectively. These operations are usually reserved for intractable pain in the terminal cancer patient. The results are often disappointing, leading to the speculation that other pathways may be involved in pain transmission as well. Pre-frontal

leucotomy or lobectomy are designed to cut off the deep connections of the thalamus and sensory cortex with the frontal lobes. These patients often obtain considerable relief. Although they can still feel pain, it does not bother them. The operation serves to dissociate pain from its unpleasant or subject affect.

Other methods for relief of pain

The general practitioner must never forget the value of psychological support, social and environmental help, and the use of placebos in dealing with those patients affected by a painful malady. Some narcotic analgesics have a central action in lowering pain perception; whereas steroids, aspirin, and related drugs produce pain-relief by reducing inflammation. Aspirin is believed also to block peripheral chemoreceptors. Tranquilisers, sedatives, and antidepressants act by modifying the reaction to pain. Atropine probably relieves pain by causing relaxation of smooth muscle, and skeletal-muscle relaxants are effective because they relieve spasm. For trigeminal neuralgia, drugs like Tegretol and Dilantin are effective, but in resistant cases, injection of alcohol or phenol into the trigeminal ganglion or even surgical division of the affected nerve root may be considered. Deep x-ray therapy, chemotherapy, and endocrine therapy are usually reserved for bone-pain of endocrine-dependant metastases. Local anaesthetics act by blocking peripheral nerve endings and can be used to produce analgesia for minor operative procedures. Acupuncture and hypnosis are becoming more popular with general practitioners nowadays, thus increasing their armanterium in tackling the problem of pain which afflicts a very large percentage of their patient.

Conclusion

The clinical management of pain is a problem that continuously confronts the physician, but there are still wide gaps in our knowledge regarding the structure and physiology of pain receptors and the central pathways mediating this sensory modality. It is hoped that a sound knowledge of the anatomical pathway for pain, outlined earlier, will help the doctor understand some of the clinical phenomena produced when this pathway is interferred with by pathological processes, and also rationalise the many and varied methods available to produce relief of pain.

Acknowledgement

Grateful thanks to Mrs. S. P. Lee for her typing assistance.

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Acute arterial embolism

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Summary
ACUTE PERIPHERAL ARTERIAL EMBOLISM is commonly encountered today. The significance of considering this entity as a medical and surgical emergency is stressed and its management outlined.

Introduction

Of recent occurrence, is an increase in the number of referrals of patients with acute arterial embolism. Unfortunately, these patients are seen at such a late stage that nothing short of an amputation of the affected extremity, is the only definitive therapy that can be entertained. In the light of this experience, it is felt that a brief note about the management of arterial embolism is perhaps both indicated and timely.

The purpose of this communication is to present a simple method of dealing with the problem of an acute peripheral embolus, with the hope that embolectomy will be in the armamentarium of the General Surgeon.

Clinical course

Regardless of the origin of an embolus and the underlying disease process, it is the location of the embolus and its subsequent propagation that determines the viability of the limb. Following occlusion, a softer coagulum (thrombus) forms in areas of decreased flow. Linton (1941) has emphasized that this propagation of thrombus distal to the embolus is of major importance to the outcome of the disease. It would not be difficult to appreciate, therefore, that time factor is an important consideration in management.

Preoperative assessment

The sudden onset of symptoms following embolisation is dramatic and its recognition and diagnosis should present no major problem. Atrial fibrillation is frequently present and is perhaps responsible for the source of the embolus in a vast majority of cases. Mural thrombi in a patient with acute myocardial infarction is not an uncommon source of an embolus. In the absence of atrial fibrillation and a history of myocardial infarction, one should consider primary arterial thrombosis as the more probable cause of the symptoms.

The time of onset of symptoms is noted since this may well determine the final prognosis. Ideally, treatment should be instituted within 6 hours of the embolic incident.

In the physical examination of the patient, the colour and temperature of the extremity are recorded. Peripheral pulses must be meticulously palpated for and their presence or absence accurately documented. There is almost never any necessity to confirm the diagnosis by preoperative angiography.

These patients invariably have concomitant heart disease. Hence, careful evaluation of cardiac function must proceed simultaneously with initial assessment and medical treatment.

Initial medical treatment

Morphine, Digoxin, diuretics and antiarrhythmic drugs are vital in the initial medical management of acute vascular occlusion.

Heparin is given immediately upon diagnosis in order to prevent repeated embolisation and to minimize distal propagation of the thrombus. The vasodilatation and anti-inflammatory properties of heparin are also beneficial to the patient. The initial dose is 5000 units intravenously. Thereafter, the same dose should be given 4 hourly to maintain a clotting time of between 2–3 times that of a control. Blood is taken $3\frac{1}{2}$ hours after a dose and the clotting time determined; if the clotting time is 2–3 times the control level, another 5000 units of heparin is given; if the clotting time exceeds 3 times the control, heparin is withheld till the next clotting time determination. Should the clotting time be less than twice that of the control, $3\frac{1}{2}$ hours after the initial dose, 7500 units may be given as the next dose instead of 5000 units (Fig. 1).

ANTICOAGULATION CHART

DATE	TIME	TIME INTERVAL (HOURS)	CLOTTING TIME RATIO (PATIENT/CONTROL)	HEPARIN DOSE (UNITS)	NURSES'S INITIALS
12/8/76	0900 AM	0	1·0	5000	
	1230	3½	1·5	–	
	1300	½	–	7500	
	1630	3½	2·1	–	
	1700	½	–	5000	
	2030	3½	2·5	–	
	2100	½	–	5000	
13/8/76	0030	3½	3·5	–	
	0100	½	–	OMIT	
	0330	3½	2·9	–	
	0400	½	–	5000	
	0730	3½	2·9	–	
	0800	½	–	5000	
	1130	3½			
	1200	½			

Figure 1

A sample anticoagulation chart

Operative management

Since Fogarty's (1963) original description of the technique of embolectomy using a balloon catheter, the mortality and morbidity associated with this condition has markedly decreased. It is important to note that the main aim in surgical intervention is to save the affected limb, hence restoration of the circulation to its immediate pre-embolic state should be the goal; lengthly reconstructive surgery should not be attempted. The surgical instruments commonly used in performing an embolectomy are as shown in Figure 2.

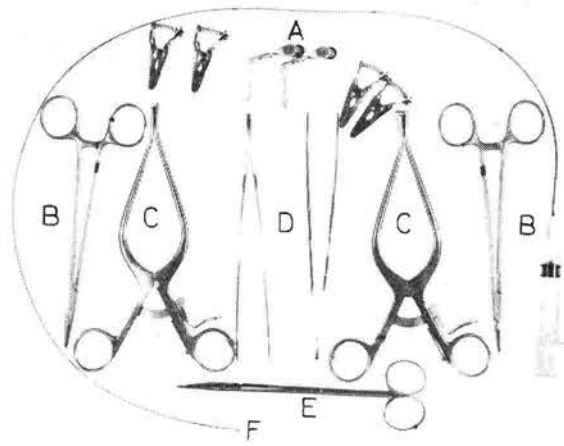

Figure 2
Basic Instruments for embolectomy.
A – variously angled vascular clamps; B – fine-tipped needle holders; C – Weitlaner's Self-retaining retractors; D – Carbide-tipped vascular dissecting forceps; E – sharp-pointed angle-on-flap scissors; F – Fogarty embolectomy catheters (size 3 + 4 Fr).

Under local anaesthesia and morphine sedation, the classical incision to expose the proximal femoral artery is made (Inset, Fig. 3). The common femoral, superficial femoral and profunda femoris arteries are circumferentially mobilized and tapes passed around them individually.

Prior to clamping the vessels, 5000 units of heparin is given intravenously. The common femoral and profunda femoris arteries are then clamped. A longitudinal arteriotomy is made and a suitably sized Fogarty catheter passed as far down as possible into the superficial femoral artery (Fig. 3, A). So as to reduce blood loss, the unclamped vessel may be angulated by traction on the encircling tapes during passage of the catheter. The balloon is inflated and the catheter gradually withdrawn. This process should be repeated until no further clots are obtained or until back-bleeding occurs. The superficial femoral artery is then clamped and the catheter passed down the profunda femoris artery (Fig. 3, B). Finally, the catheter is passed proximally into the aorta (Fig. 3, C). If there is suspicion that the embolus has propagated proximally to be sufficiently close to the aortic bifurcation, the contralateral common femoral artery should be exposed and clamped before passage of the Fogarty catheter proximally into the aorta, lest a piece of the thrombus be shot off into this "good" artery during the process. Repeated passes must be made until one is confident that all obstructing thrombi have been removed. After this 25–50 ml of heparinized saline (5000 units

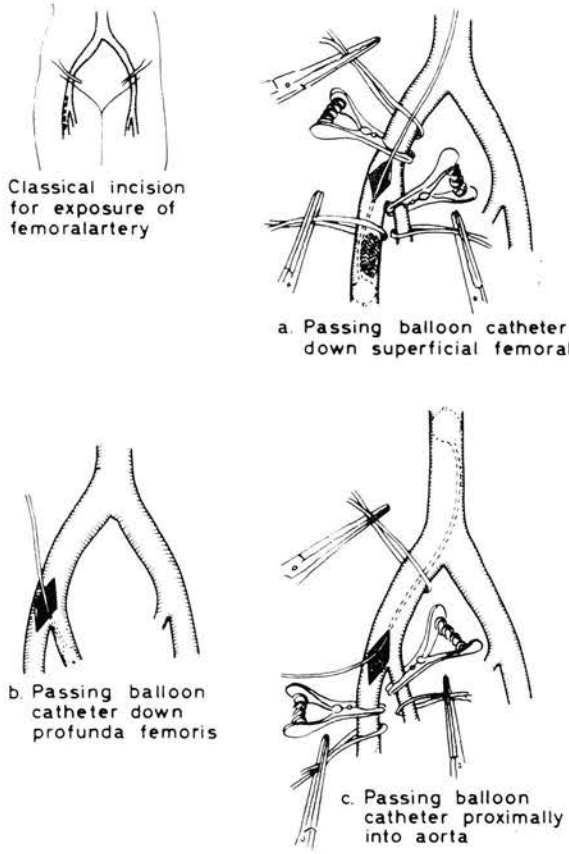

Figure 3

Technique of Embolectomy

heparin in 250 ml normal saline) should be injected into the distal vessels.

Primary closure of the arteriotomy (Fig. 4, A) is then attempted using 4-0 Prolene, Ethiflex or Tevdek. If the vessel is atherosclerotic and the arteriotomy inadvertently made jagged in the process of the embolectomy, primary closure without compromise to the lumen of the artery may not be possible. Under such circumstances, a short segment of saphenous vein may be excised via the same incision and used as a vein patch for the closure of the arteriotomy (Fig. 4, B).

A 21 gauge needle may be placed in the artery just distal to the most proximal clamp to serve as an air vent as the distal clamps are released first.

Since the patient has been anticoagulated, meticulous haemostasis is imperative before closing the various layers of the incision. It is advisable to

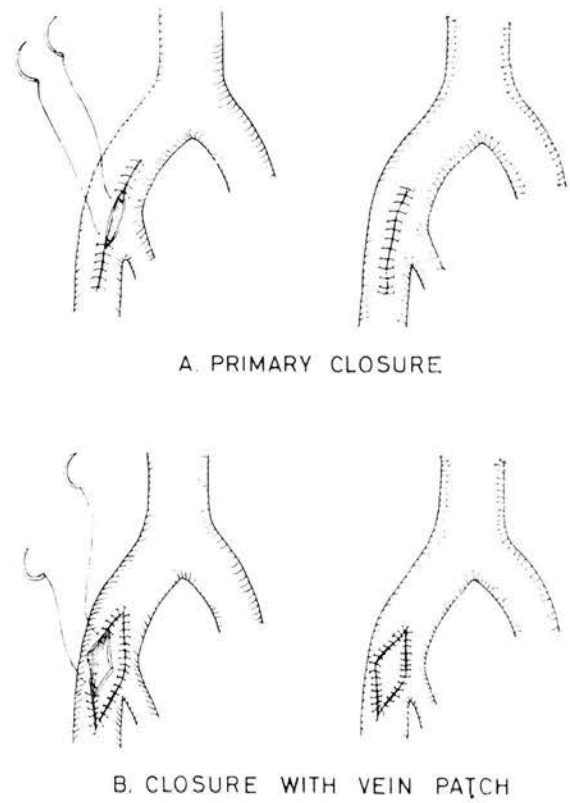

Figure 4

Closure of Arteriotomy

insert a Radivac drain in the area of dissection so as to prevent haematoma formation.

Post-operative management

During the post-operative period, heparin administration is continued according to the plan outlined earlier. The moment the patient is well enough to tolerate oral medications, he should be started on Warfarin and maintained on it for about 3–6 months; heparin being taken off the moment adequate anti-coagulation is obtained with Warfarin.

In the meantime, all therapy for his underlying cardiac and/or other medical condition should continue uninterrupted.

Discussion

Emboli, as a major cause of acute arterial occlusion resulting in gangrene has been recognized since time immemorial. Soon after embolectomy was popularised, it was observed that operations performed within 4–6 hours of the lodgement of the embolus were largely successful whereas those

carried out subsequently had a progressively higher failure rate. Based on this observation it was proposed that patients who had emboli lodged more than 12 hours previously should not be operated upon. This concept has now proved to be wrong: with proper management, viability can be preserved in well over 90% of patients so long as surgery is conducted before the muscles become necrotic. However, in delayed cases, achieving cure taxes the resources, skills and ingenuity of the vascular surgeon to the utmost for thrombi may have propagated very distally and complete removal require multiple incisions and perhaps serial operative arteriograms.

The operative procedure must be planned with regard to the influence of anaesthesia and of the operation, on the heart since patients with arterial emboli usually have serious cardiac disease. This is especially so, if the embolus had originated from a mural thrombus consequent upon a myocardial infarction. Because embolectomy can be done safely and with minimal trauma under local anaesthesia, few patients should be denied the benefit of such an operation. Imminent death and definite gangrene constitute about the only reasons not to operate. Procrastination of the surgical procedure in the vain hope of getting the patient's heart into better shape, can only invite gangrene which, of necessity, requires a major amputation – a much greater surgical stress than simple embolectomy.

Post-operatively, adequacy of the peripheral circulation must be ascertained. A palpable pulse is the most useful clinical sign and this should be identified immediately after operation. The anticoagulant effect of the heparin given preoperatively and intra-operatively should not be reversed with Protamine. In fact, anticoagulant therapy should continue into the post-operative period. The importance of prompt and continuous anticoagulation cannot be over-emphasized for the arterial embolus is only a symptom of serious heart disease. Unless the underlying source of the embolus is simultaneously treated, the patient runs a risk of recurrence of emboli, each with a 25–30% likelihood of lodging in the brain.

The prognosis of these patients depends on the ability to prevent further emboli. If anticoagulation is inadequate, recurrence is inevitable and this can only terminate in fatal or crippling cerebral thrombosis. Attention to prevent recurrent embolization can be relaxed after the predisposing cardiac condition has been taken care of e.g. a mitral valvotomy has been performed for mitral stenosis, atrial fibrillation has reverted to sinus rhythm or a myocardial infarction has healed. In many large series, the hospital mortality is about 30%; usually from the underlying heart condition. Our experience, however, does not bear this out as many of our patients arrive in extremis, sometimes several days after the onset of symptoms.

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A report on 102 rubber-band ligations of internal hemorrhoids

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Introduction

THE GENERAL PRACTITIONER is frequently called upon to treat internal hemorrhoids because they are a very common disease, especially prevalent among the actively working young adults. Most of the people with internal hemorrhoids do not bother to seek medical advice until they get the frightening complication of bleeding. Thus over 85% of them present with the complaint of passing blood during defecation, and only a minority present with other symptoms such as protrusion, pain and discomfort, sense of obstruction in the anus, etc. For mild cases conservative treatment by regulation of diet, avoidance of constipation, and the insertion of astringent suppositories may suffice since the condition is of a self-limiting nature anyway. In the more severe and persistent cases active intervention is indicated. In the past I used to treat these cases by injection, using either the 5% phenol in almond oil which was deposited in amount of two to three mililitres submucosally at the upper pole of the hemorrhoid, or the 20% phenol in glycerine which was injected in amount of 0.15 ml to 0.30 ml into the hemorrhoidal substance. Although the injection will stop bleeding effectively it is however a temporary measure and is not curative as the condition will recur when the effect of the sclerosing agent has worn off.

Below is described the technique of rubber-band ligation of internal piles used in the treatment of internal hemorrhoids.

Technique of Rubber-band Ligation

A general physical examination should be carried out on the patient to detect the presence of any metabolic or degenerative disease particularly cirrhosis of liver which may cause or aggravate piles. It is mandatory to examine the anorectal region carefully by digital exploration and anoscopic inspection to exclude such conditions as anal fissure, hemorrhoidal thrombosis, carcinoma, papilloma, polyps, and inflammatory lesions which may produce symptoms similar to those of hemorrhoids. Then a decision must be made as to whether the hemorrhoid is suitable for ligation, since a rather small one will not provide enough tissue for the rubber-band to constrict so that it will tend to slip off after application. When more than one sizeable pile is present it is necessary to choose the most "culpable" one for ligation first because only one is to be ligated at one sitting, and three weeks must be allowed to elapse for healing of the wound to take place before another one is ligated. Now the anoscope is held in position by the assistant and the ligator, already loaded with the rubber-band, is introduced into the anal canal in such a way that the chosen hemorrhoid is put inside the drum of the instrument. With the other hand the operator uses a small Allis tissue forceps to grasp the apex of the engaged hemorrhoid through the lower opening of the drum (Fig. 3). Having got the pile pulled up and steadied, the operator can now push the drum up a little bit against the neck of the hemorrhoid and at the same time close the handle of the instrument to discharge the rubber-band into place around the neck of the pile. Care must be taken to ensure that the point of application of the rubber-band is well above the anorectal line, with a distance of at least five milimetres. If the rubber-band were applied too close to the dentate line the patient would immediately experience pain which would necessitate the removal

of the band by means of a hemostat and scissors and the reapplication of the band at a higher point.

The McGivney Hemorrhoidal Ligator is considerably improved and modified from James Barron's ligator introduced in 1963, which was again an improved and modified version of the original ingenuous instrument invented by Paul C. Blaisdell in 1954 (Fig. 1). The shaft can be easily removed from the handle for sterilization. It can be rotated 360 degree on the handle to facilitate the placement of the ligating drum in each quadrant of the lower rectum. To load the small latex rubber-band (five milimetres in diameter) on to the ligating drum, the band is first threaded on to the loading cone from its pointed end and pushed down to its base. The cone is then attached to the free end of the drum so that the band can be transferred from the base of the cone to the drum. When this is done the cone is detached from the drum and the loaded instrument is ready for operation (Fig. 2).

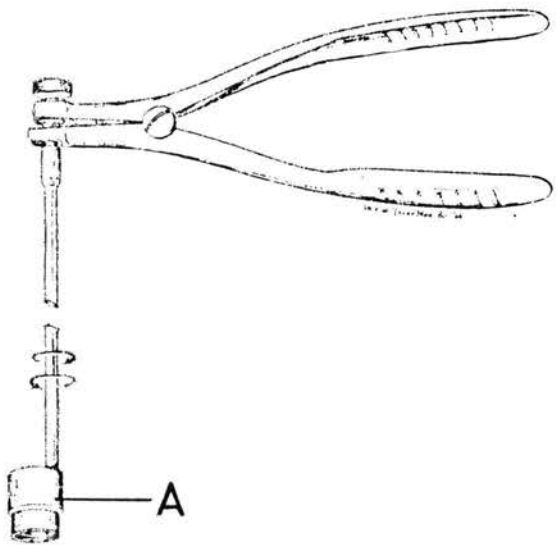

Fig. 1

The McGivney Hemorrhoidal Ligator showing the double-sleeved ligating drum (A).

Management after Ligation

Immediately after ligation the hemorrhoid begins to swell and darken in colour and the patient may feel a dull ache at the anus. Within a few hours infarction is complete but the process of sloughing may take a few days during which time some bleeding may be noticed in the stools. During the first few days, especially the first 48 hours, a

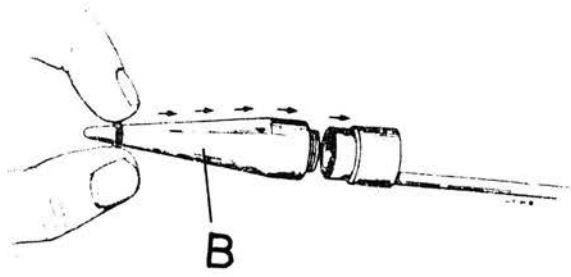

Fig. 2

The loading cone, not yet attached to the ligating drum, with the rubber-band being pushed towards its base (B).

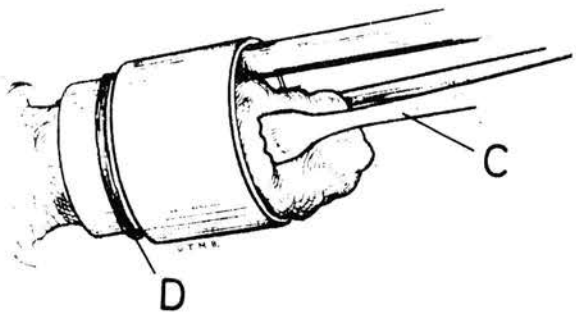

Fig. 3

The Allis tissue forceps, grasping the apex of the hemorrhoid which has been engaged inside the ligating drum (C).

The rubber-band, still loaded on the ligating drum, is ready to be discharged to constrict the neck of the hemorrhoid (D).

sense of fullness at the anus and an urge to defecate may be felt in addition to the dull aching. The patient is assured that he or she can carry on with his or her usual work and activities without restriction. A few tablets of non-constipating analgesic are provided in case they are needed. Two tablets of bisacodyl to be taken at bedtime are prescribed for the first week to keep the bowels open and the motions soft. Excessive straining at stool is to be avoided because it may cause or aggravate bleeding from the sloughing area. The patient is instructed to report back for examination if there is excessive bleeding, say three to four bloody motions within a period of several hours. Those having more than one bleeding or protruding pile should be warned that their symptoms may persist after the first ligation because only one pile is treated at one time and the untreated ones may continue to give trouble until

they are subsequently dealt with one by one, otherwise the patients may conclude that the treatment is not effective.

Complication after Ligation

The only complication is excessive bleeding from the sloughing area. Salvati (1975) reported that two per cent of his cases had excessive bleeding for which he performed electrocoagulation in the office to stop the bleeding.

Presentation of the Author's Cases

During the period from July 1975 to April 1977 I performed 102 ligations for internal hemorrhoids on 78 patients, of which 16 patients or about 20% had more than one ligation (Table I). It will be seen that there are 46 patients (60%) who are young adults in the age group from 26 to 45. There are 48 males (61.5%) to 30 females (38.5%). No cases of excessive bleeding were encountered in the present series. Of the 78 patients treated 17 or 22% were lost to follow-up. All of the 61 patients who returned for follow-up expressed satisfaction over the treatment.

Discussion and Conclusion

What is the treatment of choice for second-degree and third-degree hemorrhoids? Hemorrhoidectomy, the classical treatment, can first be ruled out because it is more or less a major surgical procedure that requires hospital admission which most patients dislike and is expensive in terms of the cost per day of maintaining a hospital bed. It should be reserved for large internal hemorrhoids associated with external piles. Other inpatient procedures, such as manual dilatation of the anus and the internal sphincterotomy, undoubtedly effective measures, are also not the treatment of choice for the same reason.

Outpatient procedures for the treatment of piles certainly are more acceptable to the patients than the inpatient ones. But they must be both effective and free of complications. The injection method can give immediate relief for bleeding but it is not curative having a very high rate of recurrence. Cryosurgery is a highly effective procedure for internal hemorrhoids in the office but it has certain disadvantages. It requires the application of local anaesthesia and the patient has to bear the inconvenience of the inevitable subsequent watery discharge which can last up to several weeks. Besides, the equipment consisting of the freezing instrument and the gas cylinder is rather expensive and costs more than two thousand dollars to start with.

In rubber-band ligation we have a simple, quick and safe office treatment for internal piles. It is highly acceptable to the patient because its postoperative local discomfort lasts for only two or three days and it does not entail interruption of work and usual activities. The necessary instruments are the anoscope, the McGivney ligator, the Allis tissue forceps, and the rubber-bands all of which do not cost more than 500 dollars. How effective is the rubber-band ligation method? In a leading article entitled "Outpatient Treatment of Hemorrhoids" in the 21 June 1975 issue of the British Medical Journal, the author presents a very succinct discussion on the choice of treatment for internal piles and seems to come to the conclusion that rubber-band ligation is the treatment of choice. The article states that Steinberg *et al.* had reviewed the

Table I

Tabulation of Patients According to Age, Sex and Number of Ligations

Age Group	15–25		26–35		36–45		46–55		56–66		Total No. of Pt.	Total No. of Lig.
Sex	M	F	M	F	M	F	M	F	M	F		
Number of Ligations												
1	5	3	14	8	9	7	5	2	6	3	62	62
2	2				4	3		2		1	12	24
3					1		1				2	6
4							1				1	4
5												
6										1	1	6
TOTAL											78	102

long-term results of rubber-band ligation of hemorrhoids and found that three and a half to six years after treatment 89% of patients were cured or satisfied, though complete absence of symptoms was noted in only 44%. Two per cent underwent subsequent hemorrhoidectomy, and 12% had further conservative treatment for recurrent symptoms. Patients whose presenting complaint had been bleeding enjoyed the same improvement or cure rate as those who had presented with irritation or pain, and the results in patients with third-degree hemorrhoids were as good as those with second-degree ones.

I do hope that this report of mine will get the General Practitioners of Malaysia interested in adopting the rubber-band ligation method to treat their patients with internal hemorrhoids.

Summary

The technique of rubber-band ligation of internal hemorrhoids was described and a series of 102 ligations on 78 patients with internal piles was reported. It was concluded that the procedure was highly effective and acceptable to the patients and could be easily carried out in the office without fear of complications which were rare.

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Windscreen eye injuries in Singapore

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Introduction

WE noticed an increase in the number of patients with "windscreen eye injuries" over the past few years. In many of these patients, permanent severe visual and cosmetic sequelae occurred. We felt these injuries should not have occurred in the first place if patients were wearing safety belts. We feel it is timely to bring to the attention of all the results of our study and to stress the importance of a safety harness in the prevention of these injuries.

Materials and Methods

The data were obtained from an analysis of the case records, interviews and clinical examination of 23 patients seen in the Department of Ophthalmology, Singapore General Hospital between January 1975 and June 1977. The patients were personally interviewed and examined by the authors regarding the circumstances relating to the accident; seating arrangement, safety belts if any, and economic status. Clinical assessment include visual acuity by Snellen's test types, slit lamp microscopy, direct and/or indirect ophthalmoscopy to assess the extent of injury and visual as well as cosmetic sequelae.

Results

The actual ages of these 23 patients range from 15 years to 55 years. Twenty-one (91.2%) were young patients aged 15 years to 39 years. Of the 23 cases of windscreen eye injuries 5 (21.7%) took place in 1975, 10 (43.5%) in 1976 and 8 (34.8%) in the first 6 months of 1977. If this trend were to continue we would expect the total percentage for 1977 to be higher than that for 1976.

Table I

Patients with Windscreen Injuries involving the Eye by Age Group

Age Group (Years)	No	%
15 – 19	3	13.0
20 – 29	13	56.5
30 – 39	5	21.7
40 – 49	1	4.4
50 – 59	1	4.4
Total	23	100.0

There was a male preponderance of 15 (65.2%) as against 8 (34.8%) females (Table II). The racial composition of the patients reflected more or less the population structure of Singapore – with 78.3% Chinese, 8.7% Malays and 13% Indians.

Table II

Patients with Windscreen Injuries involving the Eye by Sex and Ethnic Group

Ethnic Group	Male		Female		Both Sexes	
	No	%	No	%	No	%
Chinese	12	52.2	6	26.1	18	78.3
Malay	1	4.3	1	4.3	2	8.7
Indian	2	8.7	1	4.3	3	13.0
Total	15	65.2	8	34.8	23	100.0

Seventeen (73.9%) were front seat passengers as against 6 (26.1%) drivers at the time of accident (Table III). Of the 17 (73.9%) front seat passengers, 9 (39.1%) were males and 8 (34.8%) females. This contrasts with 6 (26.1%) drivers all of whom were males (Table III).

Table III

Patients with Windscreen Injuries involving the Eye by Sex and Car-Seating

Car-Seating (In Front)	Male		Female		Both Sexes	
	No	%	No	%	No	%
Driver Seat	6	26.1	0	0	6	26.1
Passenger Seat	9	39.1	8	34.8	17	73.9
Total	15	65.2	8	34.8	23	100.0

A total of 24 eyes were injured in 23 cases (one patient had bilateral injury). The extent of eye injury was considerable: 16 (66.7%) eyes suffered fairly severe injury with corneal lacerations, iris prolapse and/or cataract formation. 8 (33.3%) eyes suffered very severe injury with ruptured globes and vitreous loss.

The final visual outcome of the eyes was poor. 13 (54.2%) eyes had very severe visual impairment with visual acuities ranging from 6/60 to NPL (two eyes were blind). Five (20.8%) eyes had moderately severe visual impairment with visual acuities ranging between 6/18 and 6/36. Only 6 (25%) eyes retain good vision of 6/12 or better. Cosmetic considerations show that 12 (52.2%) patients had severe facial scarring. In the two patients who lost an eye, they had to wear a prosthesis which is far from ideal. Analysis of the vehicular speed at impact showed that in 9 (39.1%) patients accidents occurred at speeds of below 50 KmH, 10 (43.5%) at 50 KmH or more and 4 (17.4%) could not estimate their speed at impact.

All patients were hospitalised with 13 (56.5%) staying more than three weeks, 4 (17.4%) over a fortnight and 6 (26.1%) a fortnight or less. Twenty-one (91.3%) were economically active with 12 (52.2%) who were "sole breadwinners" and 9 (39.1%) who helped in the family finances although they were not the main supporter of the family. Only 2 (8.7%) were economically inactive. As far as safety belts are concerned, none of the patients wore a safety belt; and in fact none of the cars had a safety belt installed. Most were not wearing spectacles except two patients whose spectacles lenses were of glass and not safety or plastic lenses.

Discussion

To date no survey of this nature had been undertaken in this part of the world. But with rising affluence and the availability of motor vehicles, unless safety precautions are adhered to, ophthalmologists especially in institutional practices will expect to see more windscreen eye injuries. Although this is a limited study, comparing the figures for 1975, 1976 and the first 6 months of 1977 we see a definite rising trend. Perhaps an extensive study say over a 10 year period might reveal more striking statistics.

One of our significant findings is the high incidence of such injuries among the front seat passengers. This finding is not without expectation – for obvious reasons the front seat passenger is not fully aware of traffic conditions as compared to the driver and therefore cannot react fast enough to take any effective evasive action. He is therefore exposed to far greater risks than any other occupant in the motor vehicle.

For this reason it is even more important for the front seat passenger to wear a safety belt than the driver. It is hoped that when seat belts do become compulsory in 1983, equal emphasis should be placed on both the front seat passenger as well as the driver in complying by wearing the safety belt.

As we have seen the extent of eye injury was severe in nearly every patient in this study. Two patients had their injured eye removed. Two other patients had phthisical eyes. In three patients the fellow eye showed cellular activity in the anterior chamber and the possibility of sympathetic ophthalmitis was entertained. However with topical and systemic steroids, these eyes improved and hence histological confirmation of our clinical diagnosis was impossible. The rarity of sympathetic ophthalmitis in Singapore remains true in our study as in a previous study (Loh, 1968) in Singapore.

It follows, from the severity of these injuries, that the final visual outcome is poor in most of these patients. The visual loss either partial or complete is frequently irreversible due to corneal scarring, structural distortion of the anterior segment, cataract formation, vitreous haemorrhage and opacities, phthisis or removal of the eye.

Analysis of the vehicular speed at impact showed that even at slow speeds of below 50 KmH, severe windscreen injuries do occur. As you would realise, estimating the speed is difficult and we would not want to emphasize too much on this; suffice to mention that most patients felt that their cars were not travelling at high speeds at impact. Only one

patient admitted that the car was "speeding" when the accident occurred but was unable to estimate the speed.

These injuries are expensive both to the patient as well as hard on the health services. Patients stayed from 10 days to two months in hospital, taking up bed space and reducing the turnover of patients who would otherwise have occupied the available bed space. Besides having to bear the cost of their stay in hospital, most of these patients are economically active and being away from their jobs represent an economic loss not only to themselves but to their employers and the nation as a whole. If the economic loss is measured in terms of dollars and cents, it should be substantial.

Perhaps the most striking finding in this survey is that none of these patients had seat belts on. This is a widespread practice in Singapore. It is our belief and contention that if these patients had a safety harness on at impact, the severity and extent of injury would have been minimised if not prevented. A properly fastened safety harness would certainly prevent the patient's body from lurching forward and the head crashing through the windscreen.

Finally as an added precaution for those who normally wear glasses (and this is common in Singapore) we would strongly recommend that they have their spectacles made with safety plastic lenses which could act as eye shields in the event of accidents not only on the road but also in industry, sports and in the home.

Summary

Twenty-three patients seen over a $2\frac{1}{2}$ year period (1975–1977) had severe eye involvement following windscreen injuries. 17 (73.9%) were front seat passengers and 6 (26.1%) were drivers. The significant finding was that none wore seat belts. Twenty-four eyes were injured in 23 patients (one patient had both eyes injured). The extent of eye injury was severe; 16 (66.7%) eyes had moderately severe injury and 8 (33.3%) eyes had very severe injury including two blind eyes. The final visual outcome was poor in spite of surgery: over 2/3 had significant visual deficit. Twenty-one (91.2%) cases were economically active and were young patients whose ages range from 15 to 39 years. If seat belts and possibly safety plastic lenses (for those who need spectacles) were used, we believe these injuries could be minimised if not prevented.

Acknowledgements

Our thanks to all Staff of the Department of Ophthalmology for their invaluable assistance throughout this study and especially to Miss Margaret Pang for secretarial assistance, and to Dr H P Lee for his advice in the drawing up of the tables.

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Torsion of the testes: a review of 24 cases

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Introduction

TORSION OF the testis, first described by Delasiauve in 1840, remains an important clinical entity. The condition is frequently misdiagnosed and total haemorrhagic infarction of the affected testis is often the result. Prompt recognition and early operative intervention can consistently save the affected testis.

Herein, we review 24 cases of torsion in an attempt to bring this relatively common and serious surgical emergency into the general awareness of our doctors.

Methods and material

We have examined the records of 24 cases of surgically confirmed torsion of the testis in the University Hospital, Kuala Lumpur, between November 1967 and June 1976. There were 12 Indians, 11 Chinese and 1 Malay.

The ages of the 24 patients ranged from 3 weeks to 32 years, with a mean of 16.8 years (See Fig. 1). We had 2 patients under the age of 1 and 16.7% of our patients occur in the pubertal age group (11–16) years.

There were 12 cases of right sided torsion and 12 cases of left sided torsion.

Diagnosis

Scrotal pain was the cardinal symptom (see Table I) and it occurred in all patients except in the two infants. The pain was typically sudden in onset and severe in degree. Occasionally, it was

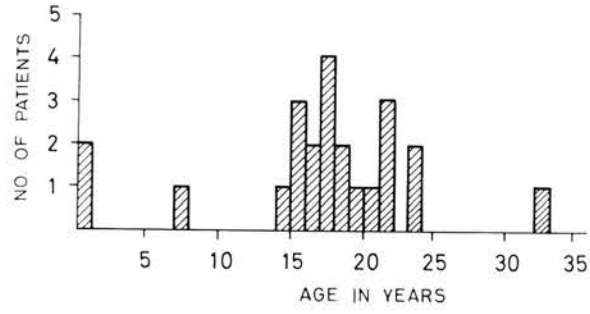

Figure 1
Age Distribution of Torsion of the Testis in 24 patients.

Table I
Clinical features in 24 cases of torsion of the testis

Symptom	No.	(%) of cases
Pain		
severe scrotal	18	(75%)
mild scrotal	2	(8.1%)
confined to groin	2	(8.1%)
Vomiting	2	(8.1%)
Nausea	3	(12.5%)
Fever (<99°F/37.2°C)	5	(28.0%)
Urinary symptoms	0	(0%)
Onset during sleep	7	(29.8%)
Previous attacks	10	(41.6%)

referred to the lower abdominal quadrant as was seen in two patients. One patient fainted from the severe pain. Nausea and vomiting occurred in two patients.

In seven patients, the torsion occurred during sleep and in one patient while resting after lunch. Only in one patient was there any suggestion of physical strain or trauma, he was blowing his nose!

Ten patients had previous similar, perhaps milder, attacks of pain in the last three years and one patient had intermittent attacks for the last six years. Another patient, operated in another hospital for torsion of the testis where an orchidectomy was done, came to us with similar acute pain in the other testis one year later.

Urinary symptoms were absent in all our patients. Five patients had low grade fever at the time of admission. Urinalysis was normal in 21 patients. Of the three patients with abnormal urinalysis, two had persistent pain for over one week. Total white blood cell count was done in 19 patients and only eight patients had white cell count over 11,000 cells per cubic millimetre.

The most consistent physical finding was an enlarged tender mass either in the scrotum or in the superficial inguinal pouch. In eight patients, the scrotum of the affected side was empty but only one of them gave a history of an inguinal swelling with an empty scrotum prior the onset of pain. In two patients, the testis on the affected side were found to have a horizontal lie.

The most common error in diagnosis was acute epididymo-orchitis. This mistake occurred in seven patients and led to a delay in treatment. In this group, the correct diagnosis was reached only after the patients returned a second time and in one patient, after a third time. This invariably led to loss of the testes.

All 24 patients underwent exploration. The preoperative diagnosis were correct in 91.6% of the patients. The salvage rate was 36.4% or 9 testes. Of these, 6 patients were operated within 8 hours after the onset of symptoms and in three, after 72 hours.

In two patients, the testes were found to have reduced spontaneously at operation with evidence of congestion and odema of the testes and spermatic cord still present. One patient had chronic intermittent pain on both sides for 6 years and acute scrotal pain on the left side for 1 week. Both testes were salvaged at operation.

No consistent predisposing abnormality was found. The well known "bell clapper" type of testes was seen only in 4 patients. The degree of torsion varied from 90° to 720° but the extent and the direction of torsion were poorly documented in the majority of the patients. Secondary hydrocoele was noted in 5 patients. The fluid was blood stained in 2 patients and both had infarcted testes.

14 patients had orchidectomy for infarcted testes. In one patient, only a wedge biopsy of the infarcted testis was done. Of the 9 patients whose testes were salvaged, bilateral orchidopexy were done only in 5 patients. The other 4 had only the affected side treated.

The average hospital stay was 5.7 days. No serious postoperative complications were noted. Mild wound infection which responded to daily dressing occurred in 5 patients. At follow up, all the patients were noted to be well.

Discussion

Torsion of the testis, more accurately called torsion of the spermatic cord (Campbell and Harrison, 1970) is an axial rotation of the cord upon itself with occlusion of the blood supply to the testis and the epididymis. This initially occludes the veins causing odema and if the occlusion is allowed to persist, it will lead to total haemorrhagic infarction of the testis. The torsion may occur intravaginally or extravaginally.

The incidence of torsion of the testis is not rare as supported by series reported by Allan and Brown (1966) and Skoglund *et al* (1970). It has been suggested that the incidence in any busy general hospital is about three or four patients a year as in our experience and perhaps even higher if one includes those that escape recognition.

The age distribution is said to be biphasic, peaks occurring in the first year of life and puberty (Skoglund *et al*). However, in our experience, there were only two patients (8.3%) below the age of one and only four patients (16.7%) fell in the prepubertal age group (11–16). Our observation of a wide age distribution in which 79% of the patients occurred in the age group (11–26) emphasises the importance of making an accurate diagnosis based on history and physical findings rather than based on age alone.

The greater length of the left spermatic cord is supposed to be more predisposed to torsion (Parker and Robison, 1971 and Jones, 1970) which again is not so in our series. All our patients had intravaginal torsion of the testis.

The main predisposing factor is said to be abnormal mobility of the spermatic cord, resulting usually from incomplete attachment of the epididymis to the testis (the broad mesorchium type of testis) or the inclusion of the epididymis and a portion of the cord within the tunica vaginalis (the bell clapper defect – see Fig. 2). The later defect was noted only in four patients. Other factors implied in the aetiology namely a strong cremasteric muscle, faulty attachment of the gubernaculum, a voluminous scrotum and excessive length of the spermatic cord remain speculative and were not seen.

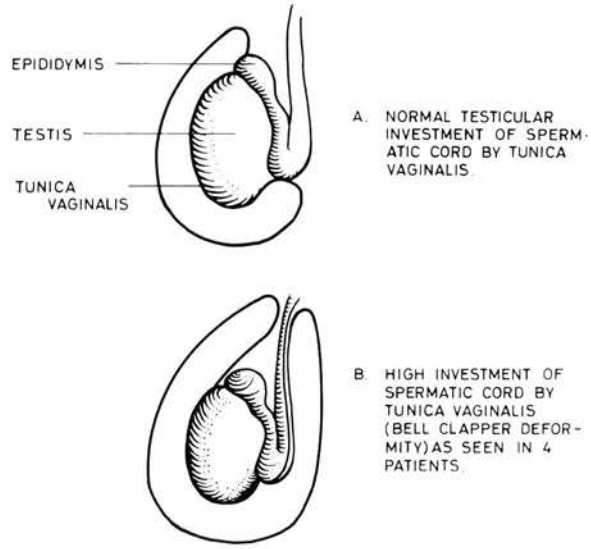

Figure 2

A. Normal testicular investment of spermatic cord by tunica vaginalis.

B. High investment of spermatic cord by tunica vaginalis.

The clinical features were characteristic. Torsion was usually heralded by sudden pain in the scrotum. Nausea and vomiting, frequent in other series, were uncommon. A previous history of intermittent scrotal pain was significantly present in ten patients (41.6%) as observed also in reports by Allan and Brown (1966) and Barker and Raper (1964). Some degree of force, whether traumatic or specific body movements or cremasteric contraction, thought to be necessary to produce torsion was only observed in one of our patients whereas 29% of our patients were sleeping or at rest when the torsion occurred.

Acute epididymo-orchitis is the frequent misdiagnosis and the principal cause of delay in appropriate treatment and low salvage rate (Parker and Robison, 1971). 29% of our patients were so diagnosed initially. The age distribution, the absence of significant urinary symptoms, a previous history of similar pain and a normal urinalysis should alert the doctor against a diagnosis of acute epididymo-orchitis. Moreover, fever is rarely present and if present, usually low grade. A white blood count over 14,000 cells/cu. mm. is unusual.

An interesting physical finding in our series was that in six patients with previously normal scrotal testes, an empty scrotum was noted on the affected side. Torsion of an undescended testis is rare and the above was probably the phenomenon of "testis redux" (Jones, 1970). When a fully descended testis undergoes torsion, the cremasteric reflex pulls it into the superficial inguinal pouch where it becomes fixed by odema and may be mistaken for a strangulated hernia or torsion of an undescended testis. The latter is easily distinguished at operation when a normal length of spermatic cord is found, and the testis, if salvageable, is easily brought into the scrotum on detorsion. In our series, one patient had torsion of an undescended testis. An undescended testis may undergo torsion particularly when an accompanying hernial sac completely invests the cord. However, this was not noted in the patient.

The salvage rate of 39% compares favourably to salvage rates of 20% by Allan and Brown (1966), 10% by Barker and Raper (1964) and 42% by Gartmann (1957) and this depends on the time interval between the onset of symptoms and operative intervention. Barker reported that the testes were saved in 9 of his 14 patients operated within 24 hours. In Gartmann's series, no testes were saved after 12 hours. Skoglund *et al* reported salvage rates as follows – "within 5 hours of onset of symptoms 83%, within 10 hours, 70% and only 20% more than 10 hours". In our series, 80% of the testes operated within 8 hours were saved while 2 testes were salvaged after symptoms have been persisted for more than 72 hours. Hence, as pointed out by Skoglund *et al,* no definite critical time limit can be set since the degree of vascular occlusion may be incomplete.

At operation, two patients were found to have their torsion spontaneously reduced following general anaesthesia. This phenomenon has been well documented. Parker and Robison (1971) reported a 73% of preoperative detorsion after general anaesthesia in acute cases. It has been suggested in these patients that cremasteric muscle spasm or other responses to pain play a role in initiating and maintaining the torsion. These mechanisms were abolished under general anaesthesia.

Sparks (1971) has advocated manipulative reduction (external detorsion) when the patient is first seen in the clinic. It is not a substitute for surgery but an interim measure to avert irreparable damage to the testis while preparations are made for the patients to undergo urgent exploration. Manipulative reduction was attempted unsuccessfully in one patient.

Definite treatment is always immediate surgical exploration. If surgical detorsion is feasible and the testis salvageable, orchidopexy should be performed. The testis is fixed by suturing the tunica albuginea to the parietal tunica. In most cases, orchidectomy may be necessary. Because the predisposing abnormality is frequently bilateral (Campbell and Harrison, 1970), prophylactic orchidopexy of the unaffected side should be carried out. This need is best illustrated by one of our patients who had an orchidectomy only performed in another hospital and one year later, presented to us with similar scrotal pain on the other side. Fortunately, the diagnosis was clear cut then and prompt surgery salvaged his only testis. Finally, should there be any doubt as to the diagnosis one should err on the side of safety and explore the testis than chance the loss of a testis.

Summary

A review of 24 cases of torsion of the testis is presented. The clinical picture, main differential diagnosis and management are discussed. No new observations were made. Rather, previous observations were re-emphasised. Torsion of the testis is an operative emergency. Only with early diagnosis and prompt surgery can the affected side be saved.

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Squamous cell carcinoma of the larynx with sarcoma like stroma

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Introduction

CARCINOMA is the commonest malignant growth of the larynx, and in a great majority of the cases, it is a squamous cell carcinoma. Occasionally, basal cell carcinomas and adeno-carcinomas develop in this location (Anderson, 1961). Rarely however, we encounter a peculiar laryngeal tumour which microscopically shows a bimorphic pattern; there is an interesting sarcoma-like connective tissue stroma and a relatively dimunitive carcinomatous component. Because of the bizarre and severe microscopic pleomorphism of the stromal spindle cells, they have frequently been interpreted as pseudosarcoma (Lane, 1957), carcinosarcoma (Frank *et al.,* 1940) or spindle cell carcinoma (Lichtiger *et al.,* 1970). However, recent studies suggest that most of these neoplasms are squamous cell carcinomas and the "sarcomatous" component is a reactive proliferation of the connective tissue cells, apparently in response to the squamous carcinoma.

This paper reports one such case because of its unusual histological appearance.

Case report

K.L.K., a 63-year-old Chinese male was admitted to the General Hospital, Kuala Lumpur, on February 7th. 1977. For a period of 6 months prior to his admission he had been complaining of progressive hoarseness of voice accompanied by copious expectoration and loss of weight. Examination of his ear, nose, and throat showed them to be essentially normal. There were no palpable lymph nodes.

Physical examination disclosed a fleshy granular looking mass arising from the whole of the left vocal cord and extending to involve the anterior commissure and the anterior one-third of the right vocal cord. The left vocal cord was fixed.

A diagnostic biopsy of the left vocal cord lesion was taken and sent to the Pathologist of the Hospital who referred the histological slides Path. No. 509/77 as consultation problem to the Division of Pathology, Institute for Medical Research, Kuala Lumpur.

The slides showed four small fragmentary pieces of tissue, the largest measuring about 0.5 cm in its greatest dimension.

Microscopically, the fragments had a nodular configuration and a variable but distinct histological pattern. They were composed of a cellular stroma of spindle cells which were closely packed together. The cells had elongated dark nuclei some of which, were atypical and large and had prominent nucleoli. The degree of pleomorphism varied from mild to moderate and quite a number of the cells showed abnormal mitotic activity. The spindle shaped cells arranged themselves into fasicles that showed considerable interlacing. In a few areas the cellularity was reduced due to fibrosis and also seen were a few foci of inflammatory cell infiltration. The surface of one of the fragments was ulcerated and covered by necrotic granulation tissue.

The covering laryngeal mucosa included with three of the fragments had undergone neoplastic change and was unquestionably malignant and showed invasion of the sub-epithelial stroma in the

form of nests of squamous cells. The epithelial lesion was moderately well differentiated and there was an accompanying inflammatory cellular infiltration.

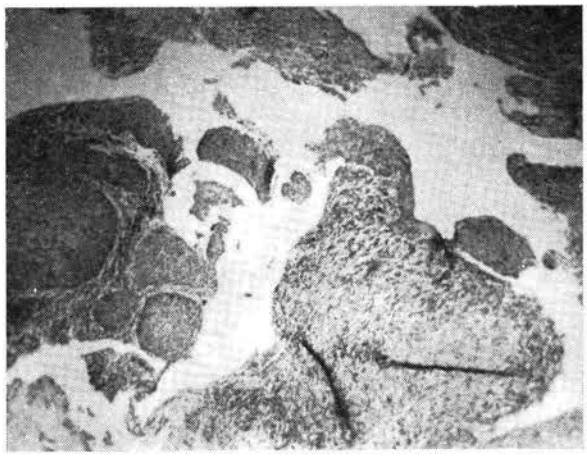

Fig. I – An invasive Squamous Cell Carcinoma across a portion of the surface of the tumour.

The remaining fragmentary bits were composed of blood, inflammatory exudate, granulation tissue, and a fragment of fibrous tissue containing groups of acini from the subepithelial mucus glands of the larynx.

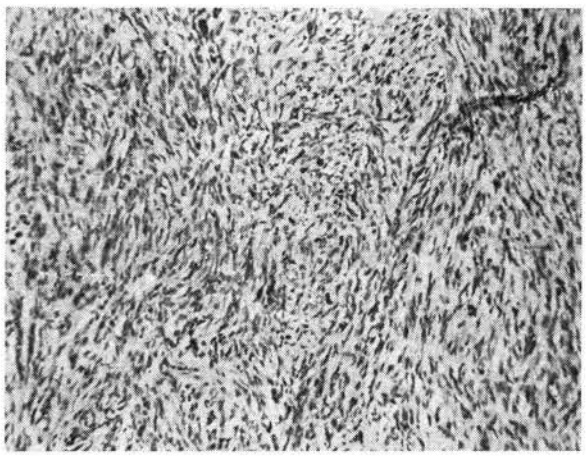

Fig. II – Stroma of biopsy specimen showing a spindle-cell sarcomatous appearance.

Further slides were prepared from the paraffin block and examined using Masson's trichrome, reticulin, and phosphotungstic acid stains. They revealed fibrous connective tissue within the stroma, distinction between the carcinomatous tissue and the surrounding stroma, and no cross-striations respectively, all confirming the impressions gained from sections stained with haematoxylin and eosin.

Apart from this small biopsy, no further pathological material was available so that it is not possible to comment on the subsequent behaviour of this growth.

Comments

Lane, (1957) first proposed the term "pseudosarcoma" to refer to presumably non-neoplastic connective tissue mass with histological appearance suggestive of sarcoma. He reviewed 10 cases of polypoid and fungating growths of the oral, facial, and laryngeal sites and regarded the sarcoma-like stroma as a secondary reactive phenomenon and probably non-neoplastic. The pathological study including the clinical course of these cases suggested that only the carcinomatous portion had truly malignant neoplastic properties.

Other reports of this condition supporting Lane's concept of non-cancerous basis of this bizarre stromal proliferation include those of Appleman and Oberman (1965), Lichtiger *et al.,* (1970) and Goellnier and associates (1973).

Appleman and Oberman described 11 cases of laryngeal neoplasm which microscopically manifested sarcoma-like areas with squamous cell carcinoma. They regarded the stromal component as infiltrative spindle squamous cell carcinoma although in some tumours they considered it as an atypical response to the invasive carcinoma.

Lichtiger *et al.,* (1970) studied 13 cases of spindle cell tumours of the upper respiratory tract, oral cavity and skin of face. Using light and electron microscopy, they reported that no evidence could be found to support the concept of malignant connective tissue component and regarded this group of tumours as spindle cell variants of squamous cell carcinoma.

Goellnier and associates (1973) described their results of 25 patients with pseudosarcoma and associated squamous cell carcinoma. Electron microscopic features of their cases including enzymic histochemistry on one of these suggested that the sarcoma-like stroma was a reactive proliferation of histiocytes and fibroblasts presumably in response to the carcinomatous tissue.

The reason as to why this type of laryngeal carcinoma should develop such a peculiar mesenchymal reaction is not clear but the pathogenesis has been linked with irradiation, traumatic stimulus, repairative process, scarring, and an atypical response to the associated squamous carcinoma.

Because of this unusual histological appearance of these tumours they pose a difficult interpretive problem. Unless the existence of such pseudo-carcinomatous tissue in association with a squamous carcinoma in these anatomical locations is known, they are likely to be misdiagnosed as sarcomas.It is particular so, if the malignant epithelial comment is scanty. Hence a biopsy from this part of the body, with sarcoma-like appearance should be interpreted with caution and careful search be made by further sectioning including additional biopsies in order to find the associated squamous carcinoma.

Significant factors related to its diagnosis are:-

(a) they are usually found in elderly males of the age group similar to that noted in routine carcinoma of the larynx.

(b) the larynx is often the site of this growth in the upper respiratory tract.

(c) most of these growths arise in the vocal cord and enlarge slowly.

(d) the lesion varies from discrete polypoid to diffuse infiltrative type.

(e) microscopically, the growth shows a cellular and pleomorphic stroma which may manifest areas of osteoid and cartilaginous metaplasia.

(f) there is a co-existing squamous cell carcinoma which may be inconspicuous.

(g) rarely does the stroma metastasize with the carcinoma.

With its distinctive clinical and pathological features the prognosis of these neoplasms depends upon the configuration of the growth. The polypoid types, being more amenable to total removal have a favourable clinical course while the infiltrative growths behave similarly to those of poorly differentiated squamous cell carcinoma.

Summary

A case of squamous cell carcinoma of the larynx with a sarcoma-like stroma is reported. Because of its unusual histological appearance it can be erroneously diagnosed as a sarcoma. The significant factors related to its diagnosis are mentioned.

Acknowledgement

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Planning for an airport disaster

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Introduction

AS MOST MAJOR AIRPORTS are located at some distance away from urban hospitals, emergencies occurring at airports can cause considerable difficulties in obtaining timely and adequate attention. Besides coping with major air disaster, the airport itself is a city on its own right with a mixed population, consisting of passengers, relatives visiting passengers and the airport authority staff. This multitude has increased over the years at most international airports and so it will be with the Subang International Airport. Table I shows these figures for some of the major airports, Mohler *et al.* (1971).

Thus from the above aspect alone there should be an adequate medical organisation available at all international airports. Unfortunately, this is not so at all major airports. It is only at some such international airports that highly well-organised services are available for twenty-four hours. These are the Charles de Gaulle and Orley Airports in France, the John F. Kennedy at New York, the Logan at Boston and the Heathrow in the United Kingdom.

The average passenger finds himself or herself in unusual and strange surroundings. The airlines cater only for problems arising in their ticketed passengers, but what of all the other non-passenger problems? Thus, the need for an adequate medical facility. If such a medical facility exists and perhaps clinics with nursing and medical staff for the case of airport personnel, then the ideal situation exists for the case of common daily airport casualties. The usefulness of this nucleus has more far reaching effects in the event a of major airport disaster. For indeed, the staff are on the spot, so to speak, and could form the initial nucleus of medical personnel in the event of a disaster. The first urgent reinforcement in the initiation of the plan to be outlined will be from the fire-brigade staff on duty at the airport.

Airport Disaster Organisation

The main objective of an airport disaster organisation is to enable the most seriously injured passengers to survive, while at the same time it will provide adequate and efficient conditions for all other categories of casualties. It is therefore imperative that the staff working at the site of an accident should have adequate assistance promptly. Casualty sorting and first aid must be top priorities. It is necessary for one hospital to be associated with each major international airport. However, in major disasters it might be necessary to evacuate casualties to more than one hospital. The tendency in the world today, in modern airports, is to have nearby, not merely a medical department catering for the needs of the airport, but an emergency hospital, such as exists near the Charles de Gaulle Airport. These hospitals are situated in relation to motorways as well as the airports. They then serve a dual purpose. The University Hospital, though some distance from the Subang International Airport, is in a similar unique position. The system controlling the management of airport disaster should be under a single central authority.

Features Peculiar To An Aircraft Accident At A Major Airport

1. The possibility that there will be a large and instantanious number of casualties.

Table I

Airport passenger, non-passenger (Spectators, well-wishers and greeters), and on-site employee numbers for the year 1948 and estimated for the year 1973, figures in parentheses are less firm than other figures.

FOR MAJOR AIRPORTS

AIRPORT	1968 Passenger Population	1973 Passenger Population	1968 Nonpassenger Population	1973 Nonpassenger Population	1968 Full Time Employees	1973 Full Time Employees
1. Boston (Logan)	8,000,000	13,000,000	6,000,000	9,000,000	8,000	11,000
2. New York (JFK)	20,000,000	30,000,000	30,000,000	45,000,000	41,000	55,000
3. Pittsburgh (Greater Pittsburgh)	5,500,000	11,000,000	(6,000,000)	12,000,000	3,000	12,900
4. Chicago (O'Here)	30,000,000	(40,000,000)	45,000,000	(55,000,000)	18,000	(20,000)
5. Los Angeles International	21,000,000	56,000,000	1,500,000	1,000,000	26,000	(35,000)
6. San Francisco International	14,000,000	22,500,000	30,000,000	45,000,000	28,000	50,000
7. London (Heathrow)	14,000,000	28,000,000	19,000,000	38,000,000	45,000	60,000
8. Paris Orly	7,000,000	14,000,000	4,000,000	4,000,000	19,000	25,500
9. Rome (Leonardo Da Vinci)	6,000,000	12,000,000	7,000,000	15,000,000	10,800	22,000

2. The fact that these casualties may be suffering not only from major injuries to the body but may also have in addition burns and the consequence of suffocation.
3. This situation is one that would lead to panic by the catastrophic nature of its origin and suddenness.

4. The wreckage will never be in one single place. It would be scattered and probably very much so, depending on the nature of the impact at the time of the crash.

5. To all these difficulties, one will have to consider those arising from adverse weather conditions such as heavy rain and thunderstorms at the time of impact.

Thus it is only a very careful and rational study that would be able to evolve as near foolproof a plan as possible. Deciding how many casualties there would be on the basis of the critical medical aircraft, the 747B is the ideal to base the plan on. On this basis, it is easy to handle problems involving smaller categories of aircraft. Following an air disaster, the casualties are generally divided into three major categories:-

1. The very extremely urgent cases which need immediate resuscitation.

2. The seriously injured passengers who do not require resuscitation.

3. Those fortunate passengers with minor injuries.

There are no definite statistics to indicate the percentages of passengers in each category in the event of air disaster. However, taking into consideration other catastrophies that have occurred throughout the world, such as earthquakes, train derailments, etc., arbitrarily it is advisable to place the surviving passengers as follows:

Category 1 — ten percent
Category 2 — twenty percent
Category 3 — seventy percent

The most important thing to be appreciated is the necessity to treat these categories of patients in an unprepared and difficult situation. Without such realisation, it is impossible to provide an adequate number of staff for medical resuscitation and nursing as is deemed necessary. Hence, without such vital planning, it is not possible to offer the best possible patient care in these most adverse conditions.

The Organisation

In trying to establish an organisation to care for these patients, one has to be realistic and not try to attain the impossibility of perfection. Two policies are available for consideration.

One This policy concentrates on evacuation of the injured as and when they are discovered. It has the advantage that it does not require specialist staff, but only stretcher bearers and ambulances. It also shows an apparent efficiency in that it caters well for the public opinion because the patients are being rapidly carried from the disaster site. This plan is transferring responsibility to others and the organisation is not without disadvantages. Many will die, who otherwise might have been saved by resuscitation. Besides, still others would suffer deterioration in their general condition and even end up by suffering external haemorrhage, suffocation, or both, by the time they arrive at hospital. These problems may have been prevented and tragedy avoided if rapid and efficient management was available at the scene of the disaster. This policy is therefore unacceptable. However, should this policy be accepted, due to one reason or another, it is advisable to distribute the patients to more than one hospital as otherwise one hospital will be ill prepared to cope with such a multitude of patients in a matter of a few minutes.

Two The ideal alternative policy would be when the injured are not evacuated by anyone, anywhere or anyhow. This scheme also has its drawbacks because of the elaborate organisation needed, but it is by far the most efficient. It makes sure that the most seriously injured are given the chance to survive while others are given the maximum moral and material comfort. Thus the following series of action are necessary to ensure the final goal:

1. The casualties have to be collected.

2. There should be adequate sorting out of all the casualties.

3. First aid and evacuation direction should be clear and precise.

4. Evacuation should be adequately organised.

The whole operation should be directed by a single authority. A medical co-ordinator should be the officer in sole charge of the disaster operation. He should be the first to arrive on the scene in the event of an unfortunate incident, to co-ordinate the work. Continuous efforts are needed to improve existing facilities or those that are likely to be organised.

The number of casualties to be catered for in the event of an air disaster will naturally depend on the type of aircraft involved. Today, in most international airports, the Boeing 747B is considered the standard critical aircraft. A crash of such an aircraft would cause the greatest number of problems.

Collection and Sorting

This takes place in two stages. The first people to move on to the scene of accident will be the firemen who will extinguish any fires and open up a passage through which the passengers could be cleared from the wreckage in less than three minutes, if possible. Ancilliary medical staff on the spot should not approach the wreckage until the fire is extinguished and when this is done, the whole wreckage area is cordoned off as a casualty clearing area and the casualties assembled here. The first medical staff for this purpose will be those of the airport authority. Figure 1 shows the first phase of the operation.

During the initial phase, the important step of sorting takes place in two stages. The initial stage is characterised by the following:

1. It takes place at the casualty collecting area.
2. It is rapid and it is carried out by non-medical staff.
3. It is functional and not lesional, for one endeavours to answer basic questions such as "Is there haemorrhage, suffocation or shock, or all?" Thus it follows that after sorting out, first aid is immediately assured for those casualties who need to overcome haemorrhage and suffocation.
4. Labelling of casualties is done at this stage of the operation, using red, yellow and green labels. A red label indicates extremely urgent patients who should not be moved without proper resuscitation before transport. A yellow label indicates the seriously injured patients who could be directly evacuated without risk and without resuscitation. A green label indicates the minor injuries who could wait until the more serious casualties have been attended to.

The second stage of the operation starts when staff and equipment reinforcements arrive on the scene. These reinforcements consisting of medical and nursing staff should come from the nearest hospital working in conjunction with the airport authority. For Subang airport, it will be the University Hospital in the first instance. With the arrival of staff reinforcements, the next step of casualty collection and sorting according to lesions, is carried out.

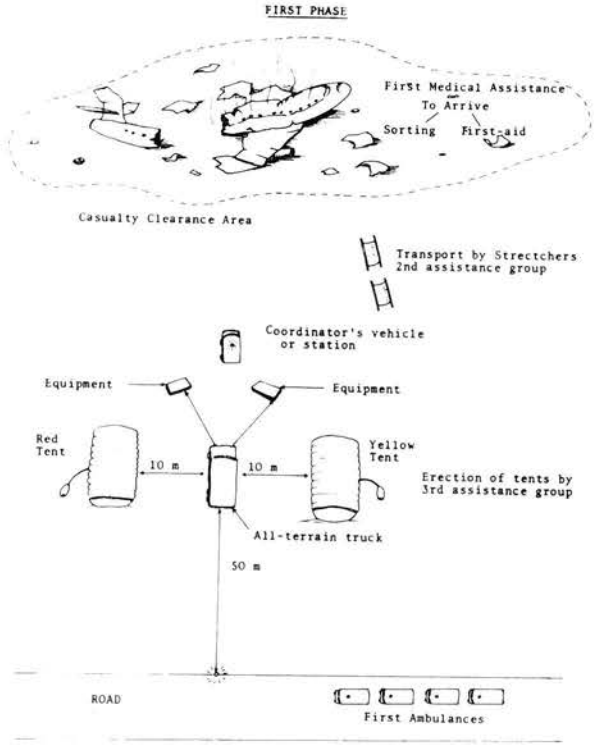

Figure 1 – Sketch of possible arrangement for Phase I of handling an air disaster.

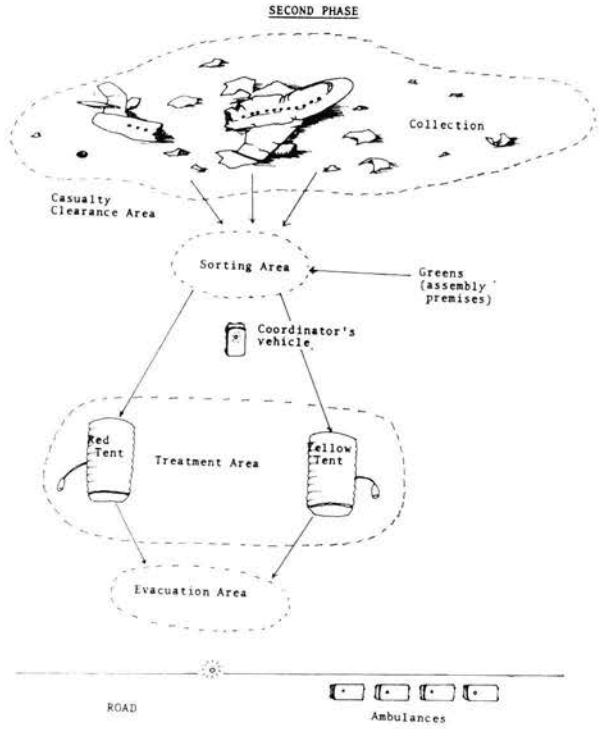

Figure 2 – Sketch of arrangement for Phase II of an airport disaster organisation.

Casualties with Red Cards

1. First aid is the most important for these unfortunate individuals. Haemorrhage has to be stopped by means of haemostatic cushions, pressure dressings, etc. Cases in shock have to be attended to by clearing the upper respiratory tract and ensuring a proper and unhampered airway. Splinting of injured limbs have also to be attended to.
2. Resuscitation of these patients should be carried out by doctors with proper equipment on the spot. Figure 3 shows a suitable arrangement for the treatment tents.
3. Evacuation of these patients after such resuscitation gets priority over all other categories.

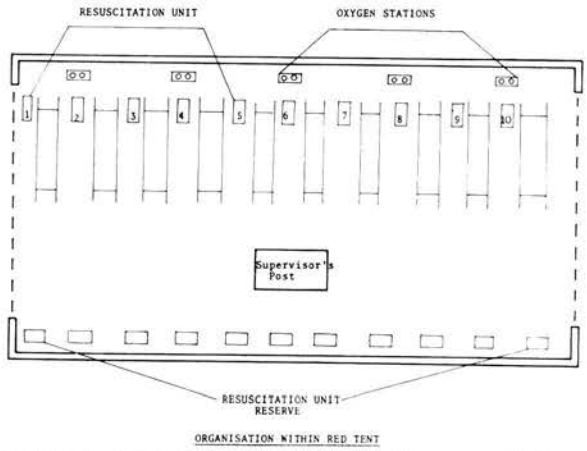

Figure 3 – Shows the general plan for resuscitation in the red tent.

Casualties with Yellow Cards

These can be evacuated in the first ambulances that arrive at the disaster site and thus start an activity that is psychologically important by assuring the public and the casualties that action is on the way for their betterment and restoration to normal. The evacuation and whatever treatment, when permitted, would be determined by the condition of the individuals.

Casualties with Green Cards

These casualties could be collected at a single spot and transported as soon as possible to a suitable area where they could have treatment for their minor injuries. Their evacuation would take effect only after those with red cards and yellow cards have been dealt with. In fact, the management of these third category of casualties could be done at the airport first aid centre. The evacuation of the casualties should be according to a plan to avoid confusion. This should be carried out as outlined below.

Plans for Evacuation

The seriously injured are accompanied by attendants. A complete, updated list of hospitals should be available. In this case, the hospitals will be the University Hospital, the Klang District Hospital and the General Hospital Kuala Lumpur. The means of transportation would be by private ambulances and by air force helicopters.

The disposal of these patients to a single hospital or more than one hospital would naturally depend

Table II.

Figures calculated for various types of aircraft and categories of the injured to be expected when the airport is ready for disasters

Aircraft Types	Capacity	Maximum Number of Possible Injured							
		Over 50% Injured				Over 85% Injured			
		Total	Red	Yellow	Green	Total	Red	Yellow	Green
Stretched DC-9-40) TRIDENT)	115	57	6	12	39	97	9	18	68
BOEING 737	125	62	6	12	44	105	10	20	76
BOEING 727 - 200) Stretched B-707-320)	189	94	9	18	67	160	16	32	112
Stretched DC-8	259	129	13	26	90	220	22	44	154
DC-10	270	135	13	26	96	229	23	46	160
AIRBUS) BOEING 747)	316	158	16	32	110	268	27	54	187
BOEING 747 C	490	245	24	48	173	416	42	84	290

on the number of seriously injured patients. It is always advisable to have more than one hospital alerted for this purpose. In this context, the University Hospital will have to bear the main brunt of the casualties, but the General Hospital at Kuala Lumpur and the District Hospital at Klang have to be alerted as well, to receive the overflow from the University Hospital. In fact, after a certain number of patients have been sent to the University Hospital, some may well be directed to the other two hospitals to ensure that prompt treatment be available to all casualties. Overcrowding all casualties in one hospital would delay the treatment of those who arrive later in the hospital. The control of numbers and direction of their destination will be the responsibility of the medical co-ordinator who will be in charge of the entire organisation. He should be readily available throughout the period of alert. Figure 4 shows the general scheme of the organisation. Complimentary action will be needed in addition to the above.

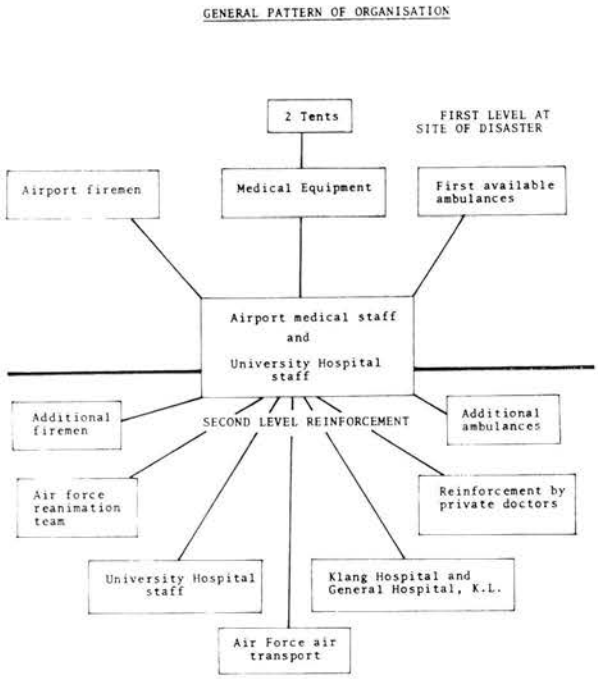

Figure 4 – Shows a summary of the general pattern of organisation in the event of an airport disaster.

The uninjured passengers should be taken to the terminal building of the airport and comforted and cared for until adequate disposal could be arranged. They may be in some degree of shock. The dead would have to be collected at this area of the airport where they could be identified and later transported by relatives.

In order to ensure efficiency of this system, unexpected and unscheduled exercises involving partial operations and full operations once or twice a year should be held. It is important to see that the soundness of the instructions is appreciated by all staff involved in the running of the emergency organisation. Frequent contact with outside bodies and doctors working outside in such practices would arouse their interest and make their services available in the time of a national crises.

The Operational Procedure in this Organisation

The alert should be triggered off by the tower and there should be direct communication from the tower to the main hospital, namely the University Hospital, that an accident is impending. On receipt of the alert, the emergency programme of the Accident and Emergency Department should be put on standby, ready to move in ambulances with staff to the scene of disaster, should it occur.

At the University Hospital, there should be a large map of the entire airport showing access roads to its various aspects. Should the disaster take place, the tower should give an indication as to the exact location of the wreckage in relation to the map, which ideally should be marked off in squares, so that location of the rendezvous point commonly known in most international airports as the "X.' point, could be selected. It may be a good procedure to have pre-selected "X" points for different areas in the map of the airport and its surroundings. One has to remember that crashes of aircraft taking off or coming into Subang are not going to happen on the runway but in the vicinity of the airport itself.

The number of staff for coping with the disaster would naturally depend on the number of casualties. With a small number of casualties – ten or slightly more – the number of staff would be limited. The staff can be divided into four categories:

1. The permanent local staff, namely the airport staff who are on the spot.

2. The medical co-ordinator who will be needed irrespective of the number of casualties. Also included in this phase are the vehicles that come under his authority and radio networks, special phone linkage, loudspeaker system, blinking lights, etc.

3. The regional staff that would have to reinforce local staff would be staff of the University Hospital, whose numbers could be increased

according to the number of casualties. The staff would have to include not only medical personnel but assistants in the form of attendants, stretcher bearers, ambulances and ambulance drivers.

4. Airforce personnel would be needed to stand by for helicopter transportation as and when indicated. In addition to this non-permanent local and regional staff, staff from neighbouring hospitals could also be called in, in the event of a major air disaster. These, of course, will all have to be pre-arranged and be in the telephone communication with the main medical co-ordinator who would summon for additional assistance as needed.

The Equipment Needed

Equipment needed for a disaster should include first aid medical kits, resuscitation equipment, perfusion sets, surgical equipment, inflatable splints, dressing material, special mattresses for fracture patients, stretchers, labels for the three categories of patients and evacuation cards. All this equipment is carried in the co-ordinator's truck and general stores stocked in the Emergency Medical Unit at the airport itself. To this medical equipment should be added ambulances, radio networks and operational equipment.

The local premises, for handling of the casualty should consist of two inflatable tents with proper lighting – the red one being used for resuscitation of the seriously injured patients, and th yellow one for major casualties. These inflatable tents used in European airports can generally be inflated in under two minutes.

The building in the airport itself which deals with the third category of minor casualties, should be divided into a sorting room, a room for minor surgery, and rooms to take the stretchers.

Details of Resuscitation Procedures

The resuscitation procedure itself can be divided into phases:

Phase 1 In the first phase, mainly first aid is given in the casualty collecting area. The co-ordinator should divide his staff into three groups:

1. the first aid staff proper for sorting, first aid, and attaching colour labels.

2. stretcher bearers for evacuating the injured from the casualty area for further treatment.

3. the tent erectors.

Casualties are evacuated immediately. The red casualties are carried to the tent. The green casualties are left to themselves for the time being. The tents are erected at the locations marked by blinking lights of the same colour by the co-ordinator.

Phase 2

By this time reinforcement should arrive at the scene to help the staff that are already on the spot and the collecting tents should be operational. The sorting out of the injured in the casualty area is by now complete and the final sorting out area is set up in front of the tent. This sorting is lesional. The red and yellow casualties should by now be in the tents of their corresponding colours while the green casualties have assembled in the premises where they could be attended to after the serious ones have been dealt with. In the evacuation area, the casualties for transport are assembled and evacuation cards are attached to them.

Phase 3

This phase depends on the circumstances available. In fact it implies an extension of the second phase, and the availability of a sufficient number of doctors and resuscitation staff on the spot; and that a real field hospital is in operation with perfectly established communication and secretarial help.

A factor of importance to be appreciated is that in this age of het transport, modern construction with reinforced structures, less inflammable material, and wide bodies, provide more possibility of absorption of crash forces with the likely increase in the number of survivors.

Discussion

In this modern era of increased air travel involving millions of passengers, adequate measures should exist for the handling of any unforseen occurrence such as a plane crash. Even though the number of air disasters are minimal compared to the many million passengers carried by aircraft each year, nevertheless it is obligatory for each international airport to be organised for such an eventuality. To be unprepared is unwise and will cost many loss of lives, some of whom might have been saved. An air disaster is an unexpected and unforseen occurrence, thrust on a community with the swiftness of a flash of lightning, that it will take the authorities quite unawares. In one fell swoop, the entire locality is transformed into a battlefield on a wartime footing, for such is the dramatic nature of these unfortunate incidents. It is the very nature of their suddenness that calls for extreme thoroughness in the planning and preparation for such an eventuality.

The broad details of a suitable organisation for this has been described, dividing the handling of the situation into three phases. The importance of each has been stressed as an essential for efficiency. In addition to the main phases for the care of the casualties, the ancilliary requirements also have been highlighted, to ensure an efficient working of the organisation. It would seem that the most essential criteria for efficiency would firstly to be adequately prepared, and secondly, to have smooth co-operation and co-ordination of the departments and personnel involved. The work has to be carried out with wartime efficiency for many a human life is at stake.

Summary

The increase in the numbers of passengers and commercial aircraft using an international airport will create major problems in the handling of accidents at airports and in their immediate vicinity. For this purpose, this paper has outlined a scheme for daily emergencies at international airports. This organisation would be the nucleus of medical activity in the event of a major air disaster. The organisation for such a catastrophe and the back-up organisation needs have been outlined as well as the organisation needed for the case of casualties.

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Rehabilitation – its role in psychiatry

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Introduction:

REHABILITATION is defined as "restore to rights, privileges, reputation or proper condition". In medicine, Hinsie *et al.* (1970) defined "the use of all medical rehabilitation as forms of physical medicine in conjunction with psychosocial adjustment and vocational retraining in an attempt to achieve maximal function and adjustment and to prepare the patient for the fullest possible life compatible with his abilities and disabilities". Essentially, rehabilitation aims at making a person function to his fullest extent following medical treatment taking cognisance of the fact of the person's abilities and disabilities. The use of rehabilitation in medicine let alone psychiatry, has only in recent times gained in importance. The preoccupation with curative and life saving medicine has been even more emphasized in the poorer developing countries where rehabilitation has taken a back seat and its formal practice regarded as a luxury that only a few large hospitals can afford on a shoe-string budget. However, with increasing success in the life saving arts of medicine and surgery, the emphasis has started to fall on the quality of medical care and the quality of after care that is so vital in the residual disabilities that persists in many patients who have been "cured". The patient who has had acute treatment may not be ill or at least seriously ill any longer but then he is not well in the actual sense either. He is therefore in a border-land that the busy hospital doctor tends to ignore and the patient tends to complain more and more about. This is the area that often requires specific attention by way of rehabilitation – the science of readjustment of the recovered or recovering person to a fuller life within the limits of his disability and ability.

Rehabilitation and Psychiatry

Psychiatry has for too long dealt with its patients by keeping them custody – not so much for the patient's treatment as a source of security for the people outside. This invariably led to institutions with inadequate facilities and overcrowded 'cells'. The quality of 'care' deteriorated to worse than that in prisons in some cases. For prisoners there was usually a limited sentence. For many in psychiatric institutions, with all their evils such a respite was non-existent. With the advent of more modern treatment methods as well as new understanding of behaviour, the need for restraints of a physical nature became more redundant in fact, even long stay in wards became less important. Electroconvulsive therapy (ECT), phenothiazines and antidepressants brought about a revolution in the thought process of the mentally ill but failed in many cases to take care of the residual disability, the readjustment to fuller functioning of the ex-psychiatric patient in society. Thousands of mentally ill no longer heard voices, stripped themselves or were violent (thanks to modern medicine) but neither were they back at their old jobs or lives in their families or society. Rehabilitation where it was sorely needed had hardly been practiced, These patients who were a liability of the institutions were now a liability of the family, the father or society.

Problems in Psychiatric Rehabilitation
Emotional Handicaps:

In medical or surgical rehabilitation, the main problems are physical, followed by psychological

and social. An orthopaedic patient who has had an amputation can hardly be successfully rehabilitated without a prosthesis of some sort. Then must come the will to accept and try the new way of life which then has to be accepted by those around him and then by society or an employer. In psychiatric rehabilitation, the physical component is superceded by a psychological one. The ex-mental patient is physically normal most often but has little drive and less motivation to do work or change. There is inertia and apathy; there is a gross lack of imagination and plenty of denial. The psychological illness has left him an emotional wreck. He expresses little feeling and less interest in anything. He may not be violent any longer but neither is he able to participate in simple tasks like going shopping or helping with housework.

Social Problems

To add to the psychological doldrums that he is in there are social handicaps. Even his own family may regard him with fear and suspicion. They have seen him 'mad' and will not take a risk in having normal attitudes to him. They treat him with caution and he reacts to this. He becomes isolated. He is seldom spoken to and he seldom talks. When he does, they talk down to him as he were a baby.

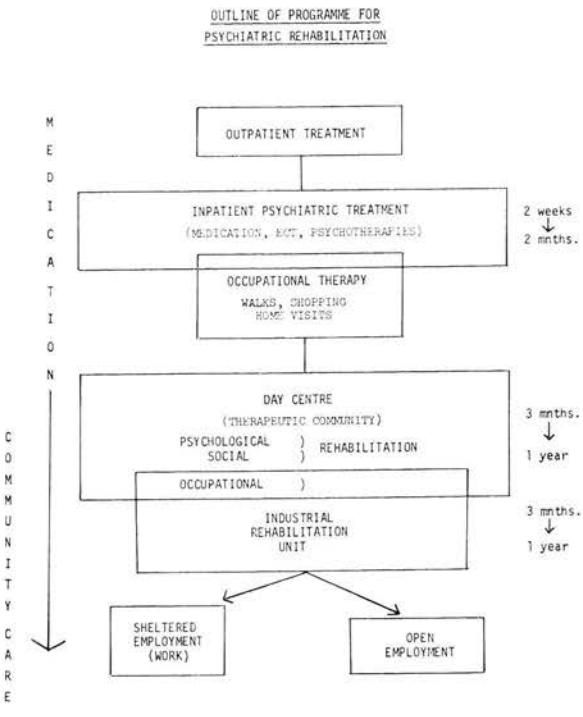

Fig. 1

Problems of Occupation

His loss of confidence, social alienation and general apathy does not help him in obtaining employing. His attitude and even his looks single him out as an 'odd' person and his chances of employment dwindle. Disappointment at job interviews have a snowballing effect on his confidence, his apathy and his social isolation. He becomes more of a recluse.

Here then, is a man who the psychiatrist says is no longer psychotic, he is not violent, he does not talk nonsense and is not hearing voices – and he is also useless in society.

A Programme of Psychiatric Rehabilitation

Any comprehensive programme of rehabilitation in psychiatry must include the three areas of deficits (psychological, social and occupational) to be effective. The programme must be tailored to fit the individual and his pace or progress of recovery.

Inpatient rehabilitation

Rehabilitation starts with diagnosis of the patient's illness, His treatment must keep in view rehabilitation needed to return him to society.

Occupational therapy should be started as soon as he is able to benefit by it and social contacts and responsibilities encouraged as early as possible. Isolation from society and dependency on hospitals easily develop with most psychotic illnesses and should be combatted by early social ambulation. Supportive group psychotherapy meetings and ward meetings are useful even in later stages of inpatient care. This part of the programme may last from two weeks to two months.

Day Centre Management

As the patient's illness improves, he may be sent on leave and his attendance at a Day Centre encouraged. Run on therapeutic community principles first postulated by Jones (1968), a Day Centre encourages patients to take more responsibility for themselves. Group psychotherapy here is more insight-orientated and occupational therapy lays more emphasis on such areas as relaxation techniques and psychodrama. Social interaction is encouraged. Behaviour problems as well as common psychological defences among members are discussed openly in the community and solutions sought out. The Day Centre in a developing country has an additional task of encouraging occupation-orientated programmes for its members through occupational therapy and sheltered workshops. Programmes here include a wide range of activities such as cooking,

group meetings, shopping and singing. Day Centre attendance is from about three months to nine months.

Industrial Units and Sheltered Workshops

Work is an essential social responsibility and an ex-psychiatric patient is seen to be still not well if he fails in the eyes of his family and society to be incapable of useful work. Patients who graduate from Day Centres successfully are then sent to sheltered workshops where needed. Here the role of the trained staff of the Industrial Rehabilitation Unit (IRU) led by the industrial rehabilitation officer (IRO) is to retrain and train the members for suitable occupations. Patients are assessed for the motor and other skills and judged on such skills as concentration, initiative and punctuality.

When they achieve satisfactory standards at the IRU, the IRO arranges for placement in suitable industry. Employment in industry may now be obtained for these patients either in sheltered employment or in open industry. The aim should however, be to seek open employment for them as far as possible; length of workshop experience varies with the individual but is usually from three months to a year. The sheltered workshop (Bellak, 1964) is like a small business and thus trains patients in all the responsibilities such as production for and satisfaction of the customer.

Medication and Community Care

The use of psychiatric medication throughout the rehabilitation programme is essential though the dosage may be reduced in individual cases as the rehabilitation programme takes effect and the patient gradually shows improvement.

Follow-up

Tertiary prevention in psychiatry or the prevention of relapses and reduction of morbidity of chronic patients demand community based treatment agencies and follow-up clinics in convenient areas in the community. Community nurses and mobile clinics can keep in touch with recidivist patients to continue medication and detect relapses early for appropriate management.

Ex-members cluns and social clubs

Many psychiatric patients who have attended rehabilitation programmes find the experience useful and tend to return to the centres to renew old ties or for advice when they have problems. Ex-members clubs channelise these needs on a regular basis and far from promoting dependency act as a community agency of help for those who need it. Ex-members clubs are informal meetings over refreshments held monthly usually with staff and ex-members to exchange views in an instructive way.

Summary

The three aspects of psychiatric rehabilitation i.e. psychological, social and occupational rehabilitation are interrelated in their common aim. The recovering mentally ill patient is hardly a patient who is well and rehabilitation forms an integral part of management in psychiatry. A wide variety of therapies are available for patients who need psychiatric rehabilitation.

Conclusion:

The age when psychiatric treatment constituted of locking the mentally ill in cells is hopefully past. The present emphasis on short stay general hospital management of acutely disturbed behaviour in mentally ill patients is deficient in its long term care of patients. What is needed is a comprehensive short-term hospitalization and longer term rehabilitation for psychiatric patients in therapeutic communities that aim at discharge of the mentally ill fit to take their rightful place as responsible people in society.

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Advances in the surgical treatment of peptic ulcer

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THE SURGICAL TREATMENT of peptic ulcer remains controversial. An attempt is made here to review briefly current literature on operative procedures for duodenal and gastric ulcer treated electively as well as for haemorrhage, perforation and gastric outlet obstruction.

Elective operations for duodenal ulcer

Much of the vast literature on the treatment of duodenal ulcer lacks scientific merit and valid comparison of operations are available only from controlled prospective randomised trials. These have been performed in recent years on vagotomy-drainage, subtotal gastrectomy and vagotomy-antrectomy by Goligher *et al.* (1968), Cox (1968), Jordan & Condon (1970), Irani *et al.* (1971), Postlethwait (1973), Howard *et al.* (1973) and Sawyers & Scott (1973) and the following conclusions are pertinent:-

1. Overall results of various operations were marginally different and slightly favoured vagotomy-antrectomy.
2. Operative mortality was similar for vagotomy-drainage (0.5%) and gastric resection with or without vagotomy (0.81%).
3. The 2 years recurrence rate was highest for vagotomy-drainage (9.6%) and lowest for vagotomy-antrectomy (2.1%).
4. Diarrhoea was more common after truncal vagotomy while severe diarrhoea was exclusive to truncal vagotomy.
5. Weight loss was slightly more frequent after gastric resections but other nutritional and metabolic problems were little different.
6. 5–10% of patients were dissatisfied after any of these operations.

These trials must however be interpreted in context as each study contained an "escape clause" which permitted a surgeon to exclude patients from randomisation because of age, general condition or operative findings, and the low operative mortality rate of under 1% probably reflected exercise of this surgical judgement. Nevertheless it might be concluded that vagotomy-antrectomy is the best ulcer curative operation and can be safely performed if patients in poor condition or badly inflamed duodenum are excluded. The long term side effects of the various operations are about the same. As approximately 10% of patients are dissatisfied with any of these three procedures the search for the ideal operation goes on.

Proximal Gastric Vagotomy

Proximal gastric vagotomy (parietal cell vagotomy, highly selective vagotomy) without drainage was first performed in patients by Johnston & Wilkinson and Amdrup & Jensen and reported in 1970. This operation preserves the pylorus so that rapid gastric emptying and duodenogastric reflux are prevented resulting in virtual elimination of dumping and diarrhoea, (Johnston, 1972; Humphrey *et al.,* 1972; Jordan, 1976). A second advantage of proximal gastric vagotomy is the very low operative mortality – 0.26% in 4557 patients (Johnston, 1975).

There is however uncertainty as to the frequency of recurrent ulceration. Whilst low recurrence rate of 0–5% have been reported (Goligher, 1974; Amdrup *et al.,* 1974; Johnston, 1975), others have experienced high recurrence rates of 8–22% (Wastell, 1972; Madsen & Krouburg, 1973; Moberg and Hedenstedt, 1973; Liedberg & Oscarson, 1973). It would appear that not all surgeons who have attempted proximal gastric vagotomy have perfected the technique. Recent findings have suggested that differences in operative technique might be significant in that a more extensive skeletonization of the oesophagus reduces the incidence of incomplete vagotomy (Hallenbeck *et al.,* 1976). Nevertheless the true recurrence rate can only be established after a prolonged follow-up. It is thus left to be seen, perhaps in 5 years, whether proximal gastric vagotomy would live up to expectations as the operation of choice for duodenal ulcer.

Elective operations for gastric ulcer

Surgery for gastric ulcer is usually necessary because of unsatisfactory medical treatment as well as a 3–7% incidence of malignancy.

Partial gastrectomy (50% gastric resection with Billroth I anastomosis) remains the standard procedure with an acceptable operative mortality of 0—2.9% and a low recurrence rate of 0–4.4% (Harvey, 1961; Stemmer *et al.,* 1968). A recent study on pylorus-preserving gastrectomy showed a decreased incidence of dumping and ulcer recurrence (Sekine *et al.,* 1975) and it would seen that this operation merits a controlled trial.

The prepyloric ulcer is associated with high acid secretion and it is now known that recurrence rate can be reduced significantly if vagotomy is performed in addition to hemigastrectomy in this special group of gastric ulcer patients (Davies *et al.,* 1977).

Vagotomy-drainage in the elective treatment of gastric ulcer has its advocates but is associated with a high recurrence rate, 14.3% – 35.7% (Kraft *et al.,* 1971; Duthie, 1970). Its use would thus be best limited to patients in poor general condition with a high lesser curve ulcer in whom near total/total gastrectomy would be hazardous.

Preliminary attempts with proximal gastric vagotomy for gastric ulcer have been reported to be encouraging (Johnston, 1973; Hedenstedt, 1973).

Surgical treatment of complications of peptic ulcer

(a) *Bleeding Peptic Ulcer*

Routine emergency gastric resection for bleeding duodenal ulcer has a high operative mortality, 13% – 30% (Palumbo and Sharpe, 1961; Foster *et al.,* 1965; Cocks *et al.,* 1972). Proponents of vagotomy-drainage have in most series demonstrated a decrease in mortality without significant increase in rebleeding. (Dorton *et al.,* 1961; Schiller *et al.,* 1970; Hegarty *et al.,* 1973). The results of controlled randomised studies are however not available, but our own experience suggest that resection with or without vagotomy is safe in fit patients and would in fact be preferable in view of a lower ulcer recurrence rate (Ti, 1976).

The standard operation for bleeding gastric ulcer continues to be gastric resection though good immediate results were obtained when small ulcers with a diameter of 2 cm or less were treated by vagotomy-drainage and suture ligation (Hegarty *et al.,* 1973).

Proximal gastric vagotomy is also on trial in the treatment of bleeding peptic ulcer (Johnston *et al.,* 1973).

(b) *Perforated Peptic Ulcer*

As the majority of patients suffer ulcer recurrence after simple suture of perforated peptic ulcer, emergency definitive ulcer curative procedures have been performed with increasing frequency on good risk patients. These definitive procedures have included proximal gastric vagotomy in recent years (Johnston, 1973; Jordan & Korompai, 1973).

(c) *Stenotic Duodenal Ulcer*

Proximal gastric vagotomy is also on trial in the treatment of the stenotic duodenal ulcer. Johnston (1973) dilated the stenosed duodenal segment but frequently encountered perforation. To overcome this difficulty Kennedy (1976) devised a technique of duodenoplasty which he has used successfully with proximal gastric vagotomy for the stenotic duodenal ulcer.

Conclusion

A concluding remark on proximal gastric vagotomy might be relevant. As the present time proximal gastric vagotomy should still somewhat be considered an experimental project and its use should be confined to University centres and those engaged in prospective randomised studies.

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COMMUNICATIONS

Surgical specialism in Malaysia

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I would like to consider some problems to do with surgical specialism in Malaysia with which I have grappled during the past year while helping to consolidate the cardiothoracic surgical unit in the University Hospital.

Malaysia is a rapidly evolving western type society. It has a national health service directed from Kuala Lumpur which is the capital and nerve centre of a country of approximately thirteen million people and with a yearly population growth of 3%.

Historical Background

In 1962 it was predicted that the children of Malaysia would grow up in an environment different from that of their parents and that their pattern of life would change accordingly. This has happened. In 1963 a 5 year university medical training scheme with a compulsory year in a teaching hospital on graduation was adopted. The scientific course was integrated with clinical application in the University Hospital which was physically joined with the medical school. The arrangement functioned with such a precision that the hospital, complete with polyclinic and accident service, was opened in 1967 just in time for the first clinical students. This class graduated in 1969 and since then, nine-hundred and twenty-four doctors have graduated. The first priority of the medical school and hospital training scheme was rightly given to the training of doctors, but the national need for post-graduate training was clearly accepted. Soon afterwards the new General Hospital of 3000 beds was built and now acts as the clinical school for the recently established medical school of the National University Kebangsaan.

The government acknowledges a shortage of medical manpower. Much medical preventive care and social medicine, especially in rural health areas, is done by non-medically qualified personnel. Approximately 120 doctors qualify yearly from the University of Malaya, and serve as House Officers for a year and are assigned to government hospitals for two years, while approximately 70 graduates return from training overseas. Many are now involved in the direction of the Medical Services and teaching at the University and General Hospitals.

Within the University Hospital and the General Hospital, post-graduate training is a busy apprenticeship system in which trainees fit in lectures and study as best they can in their spare time. In peripheral hospitals, the clinical load is often greater, and many trainees have few facilities or incentives for post-graduate study. It is hard for surgical trainees to match-up to the rigorous standards required by the Royal Colleges of Surgeons, especially for the Primary Examination.

Since the beginning of Malaysia's university orientated Medical School, emphasis has been placed on general medicine and surgery, for these satisfied the needs of under-graduate training. Training posts were set aside for clinicians – physicians, surgeons, anaesthetists, radiologists, medical scientists and technical staff, but in many cases these are inadequate to satisfy the present needs of the national health service.

In recent times there has been a depletion of senior surgical staff from the teaching hospitals and from the government hospital service. Some doctors

have migrated; others faced with financial restraints of an inflating situation and a doubtful career structure, have left the staff to pursue their specialities in unrestricted private practice. Although it is possible that private practice should be encouraged, for the costs of all medical care are born privately, complete services of the highest quality must be maintained in the teaching and general hospitals. Inspite of an increasing national need for general surgeons and for specialist surgeons to care for the growing population, whose requirements and standards are those of university level, there is a great shortage of surgical recruits.

Until recently, post-graduate medical training has been acquired in centres of learning overseas, mainly in Britain, the United States and Australia. Now this is becoming increasingly difficult and the Malaysian health service faces the dilemma of establishing sufficient post-graduate training centres in general hospitals – perhaps in some cases by upgrading metropolitan hospitals as well for this purpose – and the priorities it should give to establishing sub-specialties within teaching departments.

The necessity for providing sufficient trainee posts to satisfy the needs of a mushrooming population, both in the cities and in the rural areas, warrants a review of post-graduate training. It is only by wise planning of complementary specialist and hospital requirements in accordance with anticipated needs, similar to that which was successful in creating schools and institutions for undergraduate education, that anticipated post-graduate needs will be met.

While priority should be given to training general physicians, surgeons, anaesthetists, radiologists, and medical scientists, yet national training centres should be supported for sub-specialties; for example centres of radiotherapy, neurosurgery and urology have all been established in the General Hospital in Kuala Lumpur and cardiothoracic and vascular surgery at the University Hospital. At present, due to manpower shortage and lack of recruits, these are supplying clinical service needs, but are not training specialists to satisfy the present and future national needs.

In order to highlight some dilemmas confronting administration of the national health service, I would like to pose three questions namely:

1. **Is it necessary to provide special facilities and trainee posts above those already funded‡**

   The answer is in the affirmative; but first it will be necessary to assess the number of surgeons and anaesthetists adequate to the needs of general and special surgery in the foreseeable future and to define the basic facilities and organisation necessary for training young surgeons (registrars).

With the growth of surgical specialties and the number of patients requiring surgery, the need everywhere is for skilled and versatile surgeons to staff existing and new hospitals. These needs are expanding with a real population explosion.

Professional freedom and advancement within the limitations imposed by society, is a surgical heritage. It is only by providing professional incentives and a career structure, that the most active and able medical graduates will be attracted to undergo arduous post-graduate training and to assume the life-work of a busy surgeon.

As the caseload and staffing within general hospitals increases, surgeons naturally divide up work according to special interests and training, and refer the patients they cannot handle to a teaching hospital. Surgical training must cover a broad field, and all general surgery that can be done in a general unit should be done there.

In order to train a surgeon beyond basic skills and to develop a clinical service of an international standard, it is necessary to establish sub-departments of surgery in special areas, to which surgeons in training can be rotated for a period. When well-equipped units, staffed by surgeons of repute, have been established, trainee surgeons will be exposed to modern techniques and handling of particular surgical problems, and in time and from among these, more specialists will be recruited and trained. Only in this way can the brain-drain of graduates flowing overseas in search of special skills be stopped. The best of these may never return, or on returning, may leave again when they perceive that there are neither facilities nor the opportunity to continue their interests and professional work.

On the other hand, when the best graduates are recruited and trained locally, and are assured of professional independence and a career of their choice, they will naturally contribute their skill to help their own society; they are likely to be satisfied and aspire to develop local work; they will bring back special skills and techniques learned overseas during periods of secondment or sabbatical leave spent in special centres of learning, and in the course of time they will build national schools of surgery.

In order to attract trainees of the highest calibre and motivation into exacting specialties, it will be necessary to provide a more generous career structure, including opportunities for attending scientific meetings abroad and periods of sabbatical study leave. This is nowhere more apparent than in cardio-thoracic and vascular surgery – a service known to be expensive in staff, facilities and equipment and in consequence only to be developed as a nucleus in special centres – which has been consolidated as a service within the University Hospital. The key staff is but a skeleton comprising at present of one cardiothoracic surgeon and a trainee, one anaesthetist familiar with open heart procedures who has other important committments, and usually one part-time assistant. This is not a sufficient nucleus to build an important national service and training centre. Eventually the unit will need to operate every day and will have to be staffed accordingly.

A similar state of chronic understaffing and lack of provision for specialist trainees in national centres exists in the Institutes of Neurosurgery, Urology and Radiotherapy at the General Hospital.

In order for each to fulfil the role of referral and teaching centre, these units need to be granted independent management with adequate staffing of surgeons, anaesthetists, trainees operating personnel, beds, and they take part in teaching programmes.

In general surgery there is need for more trainee posts and for many more consultant anaesthetists and trainee posts, just as there is in the surgical specialties.

2. **Does specialism become sterile and fail to contribute to the training of surgeons?**

Unless certain guidelines are adhered to, this is likely.

A specialist fails in his duty and become sterile in a young society, when, becoming preoccupied by his own interests and his own patients and concentrating his time and energy on technical matters, he neglects to teach others and loses the flexibility necessary to adapt himself to the needs of his colleagues. He loses sight of a basic function, which is to train other surgeons and other members of his team to a way of thought and in special skills. In all societies and in order to remain alive and supported by young life, it is necessary to observe the teaching hospital tradition whereby the senior staff teaches the junior at all levels. Unless a specialty accepts its part in maintaining the whole body of general surgery and its member assist in cross-fertilisation of ideas inseparable from this integration, it will become sterile. In order to avoid this happening, it is wise to choose as teachers and surgical leaders, men of broad vision and scholarship – men of generous disposition, excelling in their craft. Such men understand the issues of marrying training to clinical service.

There are other reasons for failure, namely empire-building, personality clashes and racial discrimination.

If a specialty seeks empire over an anatomical region and does not return to the general field those areas that can be competently dealt with by general surgeons when they are trained to take them over, it loses their support. This department will become cluttered up and unable to break new ground. It will be unable to fulfil the real objects for which it was established. The real philosophy of our pyramidal elitist system, is teaching and delegation of all work to those trained to do it, leaving a specialist free to devote his energy to the work that no one else can do. Personal dislikes and animosities and jealousies between inter-departmental heads, are reefs on which many good ships founder. Lack of harmony and unity of purpose block development.

3. **How can surgical training be organised to the mutual advantage of Malaysia and the Western Democracies?**

(a) By integration of training programmes with specific universities and rotation of trainees.

This would breathe vitality into departments by cross-fertilisation of ideas and the impact of cultures. Trainee surgeons would mature, make friends and gain experience by a six-month exchange period arranged in a rotation scheme towards the end of their training. When this is not possible, and many difficulties are foreseen, trainee positions could be applied for, the application being supported by the department to which he will return on completion of training.

(b) *Senior Personnel*

There is a good place for roving-ambassadors who bring interest and goodwill. The temporary appointment of specific surgeons to the staff to work in a field or department with

the object of helping to galvanize special organisations or introduce new techniques, is of great value.

(c) *Sabbatical Leave*

Staff positions reserved for men to work in specific fields on sabbatical leave would be of mutual benefit to departments.

(d) *Arrangement of post-graduate training programmes with the help of the Royal Colleges of Surgeons:*

This could best be incorporated under the wing of the Malaysian College of Surgeons.

Teaching Unit Structure

Each unit service should be organised as a team following the easily managed traditional pattern and consisting of surgeon, senior surgical registrar, (his trained deputy who is rounding off clinical experience in the unit and occupying a semi-permanent position until appointed clinical specialist or consultant), a surgical registrar, preferably with primary F.R.C.S. when he is trainee specialist, and two rotating senior house officers undergoing general surgical training. Surgical training should be tenable for the period of training only. All training posts should be used for the purpose defined and not employed for routine service postings. Each unit should have its regular anaesthetic service.

Conclusion:

The opinion is expressed that an assessment of the numbers and categories of surgeons required by the University Teaching and Government Hospitals in the foreseeable future needs to be made, and the basic facilities for training hospitals defined. This might best be done in conjunction with the Malaysian College of Surgeons. In this way post-graduate surgical training could be wisely planned for the national service.

It is concluded that each surgical training centre allocated trainee posts, should be adequately equipped and its staff orientated towards the training of general surgeons. Sub-specialist centres for research and training should be incorporated in teaching hospitals where they are able to share facilities and take part in teaching.

In order to attract recruits of the highest calibre and motivation to fulltime staff posts, it will be necessary to plan a generous career structure and conditions of service for them.

By expansion of training centres, establishment of sufficient training posts and attention to career structure, it is anticipated that Malaysia would soon become self-sufficient in surgery. If this policy were adopted and administered by a board of post-graduate medical studies broadly representing the University, the government and the public, and all promotion based on merit and accomplishment, a national school of surgery would soon be created.

COMMUNICATIONS

A re-survey of potential vectors of dengue fever/dengue haemorrhagic fever in Sabah

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THE DATE OF arrival of *Aedes aegypti* (Linnaeus, 1758) in Sabah is unknown, although it may have been present in Malaya about 1890 (Macdonald, 1963). The earliest reliable records date back from 1920 when Stanton (1920) reported its presence in Jesselton (now Kota Kinabalu). A survey made by Ramalingam (1970) reported the presence of *Ae. aegypti* only in Semporna on the east coast. In a first extensive survey that included 39 towns and villages, Macdonald and Rajapaksa (1972) found 15 to be positive for *Ae. aegypti.* It was the first time that such an extensive survey had been made in Sabah. The distribution of this species was also found to be discontinuous and although there was no plausible explanation for this, it was concluded "with reasonable confidence that, in the absence of control measures, this mosquito will become more widespread in Sabah" (Macdonald and Rajapaksa, 1972). Since then, no effective measures were taken to control this mosquito, the known vector of dengue fever and dengue haemorrhagic fever in Southeast Asia and the Western Pacific.

No cases of dengue haemorrhagic fever have yet been reported from Sabah although dengue fever occurred in Labuan Island, off the West coast in 1969 (Ramalingam, 1970). In view of the geographic position of Sabah, the proximity of, and regular traffic with the Philippines, Singapore and Peninsular Malaysia, it was felt that the risk of introduction is high. Moreover, there has been increasing evidence to show that *Ae. aegypti* is replacing *Ae. albopictus* at least in some parts of Southeast Asia (Rudnick *et al.,* 1967). It is quite possible that this phenomenon can be brought about by progressive urbanization which tends to cause reduction in the amount of vegetation, outdoor shade and naturally occurring containers as habitats for mosquito breeding and an increase in the artificial containers. This has assisted in the establishment of *Ae. aegypti,* the introduced species, and the displacement of *Ae. albopictus.*

In view of the above, it became increasingly desirable to study the distribution of *Ae. aegypti* in the absence of control measures and some quantification of the levels of prevalence of the species so as to assess whether the infection could become established. It was with these objectives that the second statewide survey was conducted in 1974 and 1975 in Sabah. Selection of the localities for the survey was done on the basis of geographical location, but mainly restricted to coastal zones at sea level, nature of locality, e.g. urban (consisting of shop houses which are contiguous to each other, with little or no vegetation), rural (consisting of kampong houses generally scattered with vegetation and/or garden) or mixed (consisting of shop and kampong houses); distance from the chief means of communication, such as roads, rail, rivers, air and sea so that both the remote and easily accessible areas in the west and east coasts are represented.

Once the area was selected, the single-larva collection method (Sheppard *et al.,* 1969) was adopted. The larval habitats were grouped into six categories – indoor and outdoor jars, drums and miscellaneous containers. This method allowed the following indices to be measured and compared from one locality with another and from year to year:-

"Breteau Index": Number of containers positive for *Ae. aegypti* breeding per 100 houses.

Container Index: Per cent of the containers examined which were positive for *Aedes* breeding.

The container index includes both *Ae. aegypti* and *Ae. albopictus* and relative prevalence of the two species were worked out separately.

Fig. 1 shows the location of the surveyed areas where *Ae. aegypti* is present. *Ae. aegypti* was far from rare in Sabah and it showed the expected type of distribution in the absence of control measures. It was recorded from 60 localities out of a total of 96 towns and villages whereas *Ae. albopictus* was found in 75 localities. These represented an increase of 24% for *Ae. aegypti* and 58.7% for *Ae. albopictus* of new localities over four years. Generally the distribution was more continuous than the 1970 survey and more new localities were found. New locality records for *Ae. aegypti* are: Tanjong Aru (in Kota Kinabalu), Kota Belud town, Papar town, Sipitang town, Beaufort town, Batu Arang (formerly 2.5 km N in Labuan Island) and Ice-Box district (in Tawau town). New locality records for *Ae. albopictus* are: Kampong Ayer and Pak Ka (both in Kudat), Mengkabong (in Tuaran), Sungai Bahanan (in Jambongan Island), Sim Sim (in Sandakan town).

The Container Index in the present survey ranged from 0.9 to 70.6. In major townships, the range was from 1.3 to 30.1, whilst in mixed rural/urban areas, the range was from 4.9 to 45.2. In residential suburbs and rural kampongs close to major townships, the container indices were generally higher than the urban areas and ranged from 0.9 to 70.6. A drop of container indices in seven townships, three mixed urban/rural areas and eight rural kampongs was noted over four years. On the other hand, an increase of this index was seen in ten rural kampongs and four townships.

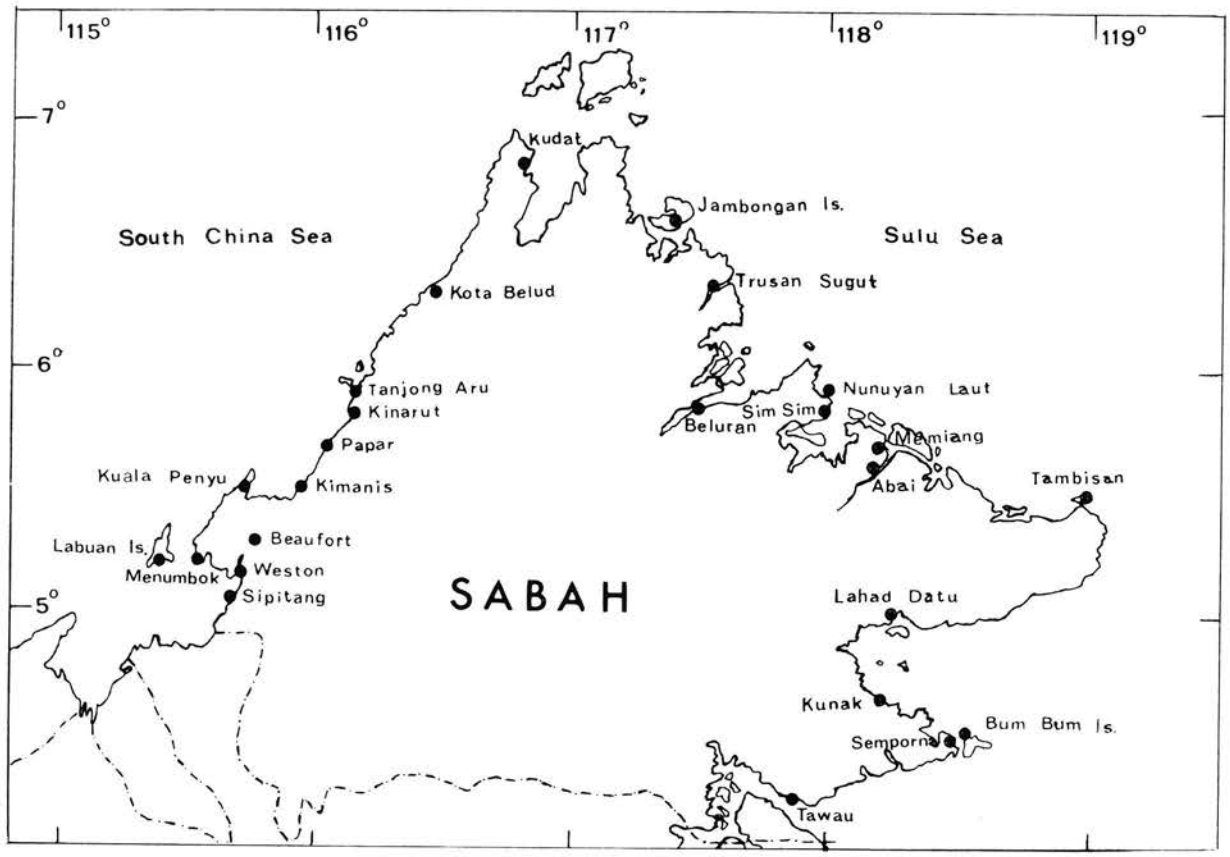

Fig. 1. Distribtuion of Aedes aegypti in Sabah (solid circles, Ae. aegypti present).

The "Breteau" Index showed the widest range. In most of the accessible villages and towns in the West Coast, this index was zero. With the exception of the kampongs in Labuan Island and Menumbok (in West coast), the Breteau index was generally above 100 in most of the outlying rural kampongs and coastal localities in the East coast. A marked decrease in Breteau indices was noted for eight localities, of which four are townships and the other four are kampongs. In the East coast, four localities reported an increase of the index.

Ae. aegypti was not detected in twelve localities in the 1970 and 1974/1975 surveys. Of these, three localities were shop-type houses and nine were kampong-type houses. Ten were situated in the West coast and the other two in the East coast. It is thought that the introduction of *Ae. aegypti* in the West coast is a slower process than in the East coast.

In the present survey, the number of houses surveyed was 3906 compared to 599 houses in the 1970 survey. The total number of collections for both species was substantially increased as can be seen in Table 1. More *Ae. aegypti* and *Ae. albopictus* collections were made in kampongs than shops in the present survey.

In those communities in the east coast where *Ae. aegypti* is the predominant species, its local distribution and prevalence were quite uniform. However, in the west coast, particularly in newly discovered localities it has not as yet spread to adjacent residential villages where *Ae. albopictus* was found to be highly prevalent in its place. New localities which were found in this survey are situated in the fishing and trading routes. It can be deduced that the introduction of *Ae. aegypti* is largely by fishing and boat traffic which regularly ply between the major townships and small coastal villages. Macdonald and Rajapaksa (1972) also mentioned this factor, but did not account for the absence of *Ae. aegypti* in those localities that receive frequent visits from Philippine and Indonesian trading craft. In the present survey, these places were all infested with this mosquito. Thus, there is also a correlation between high Breteau indices and a large amount of small-boat traffic in the east coast, northern and to some extent the south-western parts of Sabah. Since there are also regular air services between all major townships and Kota Kinabalu, it is quite likely that *Ae. aegypti* will spread to Kota Kinabalu and to other places within Sabah.

In contrast to the 1970 survey, the distribution of *Ae. aegypti* approximated close to a continuous type, and this is chiefly attributed to the capacity of this species to colonise new areas and to the availability of a large number of potential larval habitats in those areas without adequate piped water supply. A high risk of transmission of dengue and dengue haemorrhagic fever is indicated in the present survey. Applying the *Aedes aegypti* indices to the transmission of urban yellow fever (W.H.O., 1971), thirty six localities are now reported to have Breteau indices exceeding 50 whereas there were only eight localities found in the 1970 survey.

There are very strong indication for a systematic control programme to be planned in Sabah as a preventive measure to prevent any outbreaks of dengue and dengue haemorrhagic fever. Such a programme will have to include the International Airport area in Kota Kinabalu, the rural areas as well in addition to the main towns and urban areas. As a preventive measure, use of Abate sand granules by the Vector Control Unit has been considered and

Table I

Relative distribution of larval habitats of *Ae. aegypti* and *Ae. albopictus*

Species and housing	Total No. of collections		Relative distribution					
			Indoors			Outdoors		
	1970	1974/75	Jars	Drums	Miscellaneous	Jars	Drums	Miscellaneous
Ae. aegypti								
Shop	209	286	0.25	0.09	0.51	0.04	0.03	0.08
Kampong	195	2,648	0.15	0.28	0.04	0.05	0.45	0.03
Ae. albopictus								
Shop	103	117	0.11	0.06	0.28	0.12	0.18	0.15
Kampong	98	1,170	0.11	0.06	0.04	0.14	0.50	0.15

when used at a target dosage rate of 1 ppm, this may give a good control up to $2\frac{1}{2}$ to 3 months after treatment (Bang and Pant, 1972).

Acknowledgements

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Book Reviews

Low-cost rural health care and health manpower training: An annotated bibliography with special emphasis on developing countries, Volume 3 by F.M. Delaney, 1977. International Development Research Centre, Ottawa, Canada, pp. 188 (IDRC – 093e). Available from IDRC, Box 8500, Ottawa, Canada KIG 3HP.

This is the third volume in a series of annotated bibliographies on low-cost rural health care and health manpower training published by the International Development Research Centre, Ottawa, Canada. The previous two volumes (IDRC – 038e and IDRC – 042e) were published in 1975 and 1976 respectively.

The third volume, like the previous two companion volumes, will prove to be an indispensable reference to all those concerned with the design and provision of low-cost health care to rural people in the developing countries. It is a comprehensive volume that includes studies from practically the whole of the developing world. Its publication coincides with the realization, in many parts of the world, that the provision of primary medical care to all members of society at a cost that each society can afford is a highly relevant social goal in every country. Dr. H. Mahler, Director-General of WHO, in calling for this, describes it as "A social revolution in public health".

PAUL C.Y. CHEN

Microgynon 30
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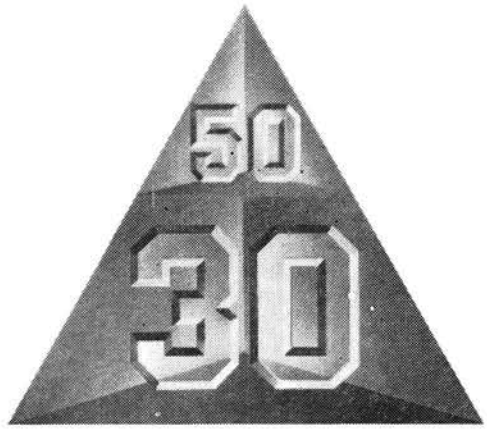

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