Short term use of large doses of furosemide in some surgical problems

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FUROSEMIDE (LASIX) has been in use for some time now and its clinical formula, mode of action and its superiority as a diuretic agent has been well documented in numerous clinical trials elsewhere (Verel, Stentiford, Rahman, Saynor 1964, Stokes and Nunn 1964, Timmerman and Springman 1964). Its therapeutic indications has also been reported in numerous articles by various authors in several countries. However, reports of the use of large doses of furosemide in surgical patients have been limited (Fourth International Congress of Nephrologists – Stockholm 1969, McKenzie, Fairley and Baird 1966, Muth 1968). It is the purpose of this article to add some information on short-term use of large doses of furosemide in some surgical patients, who were resistant to normal initial doses.

Material

During the past 18 months, 44 patients were treated with large doses of furosemide. Table I indicates the conditions for which they were used. Four patients developed intractable ascites and oedema following major hepatic resection for malignancy or for benign conditions where extensive resections were performed. Eight patients developed marked ascites and oedema following emergency porta caval shunts for bleeding oesophageal varices due to cirrhosis of the liver. Seven other patients with severe cirrhosis admitted to our units for bleeding and treated conservatively developed marked ascites. In these cases, presence of marked ascites causing respiratory distress necessitated the use of large doses of furosemide to produce quick massive diuresis.

TABLE I

Conditions for which Furosemide was used

	No.
1. Major hepatic resection for malignancy or benign conditions which developed ascites.	4
2. Emergency porta caval shunts which developed ascites.	8
3. Cirrhosis of liver with ascites treated conservatively.	7
4. Severe burns with oliguria or anuria.	8
5. Advanced malignant lesion of alimentary tract with ascites.	10
6. Head injury with cerebral oedema.	7
	44

Eight patients with severe burns between 60 to 70% developed oliguria or anuria. Ten patients had advanced malignant lesions in the alimentary canal and developed severe ascites which caused respiratory

TABLE II

Effect of High Dosage Furosemide in Liver Disease following Hepatic Resection

No.	Initial Serum Electrolytes MEq/1				Urea mg/100	Dosage	Time of full response	Serum Electrolytes at time of full response				Amount of urine passed
	Na	K	Cl	HCo3				Na	K	Cl	HCo3	
1.	129	3.7	94	27	48%	100mg i/v	2nd day	120	2.3	87	24	4¾ litres
2.	138	4.2	108	24	54%	150mg i/v	3rd day	127	2.9	94	19	6 litres
3.	132	5.1	107	22	22%	250mg i/v) and i/m)	4th day	120	2.7	93	17	8¼ litres
4.	127	3.8	102	25	54%	400mg i/v) and i/m)	3rd day	119	2.3	90	18	11 litres

Post Porta Caval Shunt in Cirrhosis of Liver Ascites and Oedema

No.	Initial Serum Electrolytes MEq/1				Urea mg/100	Dosage	Time of full response	Serum Electrolytes at time of full response				Amount of urine passed
	Na	K	Cl	HCo3				Na	K	Cl	HCo3	
1.	127	3.8	93	28	57%	1500mg i/m	2nd day	119	2.3	86	23	8 litres
2.	120	3.1	104	27	67%	2500mg i/m	3rd day	107	2.4	92	25	7½ litres
3.	134	4.3	109	22	42%	3500mg i/m) and i/v)	120	2.7	103	20	12	litres
4.	132	4.7	106	24	53%	400mg i/m) and i/v)	2nd day	124	2.8	99	22	9½ litres
5.	138	3.2	103	24	42%	2500mg i/v	3rd day	130	2.1	100	19	8 litres
6.	131	4.1	106	23	52%	3500mg i/v) and i/m)	2nd day	126	2.7	98	20	12 litres
7.	138	3.2	103	24	48%	5200mg i/v) and i/m)	4th day	124	2.1	97	20	16 litres
8.	126	4.2	107	24	52%	5250mg i/v) and i/m)	5th day	117	2.3	98	22	13¼ litres

Note: i/v and i/m – in divided doses – morning and evening.

distress. Seven patients were treated for cerebral oedema following head injury. They had either extradural or subdural haematoma which were evacuated by trephening.

In all these patients, the normal daily dose of 40 mg. intravenously or intramuscularly was commenced and gradually increased to 400 mg. daily in divided doses. Fluid intake and output were recorded. Serum electrolytes were estimated daily. Where practicable, the patients were weighed daily and blood pressure, pulse rate and central venous pressure were monitored. Blood sugar levels were estimated periodically. If the response to 400 mg. daily was poor or if the patient's condition caused anxiety, the dose of furosemide was increased to 1,000 mg. on the first day with a further increase of 1,000 mg. daily, if necessary. The highest dosage given in this series was 5,250 mg.

Result

Table II shows the detailed analysis of the patients with liver diseases. The ascites responded well to high doses of furosemide. The injections were discontinued within a week and subsequently the patients were given oral maintenance dosage of 40 mg. twice daily. Liver function studies showed no deterioration in the function.

All the eight patients with severe burns showed marked improvement, the urinary output returning to satisfactory levels within three to four days of the commencement of the therapy. The results of the blood urea appeared to be variable but returned to normal within a week.

In ten patients with advanced malignant lesions of the alimentary tract, high doses of furosemide caused immediate response in seven patients as shown by the decrease in the girth of the abdomen and relief of respiratory distress. The remaining three patients showed virtually no response even after a daily dosage of 5,000 mg. However, as soon as the intravenous therapy was discontinued, the ascites in seven patients, who had initial response, recurred. No further response was then obtained after a week's treatment.

The seven patients with cerebral oedema following trephening improved dramatically after administration of high doses of furosemide. A daily dose of 1,000 mg. was given intravenously for 4 – 6 days in all the patients.

Adequate hydration was ensured by monitoring blood and central venous pressures. Electrolytes were supplemented according to the serum electrolyte levels estimated after the first large dose and massive diuresis. No changes in the blood sugar levels were noted.

Discussion

Ascites and oedema rapidly developed following hepatic resection, or porta caval shunts in cirrhosis of the liver, because of hypoproteinaemia and anemia. In most cases, the normal dose of furosemide is adequate to control the ascites and oedema. However, in resistant cases, it was found necessary to give large doses of furosemide to achieve a response. Our experience has been that the parenteral route is the most suitable to achieve quick response, since absorption is unpredictable by oral route. This procedure eliminates the water but conserves proteins. The main disadvantage with higher dosage in hepatic patients is hypo-kalemia (Sherlocks and Shaldon 1963) which should be supplemented, according to serum electrolyte results.

It is our current practice to administer 40 mg. of furosemide for most cases of burns involving more than 30% of the body surface. This enables rapid elimination of overt oedema and preventing the oliguria phase. When, however, oliguria or anuria is present, it is customary to increase the dose of furosemide. In our experience, eight patients required dosage upwards of 1,000 mg. to effect a diuretic phase. No permanent damage to the kidneys were observed.

Although temporary response was obtained in seven out of ten patients with intractable ascites in malignant lesions of the alimentary tract, our findings indicate that furosemide has little to offer to these patients except in the immediate phase. Such patients are probably better treated by abdominal paracentesis.

Our experience has shown that furosemide is extremely effective in head injuries and our findings agree with those of others (Galle and Standacher 1968). In some patients, rapid recovery from the effects of cerebral oedema can be achieved by the use of high doses of furosemide when the recovery is slow.

Our preference for the administration of high doses of furosemide by injection in these 44 patients is that rapid onset of action and precipitation of early massive diuresis prevent accumulation of the drug in the system (McKenzie et at 1966).

These series have shown that apart from the possibility of massive output of urine which may lead to dehydration and electrolyte depletion, especially potassium, no other major side-effects were noticed. The main problem seems that only 20 mg. vials are

available in our country and it is cumbersome to the nursing staff in administering the drug parentally and painful to patients who have to receive such large doses intramuscularly.

Summary

Large doses of furosemide, varying from 1,000 mg. to 5,250 mg. were used in 44 surgical patients. Since they were resistant to normal doses of 40 mg. in the initial stages, higher doses were employed as a short-term therapy to evoke a diuresis.

Twenty-nine patients had marked ascites due to liver diseases or malignancy of the alimentary tract, eight patients had severe burns with oliguria or anuria and seven patients cerebral oedema following head injury.

Although seven out of ten patients with malignancy of alimentary tract responded well initially, the ascites returned soon after withdrawal of therapy and became resistant to subsequent higher doses. For these cases, we feel, use of this regime, probably, is of no value.

Marked diuretic response, absence of side-effects and desired clinical improvement achieved in liver, kidney and head injury cases prove the fact that, with adequate supplementation of electrolytes, large doses can be safely given in resistant cases.

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