Radiological investigation of neurological disorders

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THE EDITOR, WRITING in the Malayan Journal of Medicine (1964) hoped that by 1973 there would be five neurosurgical centres in the Federation. One centre has been in operation at the General Hospital, Kuala Lumpur since 1963; a neurosurgical service has been provided at the University Hospital since May 1971 and a neurosurgeon has recently been appointed to the Penang General Hospital. A neurosurgical centre cannot function without the services of a neuroradiological and a neuro- pathology department and facilities for brain scanning, which ideally should be included in the neuroradiological department (Burrows 1972).

During the year, following the establishment of the neurosurgical service at the University Hospital, the number of neuroradiological procedures have more than doubled, and these procedures and cases are reported in this paper.

Materials and Method

During the year commencing June 1st 1971, 208 patients with neurosurgical, neurological or orthopaedic disorders were submitted to neuroradiological procedures, viz. carotid and vertebral angiograms, ventriculograms and encephalograms and myelograms. Every patient has a record of the procedure entered on a small filing card; the diagnosis is subsequently added and the card is filed.

The number of procedures performed during the year commencing January 1970 before the establishment of the neurosurgical service is compared to those performed after its establishment (Fig 1).

During the year commencing June 1971, the following procedures were performed:

135 carotid angiograms all by direct puncture,

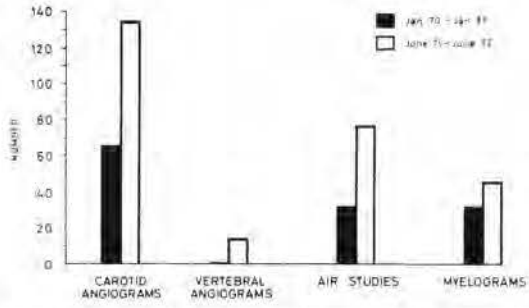

Fig. 1: The number of neuroradiological procedures performed in the year before the establishment of a neuro-surgical service (black) compared with those performed in the first year after its establishment (white).

comprising 20 bilateral and 95 single sided angiograms.

14 vertebral angiograms, nine by direct puncture and five by catheterisation.

77 air studies, comprising 40 ventriculograms and 37 encephalograms.

9 Myodil ventriculograms were performed but these have not been included in Fig. 1 as they followed an air ventriculogram in all cases.

46 myelograms, 45 by lumbar puncture, one by cisternal puncture.

Results

Angiography and air studies are complementary in the investigation of intracranial lesions, so they have been included together in Table 1 which shows the diagnosis in 162 patients with an intracranial lesion and the investigations performed to reach the diagnosis. Angiograms include both carotid and vertebral angiograms and air studies both ventriculograms and encephalograms.

The diagnosis in the 46 myelograms performed is given in Table 2.

Discussion

The number of angiograms and air studies have more than doubled since the advent of neurosurgery at the University Hospital (Fig. 1), but the increase in myelograms has not been so great as these were already being done at the request of the orthopaedic surgeons.

The racial incidence of the total patients admitted to the University Hospital (excluding obstetrics) is almost identical to that of patients undergoing neuroradiological procedures (Table 3). Although not all patients with neurological disease have neuroradiological procedures, it is likely that the incidence of neurological disease and, in particular, neurosurgical conditions is similar in the three ethnic groups in Malaya and it does not appear to be commoner in Indians as was found by Issler (1972).

The largest group of patients investigated were those with head injury in whom carotid angiography

Table 1

Diagnosis of Intracranial Lesions in 162 Patients and Neuro-Radiological Procedures to reach the Diagnosis.

Diagnosis		No. of Patients	Angiograms	Air Studies
Head injury		26	32	0
Subdural haematoma	8			
Extradural haematoma	4			
Carotico-cavernous fistula	2			
Normal angiogram	12			
Tumours		25	23	15
Glioma	13			
Metastases	4			
Pituitary tumours	3			
Meningioma	2			
Neuroma	2			
Haemangioblastoma	1			
Hydrocephalus		23	2	28
Subarachnoid haemorrhage		16	39	0
Aneurysm	6			
Arteriovenous malformation	5			
Normal angiogram	5			
Epilepsy		13	4	10
Intracerebral haemorrhage or thrombosis		12	13	0
Encephalitis and meningitis		9	9	4
Abscess		8	7	6
Vascular stenosis or occlusion		8	9	0
No demonstrable intracranial disease		7	2	5
Tumour excluded	2			
Hyperostosis ? meningioma	1			
Dermoid cyst of skull vault	1			
Thyrotoxic opathalmoplegia	1			
Migraine		4	4	0
Diagnosis unknown		4	5	1
Third nerve palsy	3			
Optic atrophy	1			
Degenerative disease		3	0	4
Failed examination		2	0	2
Atrophy		2	0	2
Total		162	149	77

Table 2

Diagnosis in 46 Patients having Myelograms.

Diagnosis		Number of Patients
Lumbar disc protrusion		12
Cervical spondylosis		7
Extradural lesion		6
Spinal metastases	2	
T.B. spine	2	
Thoracic disc protrusion	1	
Benign haemangioma	1	
Intradural lesion		5
Neurofibroma	2	
Cyst	2	
Arachnoiditis	1	
Brachial plexus trauma		4
Arteriovenous malformation of spinal cord		3
Myelitis		2
Motor neurone disease		2
Syringomyelia		1
Spinocerebellar ataxia		1
Ankylosing spondylitis		1
Tumour invasion of peripheral nerves		1
Normal myelogram — diagnosis unknown		1

was performed to exclude an extracerebral haematoma. In some centres, especially where carotid angiography is not readily available, cases with suspected extradural or subdural haematoma have burr holes made and the haematoma aspirated. If no haematoma is found, then air is introduced and a ventriculogram performed (McKissock et al 1960). In the present series, 12 (46%) patients with head injuries had normal angiograms, but then these patients were spared burr hole aspiration for a suspected haematoma. This requires the use of an operating theatre and furthermore, multiple burr holes have to be performed to diagnose or exclude a subdural or extradural haematoma.

In the group of patients with intracranial tumours, 13 (52%) had a glioma, which is similar to other reported series where gliomata constitute 45% of all intracranial tumours (Brain & Walton 1969).

The majority of patients with hydrocephalus were children and 16 (70%) patients had hydrocephalus secondary to meningitis. Two patients had spina bifida with a meningocoele and three patients had an encephalocoele. In the United Kingdom, the ratio of encephalocoeles to spina bifida is 1:5 (Norman 1962) but in Southeast Asia, encephalocoeles are commoner than spinal meningocoeles

Table 3

Racial Distribution of 208 Patients having Neuro-Radiological Procedures compared with total Hospital Admissions.

Race	Number of Patients having Neuro-radiological Procedures		Total Admissions to University Hospital (excluding obstetrics)
Chinese	121	58%	58%
Indian	50	24%	26%
Malay	29	14%	12%
Orang Asli	5	2.5%	
Others	3	1.5%	4%

with anterior encephalocoeles more common than occipital encephalocoeles (Suwanwela 1969).

The observation at the General Hospital, Kuala Lumpur, of arteriovenous malformations outnumbering aneurysms ten to one, with approximately two-thirds of these lesions having bled (Spillane 1972) were not found in the present series of patients with subarachnoid haemorrhage. Although the number of patients with subarachnoid haemorrhage was not large approximately, one-third had bled from an arteriovenous malformation, one-third from an aneurysm and in one-third the angiograms were normal. In the United Kingdom, aneurysms are nine or ten times as common as arteriovenous malformations in subarachnoid haemorrhage (Brain & Walton 1969). It is now standard practice to perform bilateral carotid and vertebral angiography in patients with subarachnoid haemorrhage.

In only two patients was a diagnosis of cerebral atrophy made. In the United Kingdom, this is a common encephalographic diagnosis and the greater number of patients with atrophy seen there is presumably due to the fact that many more elderly patients are investigated.

The majority of the myelograms were performed in patients with lumbar disc protrusion which were demonstrated in 11 (92%) patients referred with that diagnosis. Myelographic appearances suggested an arteriovenous malformation of the spinal cord in three patients but angiography was not performed to confirm the diagnosis.

Two patients with spinal cord compression, in whom a previous lumbar puncture had been performed, were submitted to myelography. A myelogram should not be carried out within 10-14 days of a previous lumbar puncture as a common subdural-subarachnoid reservoir of cerebro-spinal fluid may be produced in the lumbar region after needle puncture and this may lead to contrast

being injected outside the subarachnoid space (Shapiro 1968). This occurred in one of the patients so Myodil had to be introduced by cisternal puncture.

It is eminently desirable that neuroradiological procedures should be performed by a radiologist who has specialised in this subject. As several cases, especially head injuries, are emergencies, there must be radiographers on call who are proficient in the procedures. If three-quarters of an hour is allowed for a carotid angiogram and one hour for a myelogram or an air study, then these procedures are very time consuming. To obtain the best results expensive radiological equipment is needed, so it is thus better that neurology should be developed at a centre where this sophisticated equipment together with facilities for brain scanning are available.

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