

ILEO-URETEROPLASTY-BIOCHEMICAL DISTURBANCES FOLLOWING THE PROCEDURE

By

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As early as 1883 an isolated segment of small intestine was used by Tizzoni and Foggi (18) to make a substitute bladder in dogs. The animals were continent and voided once an hour. Although no biochemical studies were made but they apparently enjoyed good health. The first ileal replacement of ureter in dogs was attempted by d'Urso and d'Fabii (3) in the year 1900 and in human beings by Shoemaker (15) in 1909. Since then sporadic efforts have been made to replace the human ureter by the ileal graft (9, 11, 20, 10, 5). Still others have tried the procedure on animals (6, 4, 2, 10.). A number of workers have drawn attention to the biochemical disturbances that may follow the procedure. Tasker (17) showed that following ileo-cystoplasty the venous blood draining the ileal graft contained a significantly higher potassium content, when the bladder was filled with urine, as compared to when it was empty. Pyrah (13) using radioactive isotopes found that sodium, potassium and chloride ions migrated freely across the ileal mucosa. On the other hand, Renolds (14) observed no electrolyte disturbances following ileo-ureteroplasty in dogs.

In the light of such controversy, it was considered desirable to assess the biochemical status of mongrel dogs following ileo-ureteroplasties.

MATERIALS AND METHODS

30 mongrel dogs of either sex and weights were selected for the study. They were free from skin infections and were otherwise healthy. Mixed diet was given to them. Regular pre and post-operative estimations of blood urea, serum sodium, potassium and chlorides were carried out.

The bowels of all the animals were sterilized with chloromycetin one gm. daily given orally for 4 days before the operation. They were anaesthetized with Nembutal anaesthesia. 500 ml. of 5 per cent, glucose solution was given as intravenous drip during the operation which lasted for about 3 hours. The right ureter was divided between ligatures to obtain conditions somewhat identical to the human patients submitted for this operation in the presence of renal damage. A suitable length of the terminal ileum was isolated as a pedicle graft with its mesenteric blood supply intact. The continuity of the remaining gut was restored by end to end anastomosis. The lumen of the graft was irrigated with a pint of normal saline, containing 2 percent,

sulphathiazole, five hundred thousand units of sodium penicillin 'G' and 0.5 gms. streptomycin (4).

In 11 dogs the whole length of the left ureter was replaced by the ileal graft (Group A). In an equal number the lower one third of the left ureter was replaced by the graft (Group B). 8 animals had the central or upper one-third of the left ureter replaced by the ileal graft (Group C)—(Fig 1).

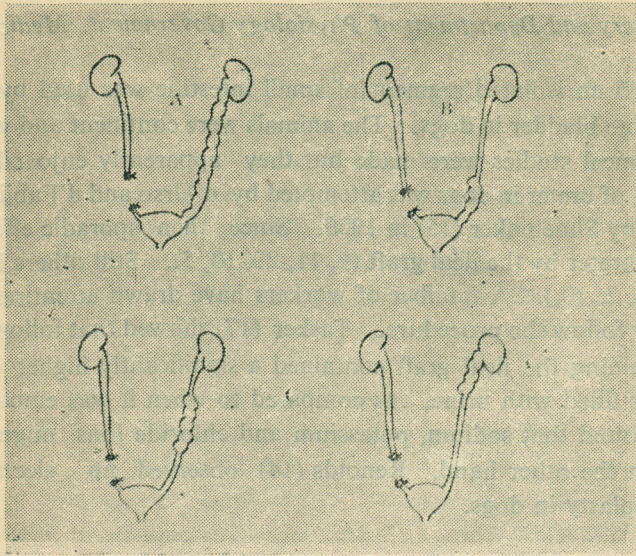


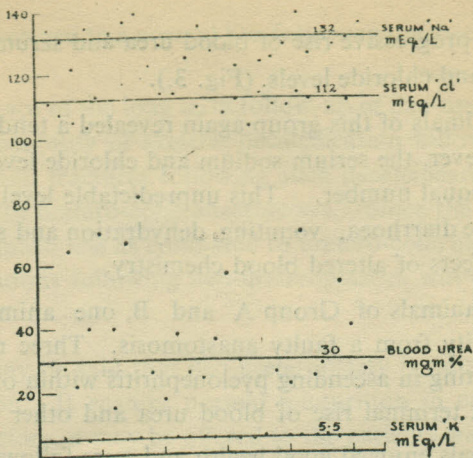
Fig. 1

After the operation, all the animals received four hundred thousand units of procaine penicillin and 0.5 gms. streptomycin as intra-muscular injection daily for one week.

OBSERVATIONS AND DISCUSSION

The average pre-operative blood urea was 30 mgs. % with a wide range of variation of 20-105 mgs. % The other constituents showed relatively slight variation only. The average serum sodium was 132 mEq/L potassium 5.5 mEq/L and chlorides 112 mEq/L (Fig 2).

The wide variation of non-protein nitrogen in dogs and its erratic behaviour following operations on the urinary tract may be due to high incidence of chronic nephritis among these animals (7). The condition may be so insidious as to pass completely un-noticed in these animals. Kalarenbeek (8) reported that the normal blood urea in mongrel dogs was 25 mgs % while in uraemia it varied from 359-975 mgs/% We have not witnessed such high figures of blood urea in the present series, even in the terminal stages. Furthermore, we have neither come across such high figures in the available literature, nor is this our experience in the uraemic patients. The maximum blood urea recorded in one of our animals has been 335 mgs. %

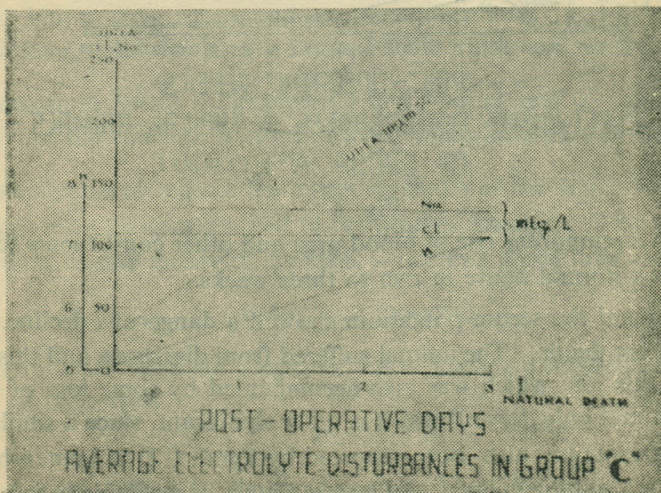


AVERAGE PREOPERATIVE BIOCHEMICAL READINGS

Average electrolyte figures.

Fig. 2

All the Group C animals died within three to four days after the operation. Hence, the replacement of the middle or upper segments of the ureter by an ileal graft is not considered practicable. The stoma between the graft and the distal segment of the ureter fails to function, because it becomes blocked with mucus and debris from the intestinal loop. The first four ani-



Electrolyte disturbances in Group C animals.

Fig. 3

imals of this group showed a progressive rise of blood urea and serum potassium without much change in the serum sodium and chloride levels. (Fig. 3.).

The remaining four animals of this group again revealed a tendency for rising blood urea and serum potassium. However, the serum sodium and chloride levels were higher than normal in two and lower in an equal number. This unpredictable level of these constituents may have some thing to do with the diarrhoea, vomiting, dehydration and starvation from which they suffered in addition to the effects of altered blood chemistry.

From amongst the 22 animals of Group A and B, one animal died due to leakage of urine into the peritoneal cavity from a faulty anastomosis. Three more animals died due to delayed stomal stenosis, resulting in ascending pyelonephritis within one month of the operation. All these animals exhibited a terminal rise of blood urea and other constituents.

The remaining 18 animals enjoyed good health and were followed upto five months. No difference in Group behaviour was observed among them, although as many as 8 of them showed some histological evidence of renal infection. The general pattern of biochemical changes in typical animals of these two groups (A & B) is depicted in Fig 4.

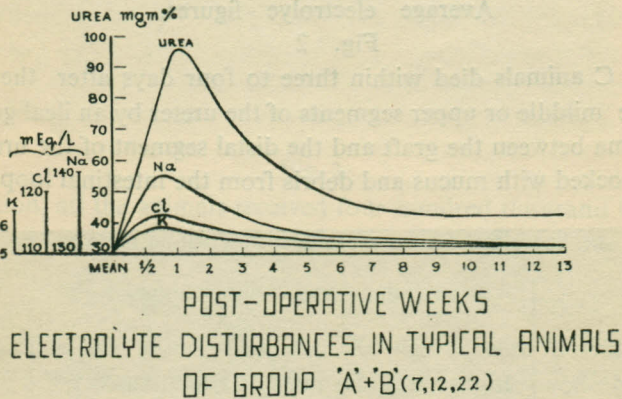


Fig 4

There has been a temporary rise of blood urea and other constituents following the operation, which settled to a normal figure in two to three weeks.

Only in one animal the serum potassium showed a dangerous decline. It was recorded as low as 2 mEq/L before death. The animal suffered from diarrhoea and this probably explains the excessive loss of this ion, which was also accompanied by some loss of sodium. Though, it happened in one animal only, nevertheless it is quite significant, since a similar fall in serum potassium with ensuing coma has also been reported by Pyrah (12) in human-beings. Hence, we feel, that a quick method of blood chemistry check-up must be available before embarking on this type of surgery. Cases are on record, whereby patients with urinary diversions admitted in a

moribund state have been revived to a normal life, following timely correction of the blood chemistry (12).

We have no experience of the long term follow-up of ileo-ureteroplasties. Hence, nothing can be said about the possibility of skeletal decalcification following the operation. Pyrah (12) has reported deformities and fractures following such decalcification due to prolonged acidosis among patients treated with uretero-colic anastomosis. Since the incidence of hyperchloraemia after ileo-ureteroplasty is much less as compared to uretero-colic anastomosis, it may be assumed that the skeletal complications following ileo-ureteroplasties will also be less frequent and less serious.

In conclusion, it may be said that ileo-ureteroplasty is quite a satisfactory procedure for want of a better operation. It ensures normal micturition in contrast to the other forms of urinary diversions. Therefore, it may be offered to the patients with injured or damaged ureters, provided the kidney function is relatively normal. In this series, the biochemical changes have been of a transitory nature, even in the presence of a solitary kidney. These are likely to be absent or insignificant when both the kidneys are functioning normally.

SUMMARY

1. A study of biochemical changes following ileo-ureteroplasties in 30 mongrel dogs is presented.

2. The wide variation of blood urea levels and its erratic behaviour following urinary tract surgery in mongrel dogs is pointed out.

3. Invariably blood urea, serum sodium, potassium and chlorides show some rise after the operation, but these settle down to a normal level within 2-3 weeks.

4. Serum potassium fell to a dangerously low level in one of the animals. Hence, the vigilance on the part of the clinician is stressed when embarking on this type of surgery.

5. It is unpracticable to replace the upper segments of the ureter by an ileal graft. The lower end of the graft must be anastomosed to the urinary bladder. Otherwise, the lower stoma fails to function and the animal dies from uraemia, with rising blood urea and serum potassium.

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