

**STUDIES ON VESICO-COLOSTOMY
AND
VESICO-RECTOSTOMY IN DOGS**

By

T. SARADA AMMA

A THESIS

submitted in partial fulfilment of the requirement
for the degree

MASTER OF VETERINARY SCIENCE

Department of Surgery

Faculty of Veterinary and Animal Sciences

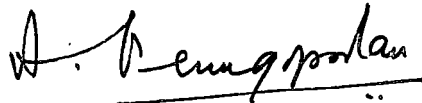
KERALA AGRICULTURAL UNIVERSITY

Mannuthy -- Trichur

1975

CERTIFICATE

Certified that this thesis entitled " STUDIES ON VESICO-COLOSTOMY AND VESICO-RECTOSTOMY IN DOGS", is a record of research work done independently by Kumari. T.SARADA AMMA under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to her.



(A.VENUGOPALAN)

Chairman of the Advisory Committee,
Professor and Head of the
Department of Surgery,
Mannuthy,
14th Nov. '75. College of Veterinary and Animal Sciences.

DECLARATION

I hereby declare that this thesis entitled "STUDIES ON VESICO-COLOSTOMY AND VESICO-RECTOSTOMY IN DOGS" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title of any other University or Society.

Mannuthy,
14th Nov. '75.

Signature of the Candidate. Saradaamma

Name of the Candidate: T.SARADA AMMA

LIST OF ILLUSTRATIONS

Fig. No.	Page
1. Canine pelvis and abdomen (ventral view)	57
2. Canine pelvis and abdomen (lateral view)	58
3. Vesico-colostomy (diagramatic)	59
4. Vesico-rectostomy (diagramatic)	60
5. Bladder, ureters and colon and the site of anastomosis	61
6. Photograph showing the opening of bladder (ostium) into the colon	61
7. Photomicrograph: site of anastomosis (vesico-colostomy)	62
8. Photomicrograph - cystitis	62
9. Photomicrograph - colon	62
10. Rectum, bladder and the site of anastomosis	63
11. Photograph: ostium communicating the bladder and rectum	63
12. Skiagram after barium enema	64
13. Photomicrograph - site of anastomosis (vesico-rectostomy)	65
14. Photomicrograph - site of anastomosis (vesico-rectostomy), higher magnification	65

INTRODUCTION

ACKNOWLEDGMENT

My grateful acknowledgment is due to Dr.A.Venugopalan, Professor and Head of the Department of Surgery, and Major Adviser, for his guidance in the preparation of this thesis; and also to Dr.P.O.George, Dr.P.J.Philip and Dr.C.K.S.V.Raja, the members of the Advisory Committee.

I am specially indebted to Dr.K.N.Muraleedharan Nayar, Lecturer, Department of Surgery, for the kind assistance and helpful suggestions given, and for critically going through the preliminary copy of the manuscript.

I respectfully acknowledge the encouragement given by Dr.A.M.Jalaluddin, Lecturer, Department of Surgery.

I gratefully acknowledge the valuable help given by the staff of the Department of Anatomy and Department of Pathology, especially to Dr.A.Rajan, Reader, Department of Pathology, for his help in conducting postmortem and histopathological studies.

I am thankful to the Professor of Physiology for permitting me to work in his laboratory.

My sincere thanks are due to the staff of the Department of Bacteriology, for helping me with the bacteriological studies.

Grateful acknowledgment is due to Sri.G.Gopinathan Nair,

Artist-photographer of the College for the photographs and diagrams.

I am obliged to the Dean, College of Veterinary and Animal Sciences, Kerala Agricultural University, Mannuthy for providing me the facilities for conducting this study.

T. SARADA AMMA

TABLE OF CONTENTS

		Page
INTRODUCTION	..	1 - 4
REVIEW OF LITERATURE	..	5 - 13
MATERIALS AND METHODS	..	14 - 21
RESULTS	..	22 - 31
DISCUSSION	..	32 - 37
CONCLUSION	..	38 - 39
SUMMARY	..	40 - 41
TABLES	..	42 - 52
REFERENCES	..	53 - 56
FIGURES	..	57 - 65

ABSTRACT

LIST OF TABLES

Table No.	Page
1. Postoperative general observations - Group I	42
2. Post operative general observations - Group II	43
3. Rectal temperature ($^{\circ}$ C), preoperative and post-operative - Group I	44
4. Rectal temperature ($^{\circ}$ C), preoperative and post-operative - Group II	45
5. Estimation of blood constituents - Group I	46
6. Estimation of blood constituents - Group II	48
7. Urine: Results on Cultural Examination	50
8. Autopsy findings	51

INTRODUCTION

Urolithiasis, stricture of urethra and traumatic injuries, are some of the conditions that cause urinary obstruction which is a serious surgical problem in the canine species. The incidence of urinary obstruction is more in male dogs as compared to bitches, owing to the long, narrow, urethra and the presence of os penis. The urethra of the bitch being shorter, having a larger caliber and being dilatable, is less susceptible to obstructions.

Urethrotomy is frequently adopted to relieve urethral obstruction in dogs. But recurrence of obstruction necessitates repeated surgery and in order to avoid it and to prolong the life of the animal, a permanent patent opening may be established for diverting the urine. One of the methods of achieving this is to perform urethrotomy and permanently fix the urethra to the skin; but since this causes dribbling of urine and soiling of the skin in the vicinity resulting in dermatitis and excoriation of skin, other methods of urinary diversion have been tried as a measure of treatment in urinary obstructions.

Urinary diversion can be either external or internal.

External diversion is the technique by which ureters, bladder or urethra as the case may be, are brought to the surface and an outlet for urine is established by anastomosing to the skin. In internal urinary diversion, the ureters, urinary bladder or urethra, as the case may be, is anastomosed to the ileum, colon or rectum. The creation of such fistula or ostium between the urinary tract and the alimentary tract was done by Maydl in 1894.

The urinary bladder can be anastomosed to the colon or rectum either by the fundus of the bladder or by the neck of the bladder. The anastomosis of the urinary bladder to the colon (vesico-colostomy) or rectum (vesico-rectostomy) has been performed in dogs with encouraging results and both the methods are reported to be good urinary diversion techniques (Mannari, 1966; Nayar and Wilson, 1974). The control of urination is maintained unaffected in these techniques with intact anal sphincter. However, these techniques do not seem to be extensively practiced under field conditions.

Vesico-rectostomy may be indicated in any obstructing lesion distal to the vesical neck which fails to respond to the usual methods of treatment. The operation can be performed in patients with inflammatory, congenital

or traumatic urethral stricture or urethral calculi. Vesico-colostomy is indicated in the above conditions as an alternative to vesico-rectostomy, and also in lesions involving lower part of urinary bladder.

The postoperative complications reported subsequent to vesico-colostomy and vesico-rectostomy in dogs were:

1. Upper urinary tract infection.
2. Leakage of urine into the abdominal cavity resulting in peritonitis.
3. Inflammation of colon and rectal mucosa distal to the site of anastomosis.
4. Closure or blocking of the surgical opening between the bladder and the colon/rectum.
5. Retention of urine with dilatation of bladder and ureters.
6. Formation of renal or ureteral calculi.
7. Cystitis.
8. Electrolyte imbalance due to failure of normal kidney function.
9. The loose faecal matter mixed with urine causing excoriation of skin in the perineal area.

The entry of faecal material into the bladder, through the communicating opening, results in urinary infection and cystitis. The absorption of the contents of urine into the systemic circulation is possible in

vesico-colostomy and vesico-rectostomy, though there is relatively lesser chance for this to occur in vesico-rectostomy. In conclusion, it may be stated that, irrespective of the method used, the upper urinary tract is rarely normal after the above mentioned urinary diversions, even in uncomplicated cases.

The present study was undertaken with the object of comparing the effects of vesico-colostomy and vesico-rectostomy in experimental dogs, in order to find out, as to which of the two methods could be recommended as more suitable under field conditions.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

The surgical conditions affecting the urinary system include: obstruction of urethra by calculi or tumours (McCullay, 1955; Smythe, 1959; Gale, 1962; Markowitz, 1964), urethral stricture (McCunn, 1953), vesicovaginal fistula (Markowitz, 1964), cancer or hyperplasia of prostate (Hoffer, 1962), cancer of urinary bladder (Levitsky, 1953; Markowitz, 1964), and injury of urethra, bladder or ureters (Markowitz, 1964 and Cordonnier, 1962). The incidence of these conditions in the order of their frequency as reported, are: urolithiasis in male animals (Bloom, 1954) occurring most frequently in 3 to 10 year old animals; cancer of bladder and urethra; hyperplasia or tumours involving the prostate; and stricture of urethra (McCunn, 1953). Besides causing interference to the normal phenomenon of micturition, the prolonged existence of these conditions induce structural and functional changes in the urinary system. The obstruction to the flow of urine induces distension of the bladder, retrograde dilatation of the ureters and hydronephrosis.

Smythe (1959) reported that urethral calculi are very common in male dogs and their common seat is just

at the entrance of the urethra to the os penis and that though surgical removal of these calculi was performed, recurrence was common, requiring repeated operations.

The operation of vesico-rectostomy was performed in man by Moore (1954). The method was successful even though repeated dilatation of the ostium was required from time to time due to its constriction. McCully (1955) performed antepubic urethroscopy in three clinical cases for the prevention and correction of recurrent urethral obstruction in cats. In this operation, about $\frac{1}{4}$ inch of the urethra after its exposure through the muscular wall of abdomen (and prior to its fixation on the skin to provide the artificial urethral opening), was made to lie subcutaneously so that the tension of skin thereon would act like a valve regulating the flow of urine. It was reported that the possibility of an ascending infection was prevented by this valve like action at the new urethral opening.

Cysto-recto-sigmoidostomy, the work of Madyl (1894) cited by Crowley and Swigart (1960), was one of the initial attempts at diverging the flow of urine to the exterior via the bowel. Dempster and Daniel (1956) studied several methods of ureteral transplantation into the colon and reported that hydronephrosis resulted when the ureters were transplanted to the lower portion

of colon. In man, ureterocutaneous anastomosis has higher morbidity than does uretero-sigmoidostomy (Gordonnier, 1956).

In 1957 Robbins carried out vesico-rectostomy in four clinical cases in men. The bladder was first opened through a suprapubic incision and from the interior of the bladder another incision was made through the bladder wall at the inter-ureteric ridge. A corresponding incision through the rectal wall was then made to establish the communicating ostium between the bladder and rectum and the corresponding edges were sutured. A catheter was passed into the rectum through the ostium and kept in situ. The initial incision on the bladder and laparotomy wound were then closed in the usual manner. The catheter was removed after a week. The operation was successful except for the requirement of periodical dilatation in certain cases.

Howard (1959) suggested a method of cysto-colostomy by the anastomosis of the fundus of bladder to the colon which had the advantage of being simpler and safe.

Beamer (1959) conducted experimental studies on male cats for recurrent urethral obstruction. The techniques adopted were:

1. Uretero-colostomy.

2. Transplantation of a portion of bladder with ureters into colon.
3. Transplantation of the neck of the bladder to the colon.

Occlusion of ureteral orifice by mucus plug was a complication in uretero-colostomy even when a polythelene tube was kept introduced into the ureters. The same defect (occlusion with mucus) was noticed when a portion of bladder with ureters was anastomosed to the colon. The defects were overcome by keeping in situ a rubber tube for 7 days in the cystocolostomy/urethrocolostomy performed in a few animals by the same author. Peritonitis was reported as a side effect in one patient.

Baker and Miller (quoted by Kenealy, 1959) performed proximal colostomy and urethro-recto-sigmoidostomy in 10 dogs. Some of these animals showed renal calculi at autopsy. 9 animals showed hydronephrosis, hydroureter and pyelonephritis. Kenealy (1959) adopted in his experimental studies a modified method of Baker and Miller and reported that the complication met with by Baker and Miller were not encountered in his study.

Barzilay (1960) reported several techniques of uretero-ileal anastomosis in dogs. Though ascending infection was not common, this method had limited value

in lower urinary tract dysfunctions.

Reynold (1960) reported cases of ileal loop bladder substitution in dogs, by different methods. A direct end-to-side anastomosis had better results and there was a marked reduction in mucous secretion after the bowel mucosa had been bathed in urine for a period. This method also has limited use in lower urinary tract complications which involves urinary bladder or urethra.

Hays et al. (1961) suggested a valve-like anastomosis of the isolated ileal segment to the colonic segment to minimise fecal regurgitation into the reformed bladder. In this operation the distal end of the ileal segment was made in the form of an everted nipple which protruded 1 cm. into the lumen of the colon after suturing, to act as a valve to minimise faecal regurgitation. The proximal end of the isolated ileal segment was anastomosed to the bladder.

In 1962 Cordonnier carried out ileo-cystostomy by transplanting the trigone into the proximal end of an isolated ileal loop as treatment for urinary incontinence and neurogenic dysfunction of the bladder. Though the upper urinary tract was found to be normal in these cases, the increased incidence of calculi formation, bladder degeneration, and technical difficulty in primary closure

of the urethra, were observed and a permanent cystostomy without tubes was suggested as a preferable method.

Anderson (1962) carried out experimental studies on ureteral replacement with isolated ileal loop and reported that though infection did not occur, hydronephrosis and oedema of the bladder mucosa were noticed in the patients. The same work was carried out by Gupta et al. (1974) and it was suggested that narrowed ileal loop with mucosa scraped off serves better than full diameter ileal loops.

Gale (1962) adopted Howard's (1959) technique of cystocolostomy by anastomosing of the fundus of bladder to the colon, in five clinical cases of urethral obstruction in cats and 3 cats survived for a period of 2½ years. Evidence of ascending infection and uraemia was noticed in cases which did not survive.

A successful transplantation of the neck of bladder to the abdominal wall was reported by Hoffer (1962) in a toy terrier suffering from hyperplasia of prostate and bilateral perineal hernia and reported that the animal had complete control over urination except for occasional dribbling.

Helper and Schiller (1962) adopted a method of urethral prosthesis by an isolated ileal segment. The urine was conducted through the cutaneous anastomosis.

Though the surgery was successful, a rise in blood urea nitrogen, up to 21-49 mg/100 ml. (Normal: 10-20 mg/100 ml.) of blood was noted. The dogs also showed a moderate rise in leucocyte count after operation. The haemoglobin values were within normal range. Serum sodium and serum potassium were within normal range (Sodium: 130-160 mg/100 ml. and Potassium: 3.7 - 5.8 mg/100 ml.). In a few cases, the lumen of the ileal loop was partially obstructed by mucus and with the small orifice the animal took 2-3 times the normal length of time for urination and thus the limiting factor was the maintenance of the orifice patent.

Markowitz (1964) carried out experimental transplantation of ureters to the anterior wall of abdomen. Difficulties were encountered in the procedure to establish a permanent and patent ureteral opening to the outside and there was the possibility of ascending infection.

Carbone (1963) performed perineal urethrostomy in cats but contended that all problems of urethral obstruction cannot be solved by this as cystitis and urethritis which usually follow, need prolonged treatment.

Stockman (1966) reported that the major problems associated with permanent urethrostomy and urethral transplant were haemorrhage and the tendency for the wound to

close completely.

Manziano and Manziano (1966) reported that failure of perineal urethrostomy may be due to faulty surgical techniques, inadequate postsurgical care or irremediable bladder or kidney lesions.

Mannari (1966) carried out cystocolostomy and urethrocolostomy in experimental dogs. In both the cases a drainage tube was kept in situ for 48-72 hours after the operation and it was reported that patent opening was obtained in those instances where the tube was retained for 48 hours or more. The reports showed that voluntary control of urination was present in the animals. Cotton thread was stated to be not a suitable suture material for anastomosis. Cultural examination of urine at autopsy showed bacterial growth except in one case which showed sterile urine. A rise of blood urea nitrogen up to 58 mg./100 cc. of blood was noticed in cystocolostomy and up to 50 mg./100 cc. in urethrocolostomy. Fecal consistency in all dogs was semisolid. The author suggested that both methods were equally good but cystocolostomy is easy to perform and required less time than urethrocolostomy. Twitchell (1969) performed urethrocolostomy in a cat, which survived 4½ years without much clinical signs.

Pond and Texter (1970) developed an antireflex

method of joining the ureters with intact trigone to an ileal conduit in dogs. The intravenous pyelogram of all dogs showed prompt bilateral function and the blood urea nitrogen was normal. The urine culture from the ileal conduit was grossly infected with various organisms, though that from the kidney pelvis was sterile.

Lapides (1971) reported that vesicorectostomy or urinary diversion in man at the level of bladder by excising segments of bladder floor and rectum and anastomosing the bladder to the rectum, is a good form of urinary diversion when the anal sphincter is intact.

Nayar and Wilson (1974) carried out urinary diversion techniques in dogs and cats by cystocolostomy, urethrocology and ureterocolostomy. In all the three methods drainage tubes were used and anastomosis was by ordinary interrupted or continuous sutures using either 2/0 catgut or cotton thread size 60. Two cases showed slight evidence of peritonitis and one dog showed evidence of ascending infection. The problem of entrance of faeces into the bladder was not observed. Calculi formation was noticed in five cases where cotton thread was used for anastomosis.

MATERIALS AND METHODS

MATERIALS AND METHODS

The studies were conducted on apparently healthy dogs. Dogs of both sex were used for the experiments, classified into two groups. In Group I, vesico-colostomy and in Group II, vesico-rectostomy were performed (For purposes of description, the animals in Group I, are herein referred to as: No. 1/I, No. 2/I, No. 3/I, etc., and those in Group II, as: No. 1/II, No. 2/II, etc.).

Prior to surgery the animals were de-ticked, and those animals which showed intestinal parasitic infestation were treated. Blood of all animals were examined prior to surgery and at weekly intervals post operatively, for haemoglobin, blood urea nitrogen (BUN), and total leucocytes and differential count. Urine samples were collected and subjected to cultural examination at the time of surgery and at the time of sacrifice (or death) of the animal.

Pre-operative preparation. The dogs were starved for 20 to 24 hours prior to surgery and were given a warm soap water enema one hour before anaesthetisation. The animals were controlled in dorsal recumbency. Ventral abdominal area was prepared and disinfected in the usual manner.

Pre-anaesthetic medication. Triflupromazine hydrochloride ("Siquil"-Squibb) in a calculated dose of 2 mg./Kg. body weight was administered intravenously, fifteen minutes before the administration of the anaesthetic.

General anaesthesia. Thiopentone sodium ("Intraval sodium" - M & B) was administered as a 5% solution intravenously "to effect". In certain cases a second dose was administered intravenously if the animal showed signs of recovery before completion of the operation.

Site. The urinary bladder was approached through the midline incision starting from 5 cm. behind the umbilicus extending towards the pubis.

Anatomical considerations. The urinary bladder is a pear-shaped musculomembraneous sac which lies in the abdominal cavity when distended, and lies in the pelvic cavity when it is empty. Dorsal to the bladder is the rectum (Fig.1). In females the uterus is positioned between the bladder and rectum. The bladder is suspended by the two lateral umbilical ligament and one large middle umbilical ligament. Ureters, blood vessels, nerves and certain amount of fat are present between the layers

of lateral ligaments. The ureters enter the bladder at the region of dorsal part of the neck, forming a triangular area with the line connecting the ureteral openings and the urethral exit, called trigonum vesicae. The urethra consists of a pelvic part and penile part in the male. Prostatic urethra is the first part of pelvic urethra, which is completely surrounded by the prostate. In the female dog the urethra is wider, shorter and more dilatable. The urinary bladder receives its blood supply from the umbilical and urogenital arteries (the cranial and caudal vesical arteries). Nerve supply is from the pelvic plexus situated dorsal to the prostate. Pelvic plexus contains sympathetic fibres from hypogastric nerve and parasympathetic fibres from the pelvic nerves. The pelvic nerves are the nerves of defecation, urination and erection, while hypogastric or colonic nerves favour retention of urine and faeces. Urethra and prostate receive blood supply from the prostatica urethral and prostatica vesical branches of internal iliac. The nerve supply is from pelvic plexus. The colon is divided into three parts as the ascending or right colon, a transverse colon which is cranial to the root of mesentery, and a long descending colon or left colon. Left colon averages 20 cm. in length in a medium sized dog. The diameter of

the colon gradually increases from the ileo-caecal junction to the rectum. The descending colon continues as the rectum without any marked bend except for having a gradual slope towards the right when it reaches the pelvic inlet. The colon consists of a serous coat, muscular coat and a mucous coat. The mucosa is thicker and intestinal glands (Lieberkuhn) are longer than in the small intestine. The blood supply to the left colon is mainly from the caudal mesenteric artery. A good part of left colon also receives its blood supply from the middle colonic artery. The nerve supply is from pelvic plexus. The rectum is the continuation of the terminal colon, begins from the pelvic inlet, and measures 10 cm. in an average sized dog. There is no demarkation between the colon and anterior part of rectum. The rectal wall is covered by the peritoneum only up to the level of second or third coccygeal vertebrae (Fig.2). The crypts of Lieberkuhn in the rectum are longer than that of the colon and contains many mucous cells (goblet cells). The submucosa of rectum is thick and studded by numerous lymph nodes and there is an increase in the thickness of tunica muscularis of the rectum as compared to the colon. The blood supply to the rectum is from the haemorrhoidal artery. Anterior part of rectum also

receives supply from posterior mesenteric artery. The nerve supply for the rectum is from the pelvic plexus. (Bradley, 1948; Gordon, 1960; Miller, 1952).

Technique. In female dogs, a longitudinal incision was made on the midline starting from the umbilicus to the pubis. In male dogs the skin incision was made 2 cm. lateral to the penis and prepuce and the penis and prepuce overlying the midline were deflected to one side to get at the mid-line and linea alba. The caudal hypogastric vessels lying immediately below the skin and ramifying towards the prepucial area were avoided or cut between ligatures before abdominal cavity was entered.

The peritoneal cavity was entered through a longitudinal incision on the linea alba taking care to avoid injury to visceral organs. The wound edges were retracted and the bladder was then exposed. A sample of urine was collected aseptically for cultural examination. The bladder was then emptied with gentle pressure. The neck of bladder was isolated by removing the adipose tissue around it.

Anastomosis. The different techniques of anastomosis adopted in the two groups are explained below:

1. Vesico-colostomy. In Group I, vesico-colostomy was done (Fig.3). The neck of bladder was ligated proximal

to the prostate in male dogs, and at the commencement of the urethra in female dogs, care being taken to exclude the vesical branch of vesico-genital vessels from the ligature. The descending colon was identified and exposed. The viscera were packed off with sterile towels. The contents of colon, were gently milked towards the rectum and Doyen's bowel clamps were used to clamp the colon. The fundus of the bladder and the anti-mesenteric side of the posterior part of descending colon were sutured together by continuous sutures, for a distance of about 2 cm. and the ends of the suture thread were left long. An opening of 1 cm. diameter was made on the anti-mesenteric part of the colon, close to the suture line. A similar incision was made on the apposing portion of the bladder so that the length of the two incisions were equal. The edges of wound on the colon were anastomosed to the edges of the wound on bladder by means of Connells suture, or simple continuous suture using 2/0 catgut or No. 60 cotton thread to provide a communicating ostium between the bladder and colon. The first line suture was continued over this layer, thus completing the anastomosis.

2. Vesico-rectostomy. In Group II vesico-rectostomy was performed (Fig.4). The neck of bladder was cleared

of fat and was clamped. A transfixing ligature was applied on the urethra, distal to the clamp (proximal to the prostate gland in male dogs). The urethra was severed between the clamp and the ligature. The rectum was isolated and lifted and bladder neck was sutured to the rectal wall for about half of its circumference, by inserting continuous suture and the thread was left long. An opening was made on the rectal wall equal and corresponding to the width of the bladderneck. The two openings were then anastomosed with Connells suture. The first line of suture was then carried around, burying the Connells' suture, thus completing the anastomosis.

The patency of the anastomosis in each case was checked by pressing the bladder and making urine to enter the colon or rectum, as the case may be, through the new opening. The abdominal wound was sutured in the usual manner. The skin wound was sutured by interrupted sutures using monofilament nylon.

Postoperative care. The wound was daily cleaned with 70% alcohol and was dressed with Pendistrin-SH (Squibb) ointment. Antibiotics (Streptomycin 0.5 gm. with Penicillin-4 lakhs I.U.) were administered intramuscularly for four days postoperatively.

Abdominal sutures were removed on the seventh or eighth day. The animals were kept under observation for one month postoperatively and the general observations made are recorded in table 1 and 2. Rectal temperature was also recorded daily (Table 3 & 4). Samples of blood were collected and studied at weekly intervals. Haemoglobin content, total and differential white cell count and blood urea nitrogen (BUN) were recorded until the animals died or were sacrificed after 30 days (Table 5 & 6). Postmortem was conducted when the animal died or when it was sacrificed. Histopathological examination of the anastomotic area was conducted in two cases. Urine samples were collected pre-operatively as well as at the time of autopsy and cultural examinations were conducted (Table 7).

RESULTS

RESULTS

No. 1/I. The dog was kept under observation for 16 days and was apparently normal during postoperative period except for having loose motion, loss of appetite, and a crouched posture during the first week. The ostium was well established and urine was being passed through the rectum, mixed with faeces. Body temperature was within normal limits. There was no incontinence of urine from the third day (Table 1). Total leucocyte count revealed a slight reduction in the first week, followed by a rise in the second week, but within normal range. Neutrophilia was noticed during second week. Haemoglobin content showed a reduction in the second week and ranged within physiological limits. There was no significant variation in the amount of blood urea nitrogen (Table 5). The animal was sacrificed on the 17th day and postmortem examination was conducted (Table 8). The bladder was contracted. Urine was yellowish and turbid. Cotton thread used for anastomosis was not fully encapsulated. Left kidney showed yellowish white patches of nephritis on the surface. Cultural examination of urine showed the presence of Proteus organisms in abundance (Table 7). The colon and rectal mucosa were grossly normal.

No. 2/I. The animal was kept under observation for 44 days. Distension of abdomen was noticed on the next day of operation and urine was dribbling through the rectum. But the incontinence of urine stopped by the 3rd day. Appetite was good and the animal was apparently normal through out the postoperative period. The ostium was well established. Loose motion was noticed because faeces and urine were voided together (Table 1). Rectal temperature did not show any significant variation during the postoperative period (Table 3). Total leucocyte count revealed a slight rise in the first and second week, reduction in the 3rd week, and followed by a rise at the end of 4th week. Neutrophil count showed a reduction in the second week and a corresponding increase in lymphocytes, which reached normal at the end of fourth week. Haemoglobin was found to be reduced from 9 g. % to 7 g. % at the end of fourth week. Blood urea nitrogen content increased on the first week and then gradually declined to a very low level on the 4th week (Table 5). On the 45th day, the animal was sacrificed. Autopsy revealed a contracted bladder (Fig. 5) with yellowish urine which contained flakes of mucus. The ostium was patent (Fig. 6). Bladder mucosa was hyperaemic and colon and rectal mucosa beyond the site of anastomosis was hyperaemic (Table 8).

Section of right kidney showed small whitish streaks, suggestive of nephritis. Histopathological examination of anastomatic area revealed proper healing of the cut surface of the bladder and colon (Fig. 7). Cellular infiltrations were noticed in the mucosal, muscular and serous coats of bladder as evidence of non-suppurative cystitis (Fig. 8). Colon mucosa were intact and there was no pathological change (Fig. 9). On cultural examination of urine *Corynebacterium pyogenes*, *Staphylococci* and *Streptodocci* were present (Table 7).

No. 3/I. The animal was alive for 21 days post-operatively. From the third day the appetite was normal. Straining while passing urine was noticed on the sixth day. Motion was semisolid in consistancy. Voluntary control over passing of urine was acquired from the third day (Table 1). Temperature was subnormal in the second week (Table 3). From the 14th day onwards the animal was passing urine through the genital passage indicating a failure of the ligature at the neck of the bladder. So surgery was performed on 19th day and the bladder neck was divided between ligatures. The neck of the bladder was closed by inversion sutures. On 21st day loose motion was noticed, the animal was unable to stand up.

Haematological study revealed a reduction in total

leucocytes count at the end of first week and an increase in the third week. A rise in neutrophil count and a reduction in eosinophils was noticed at the end of first week. Later eosinophil count showed a gradual increase. An increase in haemoglobin content was noticed on the third week after a slight reduction in the second week. Blood urea nitrogen showed a slight reduction at the end of second week, though within normal range (Table 5). The animal was very weak and died on the 22nd day. Postmortem examination revealed a small contracted bladder which was completely empty. Abdominal cavity contained a little serous fluid. The opening to the colon was not patent and was closed by scar tissue formation. Nephritis was noticed. Colon and rectal mucosa were normal (Table 8). Culture made from a swab of the bladder revealed the presence of coccobacillary organisms (Table 7).

No. 4/I. The animal was alive upto 40 days post-operatively. From the second day onwards the animal had normal appetite. Control over passing of urine was acquired from the third day. The abdominal sutures were removed on the seventh day. On 24th and 25th day the animal showed straining while passing faeces and urine. Slight distension of abdomen was noticed from 27th day onwards. There was pain on palpation of the abdomen. The animal

was trying to keep the forepart higher than the hindpart of the body. From 37th day onwards appetite was poor (Table 1) and temperature was subnormal on the 39th day. The animal died in the afternoon of 40th day.

Haematological studies revealed a reduction in total leucocyte count in the first week and a rise in the second, third and fourth week, which remained within normal range. A slight neutrophilia was noticed at the end of second week and became normal by the end of third week. A reduction in haemoglobin content was noticed at the end of fourth week, after a small rise at the end of first and second week. Blood urea nitrogen level increased to almost double the preoperative value in the first week, showed a reduction in the second week and a rise at the end of third week and remained at that level to the end of fourth week (Table 5). However these fluctuations were not significant and were within normal limits.

Postmortem examination revealed a distended bladder. Urine was normal in colour and consistency. Anastomosis has healed. Fistula was too small in size. There was no lesion in the colon or rectum. Bladder mucosa showed few haemorrhagic spots. Kidneys and ureters were grossly normal. The whole of the small intestine was slightly

bluish in colour and intussusception of the ileum was noticed, which could be the cause of death of the animal. The urine sample could not be subjected to cultural examination postoperatively (Table 8).

No. 1/II. The animal was kept under observation for 38 days. The animal was apparently healthy during the postoperative period. From the third day onwards voluntary control over voiding of urine was acquired. Fistula (ostium) was well established. The faeces was always mixed with urine and was loose in consistency (Table. 2). Appetite was good throughout the postoperative period. The body temperature was subnormal during the first postoperative week (Table 4). Haematological study revealed a rise in total leucocyte count, through out the postoperative phase, though within normal limits. A reduction in the neutrophil count and an increase in lymphocyte count was noticed at the end of first week but it returned to the original values at the end of fourth week. Haemoglobin content was low in the second and third week and at the end of fourth week the value reached the preoperative level. Blood urea nitrogen level increased slightly in the third week but was lower at the end of fourth week (Table 6). An intravenous pyelogram taken on the 35th day revealed normal kidney filtration of the contrast medium and filling of the bladder and its emptying into the rectum. On the

39th day the dog was sacrificed. Postmortem examination revealed a contracted bladder (Fig.10). The right ureter showed slight dilatation. The ostium was well established (Fig.11). Adhesion of omentum to the bladder was noticed. Fecal material was noticed in the bladder and there was evidence of cystitis. There was no lesions in the colon or rectum (Table 8). Culture of a swab taken from the bladder revealed the presence of Coliforms and Proteus organisms (Table 7).

No. 2/II. The dog was kept under observation for 40 days postoperatively. Appetite was good from the second day and up to the fifth day the animal did not pass faeces and urine. A glycerin enema was given from third to fifth day to evacuate the bowels. During these periods there was distension of abdomen and the distended bladder could be palpated. The bladder was emptied by puncturing with a hypodermic needle. On the sixth day the dog was able to pass clear urine through the rectum. The dog was apparently healthy from the sixth postoperative day. Loose motion was noticed from the seventh day. Control over micturition was acquired from the sixth day onwards (Table 2). Temperature was subnormal in the first week but became normal on the 12th day, rose slightly from 15th to 19th day and then became normal on the 20th day (Table 4).

Haematological study revealed a reduction in total leucocyte count in the first week and a rise in the second and third week and then a reduction in the fourth week. Differential count showed no significant variation. A rise in haemoglobin content was noticed in the second and third week and a reduction at the end of fourth week. Blood urea nitrogen was within normal limits but showed a gradual increase at the end of second week but became normal at the end of fourth week. Intravenous pyelogram on the 40th day showed normal kidney filtration and the filling of the bladder with the contrast medium. The bladder was emptied through rectum after applying gentle pressure. On the 41st day, the animal was sacrificed and postmortem was conducted. Autopsy findings revealed no gross abnormality except that the cotton thread used for anastomosis was not fully encapsulated. Slight thickening of the bladder wall was also noticed (Table 8). Cultural examination of urine sample at the time of autopsy revealed the presence of Coliform organisms (Table 7).

No. 3/II. The dog was alive up to 10th day post-operatively. On the second and third days, the animal passed clear urine through the rectum. Appetite was poor. On the fourth and fifth days blood was noticed in the urine

mixed with faeces. Animal was very weak (Table 2). From seventh day onwards vomiting was noticed during night. Haematological examination revealed a slight reduction in total leucocyte count in the first week. A slight increase in neutrophils and a reduction in lymphocytes was noticed. Haemoglobin content showed a reduction at the end of first week. Blood urea nitrogen showed a rise up to 65.27 mg. The animal died in the morning of 11th day and postmortem examination was conducted. The bladder was contracted and thickened and contained a little, light yellowish, urine. A few haemorrhagic spots were noticed on the bladder mucosa. Rectal mucosa at the site of anastomosis was inflamed. Opening was patent (Table 8). Kidney and ureters were grossly normal. Cultural examination of urine revealed the presence of Coliforms and gram negative organisms (Table 7).

No. 4/II. The animal was kept under observation for 33 days. Appetite was normal from the third day onwards. Control over micturition was acquired from the third day (Table 2). Fecal consistency was semisolid. Animal was apparently normal till the 32nd day. Total leucocyte count showed a rise at the end of second week but then gradually reduced till the end of fourth week. Neutrophilia was noticed at the end of first week but was reduced to normal

from the second week. Haemoglobin content reduced in the first and second weeks but reached normal in the third week. Blood urea nitrogen showed a gradual increase in the second week and reached 22.5 mg. at the end of fourth week (Table 6). On the 33rd day a barium enema was administered and a radiograph was taken which revealed to entrance of the contrast media into the bladder (Fig.12). On the morning of 34th day the animal was sacrificed and postmortem was carried out. On autopsy the bladder was found to be slightly thickened. Bladder contained clear urine. Bladder mucosa was congested. Hard faecal material was found to be adherent to the cotton thread used for anastomosis. Colon and rectal mucosa were normal (Table 8). Histopathological examination of the anastomosed area revealed normal healing (Fig.13). Mucosa of the bladder showed moderate diffuse infiltration with neutrophils, lymphocytes and mononuclear cells and focal areas of fibrosis (Fig. 14). Muscular band was moderately oedematous. These changes were indicative of mild cystitis. A swab from the bladder on cultural examination revealed the presence of Coliforms and Proteus organisms (Table 7).

DISCUSSION

DISCUSSION

The experiments vesico-colostomy and vesico-rectostomy were conducted in two groups, each group consisting of four dogs. The experimental technique adopted was to anastomose the fundus of bladder to the colon in one group and to anastomose the neck of bladder to the rectum in the other group. The artificial openings communicating the bladder to the colon or to the rectum, as the case was, were found well established in all dogs except in dog No.3/I. Clinically all dogs were apparently healthy except dogs No.3/I and 4/I and 3/II.

In all dogs anastomosis was perfect and there was no leakage of urine into the abdominal cavity even though no indwelling drainage tube was used. This was an advantage over Mannari's (1966) experiment who reported the use of drainage tube.

The ostium made to the colon was occluded by scar tissue in dog No. 3/I and complete closure of the ostium was noticed by the 14th postoperative day. In dog 4/I the ostium was found to be constricted due to scar tissue formation and cicatricial contraction.

Within 48 to 72 hours all dogs could pass urine through the rectum with voluntary control. No soiling of the perineum was noticed, except in dog 3/I in which

soiling of perineum and hind quarters was noticed on the day of its death. In all dogs where the ostium was well-established, loose motion was noticed as the faeces and urine were mixed together. Dogs No. 1/II, 2/II and 4/II were sometimes able to pass clear urine through the rectum. This agrees with the observations of Moore (1954) in human beings. Control over micturition was acquired in all dogs within about three to four days after operation. The control over micturition was achieved evidently by the intact anal sphincter. Similar results were also observed in the work of Beamer (1959), Howard (1959), Gale (1962), Mannari (1966), Moore (1954) and Robbins (1957). None of the experimental dogs developed any eczematous lesions during the postoperative period though such lesions were noticed in 30% of the cases reported by Mannari (1966).

Urine samples were subjected to cultural examination before surgery and were found to be sterile except in dogs No. 1/I and 2/II where E.coli and other gram negative organisms respectively were isolated. Urine culture at autopsy was not done in dog No. 4/I. In others the urine cultures were found to be contaminated with either E.coli, Streptococci, Staphylococci, Corynebacterium and other gram negative organisms. Mannari (1966) reported that culture of urine sample postoperatively contained E.coli

or anthracoid organisms except for a single case where sterile urine was obtained.

A rise in blood urea nitrogen was noticed in dogs 2/I and 3/II. The dog 3/II had a rise up to 65.27 mg. at the end of first postoperative week, possibly due to excessive fluid loss through vomiting and bleeding that occurred on the third and fourth day. Mannari (1966) recorded a rise of blood urea nitrogen up to 58 mg. and reported that there must be a definite rise in blood urea nitrogen level during the postoperative phase. This was not true in the above experiments since some dogs (1/II & 2/I) had a value less than normal. This lowering of blood urea nitrogen may be due to dietary interferences i.e., a low protein diet. In addition, dog No. 2/I was pregnant and had given a litter of pups during the experimental period. In all other cases there was not much increase and the value remained within normal range. From the observations, it could be inferred that a surgical urinary diversion does not always effect an increase in blood urea nitrogen and that if any reabsorption of urine occurred in the colon and rectum, the quantity was negligible to bring about significant changes in blood urea nitrogen level.

Dogs which survived for more than one month

dogs No. 2/I and 4/I showed a reduction of haemoglobin content (Table 5) at the end of fourth week and in others the haemoglobin content of blood showed variation in different periods of the postoperative phase.

Total leucocyte count in 50% cases (No. 1/I, 3/I, 4/I and 2/II) showed a sudden decrease at the end of first postoperative week, which became normal subsequently and remained normal or higher (Table 5) but within normal range. In dogs No. 1/II and 4/II the total leucocyte counts were always high from those of the preoperative values. In dog No. 2/I a rise in leucocyte count was noticed in the first postoperative week. A similar rise was seen in the second week in dogs No. 2/I, 3/I, 3/II and 4/II (Tables 5 & 6). In the dog No. 4/I the neutrophil count was slightly low at the end of third and fourth week.

Dogs 1/II and 2/II were subjected to intravenous pyelography at 35th and 40th day respectively. In both cases there was normal kidney filtration and the contrast media were seen in the bladder 10-15 minutes after injection of the media and was emptying into the rectum. A radiograph of the dog No. 4/II was taken after administration of barium enema to outline the rectum and to

see whether any regurgitation of the material into the bladder occurs. Radiograph after 5 minutes of administration of barium enema showed that the bladder was completely filled with the contrast media (Fig. 12). This corresponds to the result obtained by Robbins (1957) in human beings.

Colon and rectum were found grossly normal at autopsy except in dog No.3/II in which slight inflammation of the mucosal layers was noticed at the site of anastomosis. Hyperaemia of the colon and rectal mucosa was noticed in dog 2/I. In dog No. 1/I, 2/II and 4/II cotton thread was seen retained on the suture line at the time of autopsy and there were no complications, with these materials except in dog No.4/II in which hard faecal matter was found adherent with the cotton thread. In all others sutures were encapsulated and no calculi was found in any case. This was in contrast to the observations of Mannari (1966) and Nayar and Wilson (1974) who found cotton suture as favouring calculi formation.

Cystitis was not found to acquire serious dimension except in dogs 2/I, 1/II and 4/II. Thickening and contraction of the bladder wall was noticed in dogs

1/I, 2/I, 3/I, 1/II and 3/II. This may be due to the continuous emptying of the urine into the colon or rectum. Kidneys and ureters were grossly normal except in dogs No. 1/I, 2/I, 3/I and 1/II. Dog 1/II showed slight dilatation of the right ureter and dog 1/I, 2/I and 3/I showed nephritis.

CONCLUSION

CONCLUSION

Vesico-colostomy and vesico-rectostomy were done in experimental dogs and the following conclusions were drawn from the experiments.

1. Anastomosis, either between the fundus of bladder and colon, or between the neck of bladder and rectum, could be successfully adopted in dogs for diversion of urine from the bladder.

2. Introduction of drainage tube was not necessary for the establishment of a patent opening from the bladder to the colon or rectum.

3. The expulsion of urine was not affected in the experimental dogs and they voided faeces and urine voluntarily without soiling the perineum three to four days after surgery.

4. The use of cotton thread as suture material for anastomosis had no detrimental effect as there was no evidence of calculi formation or suppuration.

5. Gross contamination of bladder with faecal matter, though observed in one case at postmortem, did not cause any secondary complication.

6. Cystitis, observed in a few cases, were only of a mild type.

7. Infection of bladder was possible as evidenced by the presence of organisms in urine cultures but was unaccompanied by secondary complications.

8. In comparison, the ostium formed by surgery was well-established in animals in Group II (Vesico-rectostomy). Among the animals of Group I (vesico-colostomy), only 75% maintained a satisfactorily patent ostium.

Considering the overall results of the experiments, vesico-rectostomy seems to be preferable to vesico-colostomy.

SUMMARY

SUMMARY

Experimental vesico-colostomy and vesico-rectostomy, were carried out in two groups four dogs in each group. In the Group I (vesico-colostomy), the fundus of bladder was anastomosed to the colon. In Group II (vesico-rectostomy), the bladder neck was isolated and anastomosed to the rectal wall. The majority of animals were clinically normal except for having loose motion due to the mixing up of urine and faeces. The ostium was well-established in six dogs; but in one dog (4/I) the opening was reduced to a small size. In another dog the opening was completely closed by scar tissue formation.

In Group II (vesico-rectostomy) the opening was patent in all dogs. A gradual rise in blood urea nitrogen was noticed except in a few cases where reduction of blood urea nitrogen was noticed after the fourth postoperative week. In most cases haemoglobin content showed only little variation. Changes in white cell count during postoperative period were not significant.

During autopsy the bladder was found to be contracted in most cases where ostium was well-established. In dogs 4/I, 2/II and 4/II the bladder was normal in size but the wall was slightly thickened. Cystitis was observed

in three of the experiments.

Entrance of faeces into the bladder was noticed in dog No. 1/II at autopsy. In dog 4/II, a radiograph taken after a barium enema revealed entry of barium enema into the bladder. Kidneys and ureters were apparently normal at autopsy.

Radiographs were taken after injecting contrast medium intravenously in two dogs (No. 1/II and 2/II) showed proper filling and evacuation of the bladder.

It is concluded that vesico-colostomy and vesico-rectostomy could be successfully performed in dogs as urinary diversion techniques. Vesico-rectostomy gave better results than vesico-colostomy as dogs in the vesico-rectostomy group maintained the ostium better than the dogs of vesico-colostomy.

TABLES

Table 1. Postoperative general observation - Group I (Vesico-colostomy)

Sl.No./ Group No.	Date of surgery	General appearance	Appetite	Straining	Faecal consist- ency	Incont- ience of uri- ne/ fae- skin.	Soiling of peri- neal skin.	Remarks
1/I	8-8-1974	Satisfactory	Good except for the fir- st week	Absent.	Loose	Absent	Absent	
2/I	11-12-'74	Satisfactory	Good except for the fir- st 4 post- operative days.	Noticed on 7th to 10th postoper- ative day	Loose	Absent	Soiling noticed occasion- ally	
3/I	20--3-'75	Satisfactory	Good	Present on the 6th post- operative day	Semi- solid	Absent	Absent	
4/I	6--5-'75	Satisfactory for the fir- st 27 days postoperat- ively	Good up to 37th day and poor later	Noticed from 24th day on- wards	Loose	Absent	Absent	

Table 2. Postoperative General observations - Group II (Vesico-rectostomy)

Sl.No./ Group No.	Date of surgery	General appearance	Appetite	Straining	Faecal consist- ency	Incon- tience of urine/ faeces	Soiling of peri- neal skin.	Remarks
1/II	27-11-1974	Satisfactory	Good	Absent	Loose	Absent	Absent	
2/II	8--5-1975	Satisfactory	Good	Noticed in the first five post- operative days	Loose	Absent	Absent	
3/II	30--5-1975	Poor	Poor	Absent	Loose and blood tinged in the first week	Absent	Absent	
4/II	26--6-1975	Good	Good	Absent	Loose	Absent	Absent	

Table 3. Rectal temperature (degree centigrade), recorded preoperatively, and on the next day after operation, and then at weekly intervals postoperatively, of Group I animals (Vesico-colostomy)

Sl.No./ Group No.	Preoper- ative	1st day (Post- operative)	First week	Second week	Third week	Fourth week
1/I	38.9	39.1	38.9	38.9	..	..
2/I	38.6	38.4	38.7	38.4	38.2	38.5
3/I	38.9	39.0	38.8	38.0	39.2	..
4/I	38.9	39.1	38.9	39.8	39.4	38.9

(Normal range: 38.4°C to 39.4°C)

Table 4. Rectal temperature (degree centigrade), recorded preoperatively, and on the next day after operation, and then at weekly intervals postoperatively, of Group II animals (Vesico-rectostomy)

Sl.No./ Group No.	Preoper- ative	1st day (Post- operative)	First week	Second week	Third week	Fourth week
1/II	38.4	38.4	38.2	38.8	38.6	38.8
2/II	38.8	38.0	38.2	38.9	38.9	38.6
3/II	38.9	38.6	37.4	..	..	..
4/II	38.9	38.4	38.9	38.9	38.9	38.9

(Normal range: 38.4°C to 39.4°C)

Table 5. Data on examination of blood of Group I. animals (Vesico-colostomy)

Sl.No/ Group No.	Date of surgery	Period after which blood was exa- mined.	Total leuco- cytes. (cells/ cmm.)	Percentage leucocyte count					Hb (g./ 100cc.)	BUN (mg./ 100 cc)	Remarks	
				Neut- rophils	Bands	Lymp- hocy- tes	Eosi- noph- ils	Mono- cytes				Baso- phils
1/I	8--8-'74	Preoper- ative	10,250	62	0	31	3	4	0	11.00	11.18	
		1st week	9,950	55	0	34	4	4	0	11.00	10.90	
		2nd week	11,450	82	0	14	3	1	0	9.00	11.45	
		3rd week	..	..	..	..	..	..	..	..	..	destroyed
		4th week	..	..	..	..	..	..	..	..	..	17th day.
2/I	11-12-'74	Preoper- ative	8,750	62	0	28	8	2	0	9.00	10.90	
		1st week	9,200	64	3	28	3	2	0	9.00	30.97	
		2nd week	8,950	49	4	42	4	1	0	7.00	16.36	
		3rd week	8,150	69	2	22	3	4	0	7.50	9.54	
		4th week	10,450	62	6	30	2	0	0	7.00	6.75	
3/I	20--3-'75	Preoper- ative	9,750	70	0	16	13	1	0	12.00	12.00	
		1st week	7,450	82	2	10	4	2	0	12.00	12.60	
		2nd week	9,600	72	3	10	9	0	0	11.50	10.90	
		3rd week	10,950	70	2	19	8	1	0	14.00	..	Died 22nd
		4th week	..	..	..	..	..	..	..	..	..	day

Contd.....

Table 5. (Continued)

Sl.No./Date of Group No.	Date of surgery	Period after which blood was examined.	Total leucocytes (cells/cmm.)	Percentage leucocyte count					Hb (g./100cc)	BUN (mg./100 cc)	Remarks	
				Neutrophils	Bands	Lymphocytes	Eosinophils	Mono-cytes				Basophils
4/I	6-5-'75	Preoperative	9,600	67	0	28	4	1	0	10.00	6.81	
		1st week	8,500	64	3	26	4	3	0	10.00	12.27	
		2nd week	11,450	77	3	18	1	1	0	11.50	11.72	
		3rd week	10,450	69	3	24	2	1	0	10.50	17.18	
		4th week	10,400	68	4	26	1	1	0	6.50	17.10	
Normal range			6,000	60	0	12	2	3	0	12	10	
			to	to	to	to	to	to	to	to	to	
			18,000	77	3	30	10	10		18	20	

Table 6. Data on examination of blood of Group II. animals (Vesico-rectostomy)

Sl.No./Date of Group No.	Period after surgery which blood was examined	Total leucocytes (cells/cmm.)	Percentage leucocyte count						Hb (g./100cc)	BUN (mg./100 cc)	Remarks
			Neutrophils	Bands	Lymphocytes	Eosinophils	Mono-cytes	Basophils			
1/II 27-11-'74	Preoperative	8,650	60	0	34	3	3	0	11.00	10.90	
	1st week	10,800	35	0	62	2	1	0	11.00	12.27	
	2nd week	8,800	59	4	27	6	4	0	10.50	13.93	
	3rd week	9,150	55	4	35	3	3	0	10.00	16.85	
	4th week	9,600	56	3	36	3	2	0	11.00	6.81	
2/II 8--5-'75	Preoperative	11,200	65	0	29	5	1	0	11.00	9.54	
	1st week	9,150	62	4	30	3	1	0	11.00	10.00	
	2nd week	12,300	64	3	27	5	1	0	12.00	13.43	
	3rd week	11,650	59	5	30	4	2	0	12.00	12.00	
	4th week	8,100	65	1	30	3	1	0	7.50	10.90	
3/II 30--5-'75	Preoperative	9,000	61	0	37	1	1	0	13.50	9.00	
	1st week	8,000	67	5	25	1	2	0	7.50	65.27	
	2nd week	..	..	..	..	..	..	..	..	..	Died on
	3rd week	..	..	..	..	..	..	..	..	..	9-6-75
	4th week	..	..	..	..	..	..	..	..	..

Contd.....

Table 6. (Continued)

Sl.No./ Group No.	Date of Surgery	Period after which blood was exa- mined	Total leuco- cytes (cells/ cmm.)	Percentage leucocyte count					Hb (g./ 100cc)	BUN (mg./ 100 cc)	Remarks	
				Neut- rophils	Bands	Lymp- hocy- tes	Eosi- noph- ils	Mono- cytes				Baso- phils
4/II	28--6-'75	Preoper- ative	8,000	79	0	12	8	1	0	12.50	9.00	
		1st week	8,450	88	1	9	2	0	0	11.00	13.09	
		2nd week	9,950	73	2	24	1	0	0	11.00	16.50	
		3rd week	9,400	73	5	17	4	1	0	12.50	15.00	
		4th week	9,000	73	2	19	5	1	0	12.50	22.50	
Normal range			6,000 to 18,000	60 to 77	0 to 3	12 to 30	2 to 10	3 to 10	0	12 to 18	10 to 20	

Table 7.

Cultural examination of urine.

Sl.No./ Group No.	Preoperative examination		Post operative examination		Remarks
	Date of Collection	Result	Date of collection	Result	
<u>I. Vesico-colostomy</u>					
1/I	8--8--1974	Coliforms	24--8-1974	Culture overgrown by proteinis orga- nisms.	
2/I	11-12--1974	Sterile	25--1-1975	Coryne bacterium pyogenis, Strepto- cocci and Staphylococci.	
3/I	20--3--1975	Sterile	10--4-1975	Coccobaccillary rods.	
4/I	6--5--1975	Sterile	..	..	Not done
<u>II. Vesico-rectostomy</u>					
1/II	27-11--1974	Sterile	6--1-1975	Coliforms and Proteus vulgaris.	
2/II	8--5--1975	Coccobaccillary rods	17--6-1975	Coliforms	
3/II	30--5--1975	Sterile	9--6-1975	Coliforms and gram negative rods	
4/II	28--6--1975	Sterile	31--7-1975	Coliforms and Proteus vulgaris.	

Table 8.

Autopsy findings

Sl.No./ Group No.	Date of surgery	Date of death or sacri- fice	Healing of anas- tomosis and pa- tency of ostium.	Leakage of urine into the abdomen	Condition of bladder	Colon mucosa beyond the le- vel of anasto- mosis	Rectal mucosa beyond the le- vel of anasto- mosis	Anus and peri- neal skin.	Remarks
1	2	3	4	5	6	7	8	9	10
<u>I. Vesico-colostomy</u>									
1/I	8--8-1974	24-8-74	Healed; Ostium patent	Absent	Contracted; wall thick- ened.	Normal	Abnor- mal	No lesion	Nephri- tis.
2/I	11-12-1974	25-1-75	Healed; Ostium patent	Absent	Contracted; wall thick- ened, Faecal regurgitat- ion; cystitis	Hyper- aemic	Hyper- aemic	No lesion	Nephri- tis
3/I	20--3-1975	10-4-75	Healed; Ostium occluded scar tissue	Absent	Contracted; wall thicken- ed	Normal	Normal	No Lesion	Nephri- tis
4/I	6--5-1975	14-6-75	Healed; Ostium reduced to a small opening	Absent	Distended; wall thick- ened	Normal	Normal	No lesion	Intussu- ception of inte- stine was noti- ced.

Contd.....



51

170010

Table 8. (Continued)

Sl.No./Date of Group No.	Date of surgery	Date of death or sacrifice	Healing of anastomosis and patency of ostium	Leakage of urine into the abdomen	Condition of bladder	Colon mucosa beyond the level of anastomosis	Rectal mucosa beyond the level of anastomosis	Anus and perineal skin	Remarks.
1	2	3	4	5	6	7	8	9	10
<u>II. Vesico-rectostomy</u>									
1/II	27--11-74	6-1-75	Healed; ostium patent	Absent	Contracted; wall thickened Fecal regurgitation; cystitis	Normal	Normal	No lesion	Slight dilatation of right ureter
2/II	8--5--75	17-6-75	Healed; ostium patent	Absent	Normal size; thickened wall	Normal	Normal	No lesion	
3/II	30--5--75	9-6-75	Healed; ostium patent	Absent	Contracted; wall thickened; Haemorrhagic spots on mucosa	Normal	Inflamed at the site of anastomosis	No lesion	
4/II	28--6--75	31-7-75	Healed; ostium patent	Absent	Normal size; Wall thickened; congestion of mucous membrane	Normal	Normal	No lesion.	

REFERENCES

REFERENCES

- Anderson, E.N. 1962 Urinary Diversion in Mongrel Dogs - A Research Problem using Isolated Loops of Ileum for Replaining the Ureter and/or Bladder. Can. vet. J. 3 (12):365-373.
- Barzilay, Benjamin. 1960 Experimental study of the techniques of uretero ileal anastomosis. J. Urol. 83 (5): 612-621.
- Beamer, R.J. 1959 Ureterocolostomy for Relief of Urinary Stenosis in the Domestic Cat. J. Am. vet. med. Ass. 134 (5) : 201.
- Bloom, Frank. 1954 Pathology of the Dog and Cat. American Veterinary Publications, Illinois, 1st. Ed. pp. 145, 174, 194.
- Bradley, O.C. 1948 Topographic Anatomy of the Dog. Oliver and Boyd., London, 5th. Ed. pp. 25.
- Carbone, Gregory 1963 Perineal Urethrostomy to Relieve Urethral Obstruction in the Male Cat. J. Am. vet. med. Ass. 143 (1) : 34-39.
- Cordonnier, Justin J. 1956 Urinary Diversion. A.M.A. Archs. Surg. 818-827.
- Cordonnier, Justin J 1962 Ileocystostomy: Follow-up Evaluation of 14 cases. J. Urol. 87 (1) : 60-62.
- Crowley, Robert T., and Swigart, Lake L. 1960 Urinary Diversion. Am. J. med. Sci. 240 (2) : 138-157.

- Dellmann, Horst-Duster. 1971 Veterinary Histology.
Lea and Febiger., Philadelphia,
1st. Ed. pp. 170.
- Dempster, W.J.,
John, Herman R., and
Daniel O. 1956 Transplantation of ureters
Br. J. Surg. 44 : 225.
- Donald, W.F.,
George, B.V., and
Willard, G.C. 1969 Ureterosigmoidostomy. A
fifteen year experiment.
J. Urol. 101 : 168.
- Gale, V.G. 1962 An Anastomosis of Bladder
to Colon as a Treatment of
Urethral Obstruction in the
Cat. Vet. Rec. 74 (45):
1228-1229.
- Gorden, Norma. 1960 Surgical anatomy of Bladder,
Prostate Gland and Urethra
in the Male Dog.
J. Am. vet. med. Ass. 215-221.
- Gupta, S.N.,
Agrawal, B.K.,
Garg, B.K.,
Gupta, A.K.,
Mittal, V.P., and
Sharma, B.D. 1974 Comparative study on the
replacement of ureter by
ileum.
Indian J. Surg. 36 (11):428.
- Hays, D.M., and
Powel, T.O. 1961 Vesicoileosigmoidostomy in
the treatment of extrophy of
of the bladder.
Surgery. 50: 411.
- Helper, Lloyd.C., and
Schiller, A.G. 1962 A Urethral Prosthesis for
the Male Dog.
J. Am. vet. med. Ass.
141 (1) : 1443-1450.
- Hoffer, Richard E. 1962 Transplantation of the
Neck of Bladder to the
Abdominal Wall.
Small Anim. Clin: 129-131.
- Howard, J.W. 1959 Urinary stenosis in the cat.
Vet. Rec. 71 : 467.

- Kenealy, John C. 1959 Experimental evaluation of vesico-rectostomy and colostomy.
J. Urol. 82 : 544-546
- Lapides, J. 1971 Urinary diversion.
Surgery. 69 : 142-154.
- Levitsky, V. 1953 Transplantation of ureters into isolated ampulla of rectum after total cystectomy. Am. J. Surg. 85 : 91-97.
- Mannari, M.N. 1966 Studies on experimental cystocolostomy and urethrocolostomy in canines. M.V.Sc.Dissertation. University of Madras.
- Manziano, C.F., and Manziano, J.R. 1966 Perineal urethroostomy for relief of urethral blockage in the male cat. J. Am. vet. med. Ass. 149 (10) : 1312-1316.
- Markowitz, J., Archibald, J., and Downie, H.G. 1964 Experimental Surgery. Williams and Wilkins Company., Baltimore, 5th. Ed. pp. 263.
- Maydl, K. 1894 cited by Crowly and Swigart. (1960).
- McCullay, Robert M. 1955 Ante-pubic Urethroostomy for the Relief of Recurrent Urethral Obstruction in the Male Cat. J. Am. vet. med. Ass. 173-179.
- McCunn, James. 1953 Hobdays surgical diseases of the dog and cat. Tindall and Cox., London, 6th. Ed. pp. 285.

- Medway, W.,
Prier, J.E., and
Wilkinson, J.S. (Editors). 1969 A text Book of Veterinary
Clinical Pathology.
Williams and Wilkins Co.,
Baltimore, 1st. Ed. pp.218.
- Miller, Malcon E. 1952 Guide to the dissection of
Dog. Edwards Brothers.,
New York, 3rd. Ed. pp. 212,
218, 224.
- Moore, J.G. 1954 Vesicorectostomy through its
first five years.
J. Urol. 72 (5) : 840-848.
- Pond, H.S., and
Texter, J.H. 1970 Trigonal Ileal Anastomosis.
Experimental Studies.
J. Urol. 103: 746-752.
- Nayar, Ravindran S., and
Wilson, F.D. 1974 Experimental studies on
urinary diversions in
canines and felines.
Indian vet. J. 51: 545-553.
- Reynolds, Charles L.Jr. 1960 A study of ileal substitution
for continent bladder.
Am. J. Surg. 99: 50.
- Robbins, J.J. 1957 Vesicorectostomy.
J. Urol. 77 (1): 34-38.
- Smythe, R.H. 1959 Clinical Veterinary Surgery.
Vol. I. Crosby Lockwood and
Sons., London, 1st. Ed.
pp. 315.
- Stockman, Valerie. 1966 Permanent urethroostomy
and urethral transplant in
the dog.
Vet. Rec. 79 (4): 110-112.
- Twitchell, M.J. 1969 Urethrocolostomy in a cat.
Mod. vet. pract. 50 (5): 81

FIGURES

Fig. 1 Diagramatic representation of normal canine pelvis and abdomen (ventral view)

- B - Rectum
- G - Prostate gland
- P - Pubis bone (cut)
- U - Urinary bladder
- R,R - The level on dorsal aspect of the bladder at which ureters open into the bladder.

Fig. 2 Digramatic representation of normal canine pelvis and abdomen (Lateral view)

- A - Pararectal fossa.
- B - Rectum
- C - Colon
- D - Rectovesical fossa
- E - Paravesical fossa
- G - Prostate gland
- P - Os pubis
- U - Urinary bladder

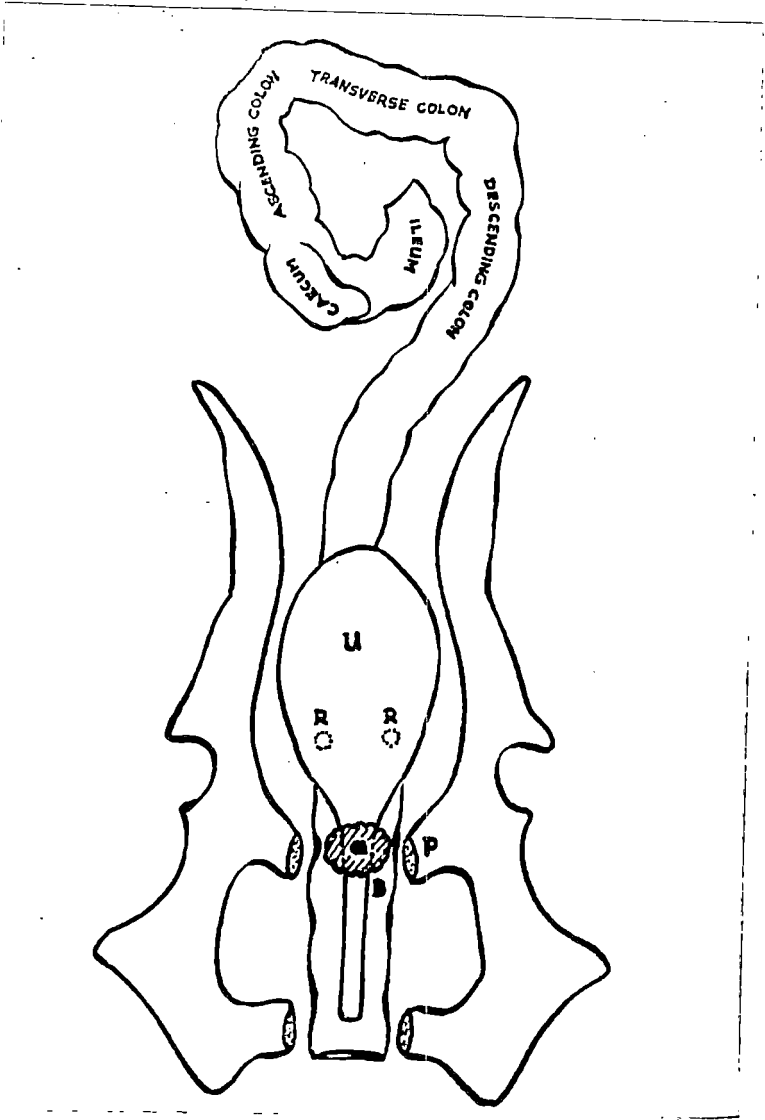


Fig. 1

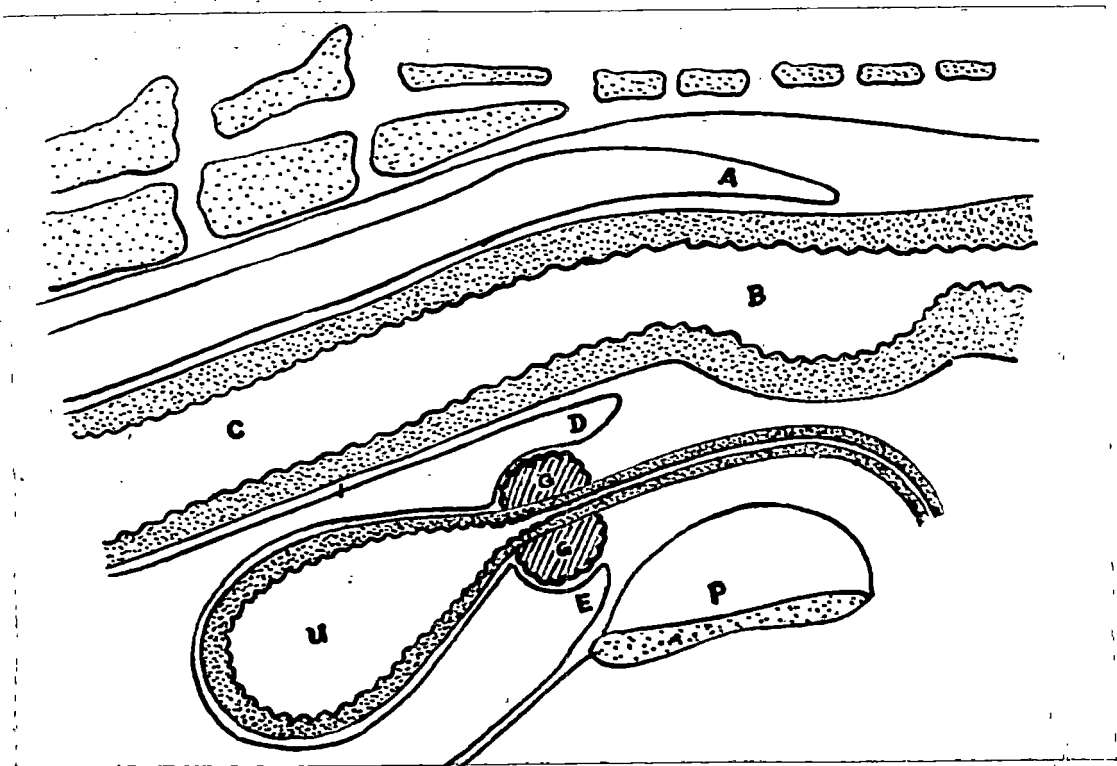


Fig. 2



UNIVERSITY LIBRARY — BIBLIOGRAPHIC CODING SHEET

Acn. no.	1a 170010	Date entered	1a 1997 02 28	Source of rec	1a KAUL-680654
Record id.		Doc. no.		Biblio. level	1a m
Phy. med.	1a 010	Lang. & Scri.	1a eng	Type of mate	1a 110
ISBN		ISSN			
Codén		Class No.			
Title	1a Studies on vesico-colostomy and vesico-rectostomy in dogs.				
Part statement					
Key title					
Parallel title					
Uniform title					
Ed. stmt.					
Personal author	1a Sarada Amma 1b T				
Corporate author					
Name of meeting					
Place and publisher	1a Mannuthy 1b Kerala Agricultural University				
Place and distrib					

Fig. 3 Diagrammatic representation of vesico-colostomy.

- A - Pararectal fossa
- B - Rectum
- C - Colon
- D - Rectovesical fossa
- E - Paravesical fossa
- G - Prostate gland
- P - Os pubis
- U - Urinary bladder
- 1 - Ligature at the neck of the bladder
- 2 - Ostium communicating the cavities of urinary bladder and colon, after the anastomosis

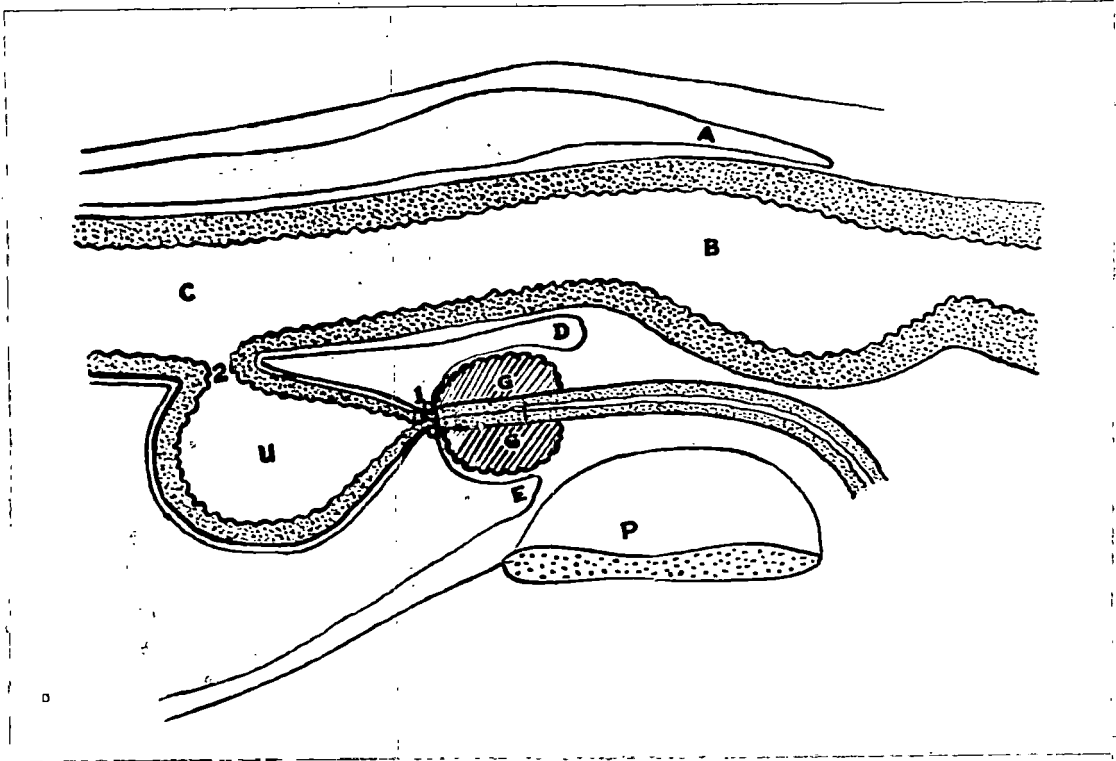


Fig. 3

Fig. 4 Diagrammatic representation of vesico-rectostomy.

- A - Pararectal fossa
- B - Rectum
- C - Colon
- D - Rectovesical fossa
- E - Paravesical fossa
- G - Prostate gland
- P - Os pubis
- U - Urinary bladder
- 1 - Cut end of the urethra with ligature
- 2 - Ostium communicating the cavities of Urinary bladder and rectum, after the anastomosis

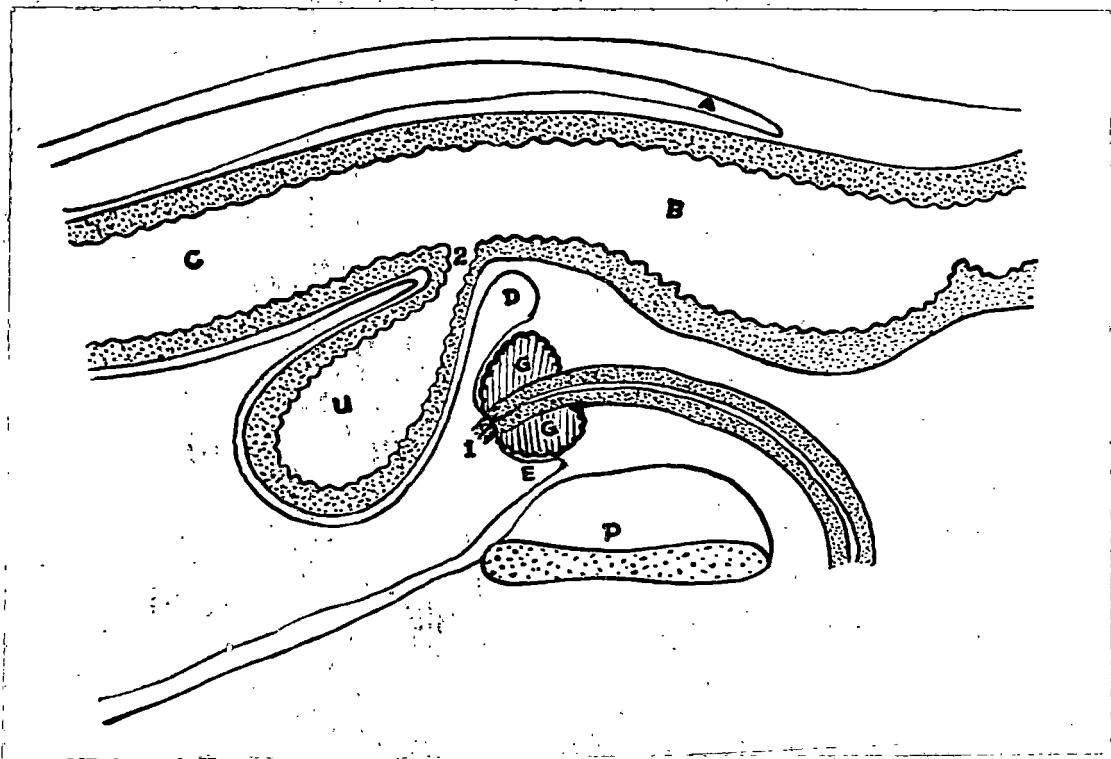


Fig. 4

Fig. 5 Bladder, ureters and colon from the dog No. 2/I,
showing the anastomosis more clearly

Fig. 6 Photograph showing the ostium communicating the
bladder and colon (Dog No. 2/I)



Fig. 5



Fig. 6

Fig. 7 Photomicrograph: site of anastomosis (Dog No.2/I). Mucosa of colon and bladder, cystitis in the region of anastomosis and encapsulated suture material in the mucosa of colon are evident, H & E x 48.

Fig. 8 Cystitis. Diffuse involvement of bladder mucosa, H & E x 48.

Fig. 9 Colon from vesico-colostomy showing no pathological changes, H & E x 48.

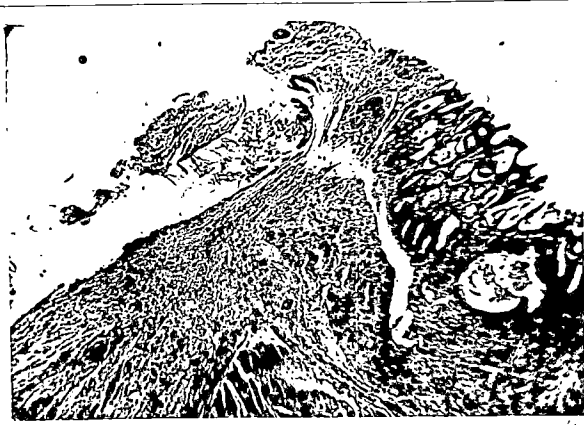


Fig. 7

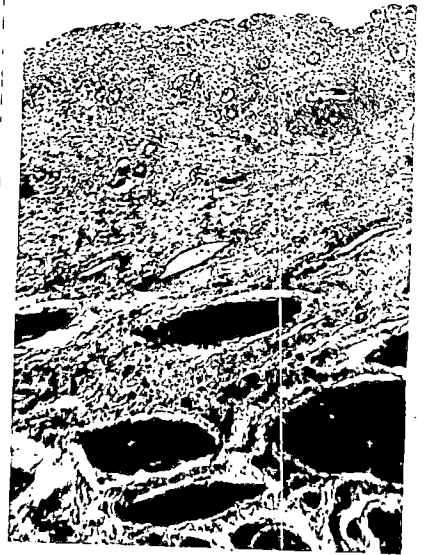


Fig. 8

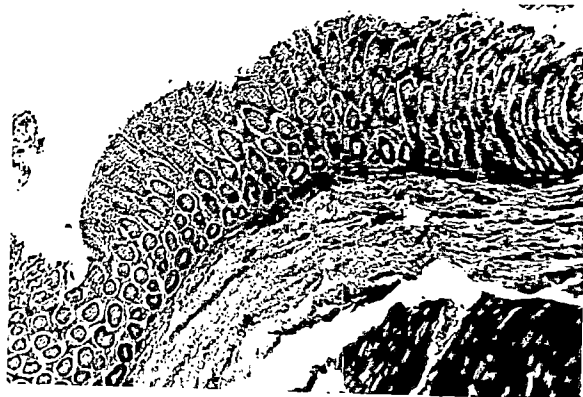


Fig. 9

Fig. 10 Vesico-rectostomy. Anastomosis of bladder with rectum. Ureters can be seen near the neck of bladder closed to the anastomosed portion (Dog. No.1/II)

Fig. 11 Bladder and rectum opened. Artery forceps is shown inserted through the opening into the rectal mucosa into the bladder (Dog No. 1/II)



Fig. 10



Fig. 11

Fig. 12 Skiagram. Presence of barium from the enema in the bladder is noticed (Dog No. 4/II-on the 33rd day after vesico-rectostomy).



Fig. 12

Fig. 13 Vesico-rectostomy. Histopathological features of the region of anastomosis. Rectal mucosa is apparently normal but there is cystitis (Dog No. 4/II), H & E x 36.

Fig. 14 Vesico-rectostomy. Complete union of bladder and rectal mucosa is evident. No inflammatory changes in the mucosa of rectum, cystitis pronounced (Dog No. 4/II), H & E x 80.



Fig. 13

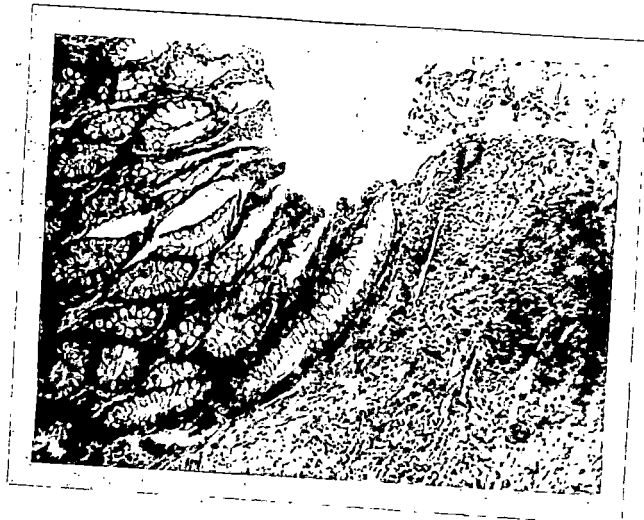


Fig. 14

STUDIES ON VESICO-COLOSTOMY AND VESICO-RECTOSTOMY IN DOGS

By

T. SARADA AMMA

ABSTRACT OF A THESIS

submitted in partial fulfilment of the requirement
for the degree

MASTER OF VETERINARY SCIENCE

Department of Surgery
Faculty of Veterinary and Animal Sciences

KERALA AGRICULTURAL UNIVERSITY

Mannuthy :: Trichur

1975

ABSTRACT

ABSTRACT

Vesico-colostomy and vesico-rectostomy as methods of urinary diversion in dogs and cats had been reported. The following experiments were undertaken to assess the relative efficacy of either of these techniques.

Surgery was performed in two groups of dogs. Under general anaesthesia, after laparotomy, in the vesico-colostomy group, the fundus of the bladder was anastomosed to the terminal part of descending colon; and in vesico-rectostomy group, the neck of the bladder was anastomosed to the anterior part of rectum.

In addition to general observations, the postoperative changes in haemoglobin content, leucocyte count, and blood urea nitrogen level were also recorded and are compared to the preoperative levels. Their clinical significance was also assessed.

The experimental dogs acquired physiological control over micturition through the anus within three to four days and there was no soiling of the perineum, though no indwelling catheter was used. The animals were kept under observation for a period up to four weeks and were later sacrificed.

Two of the four dogs in vesico-colostomy group was

in apparent good health after surgery. Of the other two, one animal died on the 17th day and autopsy revealed nephritis of the left kidney. The other died on the 22nd day and in it the ostium was seen to be closed completely by scar tissue. In the vesico-rectostomy group, three of the four dogs were in apparent good health. One dog in the group showed symptoms of uraemia and died on the 11th day but no abnormality at the level of anastomosis could be detected at autopsy. Haematological studies, in animals of both the groups did not reveal any significant changes except in one dog which had uraemia.

Intravenous pyelography after one month, in 2 dogs of vesico-rectostomy group, revealed normal kidney function and emptying of the bladder.

At autopsy the areas of anastomoses were studied (grossly and histopathologically) and urine samples were cultured to check up infection. E.coli, Streptococci, Staphylococci and certain gram negative organisms were isolated from the urine samples collected at autopsy in all animals.

In the vesico-rectostomy group the ostium was well established and patent in all animals. In the vesico-

colostomy group, there was constriction of ostium in one and in another the ostium was completely closed by scar tissue formation; but the remaining cases were apparently normal.

Histopathological examination of bladder, colon and rectum revealed complete healing of the corresponding layers of tissues at the site of anastomosis in the successful cases of either group. Mild cystitis was observed at postmortem in three animals, one in Group I and two animals in Group II. There was faecal regurgitation into the bladder in three cases one from Group I and two from Group II.

It is concluded that either vesico-colostomy or vesico-rectostomy could be adopted as urinary diversion technique in dogs; but vesico-rectostomy appeared to be more desirable than vesico-colostomy.