POST-SCROTAL URETHROSTOMY

in DOG

A DISSERTATION

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CHAPTER I

INTRODUCTION

Quite often the Veterinarian is confronted with an acute surgical condition, namely, the Urethral obstruction in domestic animals. In a vast country like India, with a very huge cattle population, almost every Veterinarian is posed with such a problem. This condition is a matter of life and death for the animal, an economical loss to the farmer and calls forth the surgical skill of the Veterinarian, and it is no less an enigma for his counterpart in the laboratory who is involved in seeking a remedy for the prevention and cure of this condition.

A small animal surgeon is equally familiar with this surgical condition which is a challenge to his skill in surgery and a test of patience when the condition is of a recurrent nature. Ovines and equines are not immune to such a condition.

The female population is rarely the victim because of the short straight course, bigger lumen, and greater expandability of the urethra in this sex.

Though the exact cause of Urolithiasis is still not known, for certain, the following factors have been given the credit as being responsible:

1. Urinary infection.
2. Vitamin 'A' deficiency.
3. Abnormal crystalline or colloid content of the urine.
4. Reaction of the urine.
5. Inheritance.
7. Early castration.
An interesting feature of urethral obstructions is that the site of obstruction, more often, is the same in most cases, depending upon the species to which they belong. The natural kink at the caudal end of the os penis in dog, the sigmoid flexures in bovines and ovines; the vermiform appendix in ovines and the tip of the penis in cats are the common sites of obstruction caused by uroliths.

Age is no criterion in the occurrence of urethral obstruction, as it has been recorded in dogs between 4 months to 14 years of age. There have been records of urethral obstruction at birth in foals. Cocker spaniels, Dachshunds, Dalmatians, Fox terriers and Silkies have been found to be, more often, the victims.

As though to mock at the Veterinarian, this surgical condition recurs in animals which have been treated, surgically or otherwise, on previous occasions. This could be explained from the fact that the formation of urinary calculi, either it be in kidneys or in the urinary bladder, may prove to be a continuous process and their migration into the urethra a subsequent occurrence.

The potentially damaging effects of calculi include "obstruction with dilatation of urinary tract; stasis, which may lead to severe infection; and direct trauma, with resultant fibrosis of functioning tissues." (5).

Mechanical injuries to the terminal penile urethra, resulting in its constriction at the site of injury; fractures of os penis (8), prolapse of urethral mucosa; and malignant growths pressing upon the urethra, are capable of producing urinary obstruction and consequently uremia, terminating in death, if unattended to by surgery.
In this study, a surgical procedure of creating a permanent urethral fistula, below the ischial arch, has been adopted and studied with a view in mind that such a surgical technique would be of great value, not only in cases of urethral obstruction due to recurring calculi but also would be equally valuable in other surgical conditions, the mention of which has already been made.
DIAGRAM OF MALE UROGENITAL SYSTEM - DOG

1. Bladder.
2. Prostate.
3. Urethra.
5. Body of penis.
7. Ureter.
8. Diferent duct.
10. Testis.
11. Spermatie vessels.
12. Abdominal wall.
13. Sheath.
CHAPTER II

SURGICAL ANATOMY OF CANINE URINARY SYSTEM

The urethra of the male dog, from the caudal end of the prostate to its entrance into the osseous canal, is distinctly dilatable and small calculi can pass through without difficulty. But the urethral portion, embedded in the osseous canal of the os penis, is undilatable because of the rigid bone surrounding it, except on the ventral aspect. The urethra, for the whole of its extrapelvic course, is enclosed in a highly vascular and erectile structure, the corpus cavernosum urethrae (15) which is the source of haemorrhage during the postoperative period. The urethra is deeply placed at the ischial arch, being covered by bulb of the urethra and bulbocavernosus muscle. The corpus cavernosum penis arises at the sciatic tuberosity and is situated dorsal to the course of the urethra. The os penis which is formed from corpus cavernosum penis extends from the body of the penis to the free extremity of the glans (15). An outline of the urogenital system of dog is given on the opposite page.
CHAPTER III

REVIEW OF LITERATURE

It has been the endeavour of the urologists to find out the factors predisposing to stone formation, and prevent it, to save the animal from a major surgical intervention.

In this regard Brodey (2) has reported a high incidence of urinary infection associated with urinary calculi. Micrococci, Haemolytic streptococci, non-haemolytic streptococci, proteus species, coliform bacteria, pseudomonas aeruginosa, Haemophilus species and Haemolytic clostridin have been frequently isolated and reported in such cases, in dogs. Most cultures associated with phosphate calculi, are said to be urease positive and the pH of urine to range from 7.0 to 8.5, in contrast to the normal range of 6.0 to 6.5, in dogs. When the pH of urine, in dogs, is as low as 5.0 to 5.5, the absence of infection is significant (2).

Checking the urinary infection and adjusting the pH of urine, may thus prove to be an effective measure of preventing stone formation in animals.

Harding H.P. and Sumner G.H. (27) have reported the use of Hyaluronidase in dogs, and Russel, M. (26) has reported the use of Renacidin in human beings for dissolution of urinary calculi.

Sheel E.H. and Paton L.M. (25) have reported the use of Aminopromazine, 10 c.c. in travenously, in feed lot cattle suffering from urethral calculi. This drug is said to have a very strong direct 'antispasmodic' activity on smooth muscle and help the animal in passing out the calculi, within a few hours after the injection.
Whatever is the worth of these therapeutic agents, they are no substitute for surgery, in bringing about relief to the animal, before it is too late.

Stanely C. Wassman (24) has described a technique of creating an urethral orifice at the subanal region. He has suggested this procedure in cancer of penis in dogs. In this technique he has removed the entire mass of penis, sheath, testes and scrotum, leaving a short stub of the penis in the ventral perineum. This stub, containing the posterior urethra, is cut off at the level of the surrounding skin and sutured in place. No complication of stenosis at the orifice was reported.

Robert E. Broday (2) has suggested in his article "Canine Urolithiasis", the creation of a permanent urethral fistula, just caudal to the penile bone, in cases of recurrent urethral lithiasis. This location of the newly created urethral opening, in his opinion, avoids the sealding and dermatitis resulting from contact of urine with skin of the perineum, buttocks and scrotum, which is a likely complication in ischial urethrostomy. This fistula, he says, will allow urinary stones to pass out before they reach the os penis and occlude the lumen of urethra.

John Rhodes (18) has reported the creation of permanent urethral fistula, at the ischial arch, as a treatment of recurrent urethral calculi, in a dog. He passes a No.3 catheter into the bladder, exposes the urethra through a surgical wound extending from the scrotum to within 25 mm of the anus, and severs the urethra with the catheter 'in situ' at a point immediately dorsal to the scrotum. The urethra is then dissected free from the surrounding tissues and brought to the surface, 50 mm ventral to the
anus. The dorsal surface of the cut end of the urethra is then incised for a distance of approximately 8 mm and the edges of the new cut reflected outward to form a triangular flap. This flap is then sutured to the edges of the skin incision with No.1 black nylon. The subcutaneous tissue in the wound is drawn together with 'O' Catgut and the skin incision closed with medium vetafil.

The author says that this operation allows speedy flow of urine by eliminating its course through the penial groove of the os penis and thus provides less opportunity for the formation of calculi. One of his patients continued to pass small calculi, without apparent discomfort, through the fistula, even after three years of the operation.

Howard J.W. (11) has performed "cystocolostomy" in a male cat with urethral stenosis. He performed laparotomy on the left side, brought out the descending colon and the urinary bladder, made a 1/4 inch longitudinal incision in colon at the level of the external angle of ilium and passed a rubber urinary catheter into the colon and out via the anus until only about 1 inch protruded from the colon wound. He then made 1/4 inch incision into the fundus of the bladder, brought bladder and colon together over the catheter, and sutured them with 'ooo' catgut, round the catheter. The abdomen was then closed with interrupted sutures of 1 N nylon. He reported no complications at any later date. He considers this technique as safe and simple, the added advantage being the unobliterated natural outlet unlike in ureterocolostomy and urethral-colostomy. Gale V.C. has reported his success with this technique in cats (22.)
Robert M. McCully (12) has reported 'Antepubic Urethrostomy' for the relief of recurrent urethral obstruction in a male cat. In his technique, he severs the urethra just anterior to the openings of the ductus deferens, brings out the intact portion of the urethra through an abdominal wound and fixes its distal portion to the skin after preparing a bed for it.

Beamer H.J. (1) has obtained successful results, in cats, with 'Urethral Colostomy', in cases of urinary stenosis. He prefers this procedure to 'Ureterocolostomy' because of the secondary complications in the latter procedure. He performed urethralcolostomy by anastomosing the neck of the bladder to an opening made into the colon, using a plastic tube which extended from within the fundus of the bladder to the outside, through colon. The only purpose of the tube was to act as a support while the two organs were sutured together.

Modelsdi, W. (14) has described the technique of 'Transplantation of the ureters into the partially excluded rectum' in human beings. The author claims the following advantages of this technique.

1) The area of possible reabsorption of urinary contents is small.
2) There is no direct contact between the ureteric openings and faeces.
3) The intrarectal pressure is low.
4) Patient is continent for both urine and faeces because either openings lie within the sphincter ani.
J.F. Glenn and F.P. Alves (10) have reported implantation of ureters into the bowel and also uretero-cutaneous anastomosis. They prefer the latter as a permanent form of urinary diversion in human beings. They have reported the following advantages of the technique:

1) Simplicity.
2) Freedom from faecal contamination.
3) Minimum electrolyte imbalance.
4) Accessability of kidneys and ureters for any future manipulation.

They have used a permanent internal splint for the distal segment of the ureter to avoid stricture at the external opening. Nylon arterial-graft segments of Edward - Tapp type were chosen as sleeves for the distal ends of the ureters. The authors have brought out the ureters through a left flank incision and fixed the sleeved ureters to the skin. But the authors did not rule out, the stricture of the terminal ureteral openings occurring at a later date.

Justin J. Cordonnier and G.H. Nicolai (7) have reported the use of 'Isolated segment of ileum' as a means of urinary diversion in cases of carcinoma of bladder in human beings. They have isolated a segment of ileum and anastomosed the ureters into its lumen. No complications were reported.

Gandin A.M. (9) has reported 'Uretero-Ileo-Urethral' anastomosis in human beings. The Canadian Academy of Urological Surgeons (3) has adjudged the surgical creation of 'Rectal Bladder' as the safest technique for urinary diversion in cases of carcinoma
of bladder or cervix in humans.

E.H. Coles (6) has recommended 'post scrotal urethrotomy' in sheep for relief of urethral calculi. He incises the skin about 1" posterior to scrotum, in the midline, and takes out the penis, using blunt dissection to separate the subcutaneous tissues surrounding it. He then locates the calculi and removes them by urethrotomy. After the calculi are cleared he inserts a self-retaining test tube, with the end removed, towards the bladder. Using 30 gauge stainless steel suturing material sutures the tube in place by passing the needle through the penis and around the tube, anterior to the retaining ring. The penis is returned later to its normal position.

The author concludes that when the test tube is left in place in the urethra, for 10 - 16 days, a permanent urethral fistula is formed to act as a permanent outlet for urine.

J.C. Carey (4) has reported a technique of 'Ischial Urethrotomy' for the relief of urinary calculi in steers between two months to two years of age.

Carey performed this operation under epidural anesthesia. A 4 inch long incision starting 4 inches below the anus, extending downward on the median line, was taken. Retractor penis and surrounding tissues were separated from the penis by blunt dissection and the penis cut at the level of the lower commissure. The proximal segment of the penis was fixed to the skin, passing the sutures through corpus cavernosum, on either side. The urethra was slit open for a length of 1 inch and the resulting fan shaped
portion was sutured to the margins of the wound on either side. The author has reported 100 per cent success in creating a permanent fistula.
CHAPTER IV

METHODS AND MATERIALS

Male dogs apparently in good health were chosen for this work. Age was no criterion.

Anesthesia:

The surgical interventions were made with the animal under deep surgical anesthesia, brought about by intravenous injection of Nembutal, given in a 5% solution, until the desired effect was produced.

Preparation of the animal for surgery:

No preoperative starvation of the dogs was thought necessary and accordingly they were allowed normal diet. The animals were given soap water enema 4 hours prior to surgery and sufficient exercise after that, till they have evacuated their bowels.

After the animal was anesthetized the whole of the perineal region, the quarters and the surroundings of scrotum were clipped and shaved. A purse string suture was placed in the anal ring to prevent contamination of the operative field during surgery. The skin was scrubbed three times with soap and water and twice with 1% cetavlon alcoholic solution. The site was mopped with sterile lint piece and painted with 1 in 1000 Tr. merthiolate. A 52 size polyethylene catheter was passed into the bladder through the urethra. The catheter thus placed in the urethra would drain the urine from the bladder and act as a guide in locating the urethra during surgery. The animal was then transferred into the surgery theatre.
Preparation of the operator:-

The hands of the operator were thoroughly washed thrice with soap and water, twice with 1% cetavlon alcoholic solution and finally with 70% alcohol.

Special instruments used:-

1) Bard-parker handle No.3 with No.11 blade.
2) Polyethylene catheters size 52-54.
3) 3 N nylon.
4) '0' Surgilon.
5) Fine atraumatic curved needles.

Technique of operation:-

The technique of fixation of urethra to the skin has varied from animal to animal. In experimental animals No.1 and No.2 the following technique was used:-

The animal was laid on the table in ventral recumbency with sand bags under the abdomen to raise the hind quarters from the surface of the table. The tail of the animal was fixed over its back with a tape. The animal was draped with sterile shrouds exposing only the field of operation i.e. from scrotum to the anus.

The body of the penis was held between the thumb and index finger of the left hand and lifted to immobilize the skin over the median line. A skin incision, 4 cm. long, starting at the level of the ischial arch and extending towards the scrotum in the median line was taken. The subcuticular tissue, the retractor penis and the bulbocavernous muscle were divided by blunt dissection to expose the urethra surrounded by the corpus cavernosum urethrae. The urethra, along with corpus cavernosum urethrae, was cut across at the level of the lower commissure with the catheter 'in situ'.
The urethra was then slit in a sagittal plane towards the upper commissure. The separated urethral portion was then reflected upward and was fixed to the skin edges, on either side, with 'O' surgilon - (Davis & Geck). The urethral segment remaining attached to the body of the penis was also fixed to the skin on either side. The urethral opening into the cut distal segment was obliterated with a catgut ligature. The polyethylene catheter, with a short end protruding from the lower commissure, was fixed to the skin with nylon sutures. The catheter was left inside for 24 hours to prevent any voluntary retention of urine by the animal and at the same time to prevent blood clots from blocking the urethral opening.

**Technique of urethral fixation in experimental animal No.31**:

The procedure till the urethra is exposed was the same as above. Then the urethra was cut across at the distal commissure and the urethral tube was separated from the body of the penis for a length of approximately 0.5 cm. The wall of the urethral segment, thus separated, was fixed to the skin edges, in an oval pattern, using 'O' surgilon and an atraumatic curved needle. The skin wound above and below it was sutured with nylon.

**Technique of urethral fixation in animals No.4, 5 and 6**:

The urethra was exposed as above, and was cut across at the level of the lower commissure and separated it from the body of the penis to the level of the upper commissure. The catheter laid in the urethra was taken as a guide while dissecting. The
urethra, thus separated, was slit longitudinally, throughout its length and fixed to the skin borders on either side, using 3-N nylon, swaged on an atraumatic curved needle.

Technique of operation used in experimental animals No. 7 and No. 8.

In these two animals a complete amputation of the prepuce, penis, spermatic cords and scrotum was performed along with urethroscope.

The dog was fixed in dorsal recumbency after preparing the site from xyphoid to base of tail. An elliptical incision was made in the skin so as to include the area from the tip of the prepuce to the base of the scrotum. The spermatic vessels were ligated after incising the tunica vaginalis. The spermatic cords were cut distal to the ligature. The sacs of the tunica were transfixed close to the external inguinal ring and the redundant portions were removed. The vessels supplying the penis and their satellite veins were ligated, with '0' catgut, by transfixeding the body of the penis at the level of the base of the scrotum and amputated the distal part. The skin incision from the base of the scrotum, was extended towards the anus for a distance of one inch. The stump of the penis thus exposed, an inch long, was fixed to the skin on either side, with 3 N nylon, the stitches passing through the subcutis and corpus cavernosum penis only. The urethra lying over the exposed stump was slit longitudinally and fixed to the skin edges, on either side, in such a way that the urethral mucosa was in level with the skin.
Post-Operative Care:

The animals were injected with 75 cc. of 5% glucose in physiological saline, immediately after the operation was over. No antibiotics were administered except in two cases. Antibiotic ointments also were not used. Only vaseline was used to smear the skin all around the wound including the scrotum, to prevent any damage that is likely to occur when blood and urine came in contact with it especially during the first postoperative week. The operated animals were provided with clean beds and the surgical wounds were kept clean till the healing was complete. The nylon stitches were removed on 8th day of operation.
CHAPTER V.

RESULTS.

In the first three experimental animals (No.1 to No.3) the wound healing was complete, leaving a patent urethral opening at the level where the urethra was fixed to the skin, in fourteen, sixteen and twelve days respectively. But at the end of this period, a slight stricture was evident at the newly created urethral opening and the animals passed urine in thin but forceful stream. No other complication was recorded at the end of 30 days of observation in each case.

In the rest of the experimental animals (No.4 to No.8) the wound healing was complete in 12 - 14 days and the urethral fistula remained patent throughout the period of observation, which was 30 days in each case. No stricture was evident at the urethro-cutaneous junction - and the animals passed urine in a good jet. (See photographs of the dogs No.s 4, 5, 6, 7 and 8 showing the urethral fistula with a polyethylene catheter in situ).
Dog No. 4.

Picture taken on the 9th day of operation.

Dog No. 5

Picture taken on the 30th day of operation.
Dog No. 6
Picture taken on the 30th day of operation.
CHAPTER VI.

DISCUSSION

It is a common practice to relieve urethral obstructions by urethrotomy at the site of obstruction and allow the surgical wound to heal as an open wound, thus permitting reestablishment of the normal passage. It is common for the calculi to recur and cause urethral obstruction. No wonder if the site of obstruction, the second time, is at the same spot where it was previously operated.

Creation of a permanent urethral fistula, as suggested by Brodey (2), at the caudal end of os penis, answers the purpose very well in cases of recurrent urethral obstruction. The only objection to this procedure, if at all, is that a sufficient length of the urethra is left intact when it could be shortened to facilitate easy passage of calculi. Apart from this the length of the urethra between the neck of serotum and the caudal end of os penis may be too short, in some cases, to facilitate fixing of sufficient length of urethra to the skin, unless a simultaneous castration and amputation of serotum is decided upon. Also in carcinomatous involvement of penis and sheath, location of urethral opening at this level may not be possible, as such, the condition would demand radical excision of these parts.

Creation of an ischiad arch urethral fistula described by John Rhodes (18) is most desirable in cases of recurrent urethral lithiasis. Such a procedure will facilitate speedy flow of urine, because of the shortened urethra, absence of any bend in its length and exclusion of its course through the osseous canal.
Dog No. 7
Picture taken on the 20th day of operation.

Dog No. 8
Picture taken on the 20th day of operation.
Ante-pubic urethrostomy described by McCully (12), in cats is not practicable in dogs because of the short neck of the bladder in that species.

Cystocolostomy described by Howard (11), in dogs, seems to be an easier technique of urinary diversion and is worth trying.

The different techniques adopted during this study were the same as described by the previous workers except for very slight modification in two cases. In these two cases the urethra was not separated from the body of the penis. The body of the penis was first fixed to the skin edges and then the slit urethra, the sutures passing through the urethral mucosa, the corpus cavernosum urethrae, corpus cavernosum penis and the skin. The urethral fistula in these cases, was post scrotal than ischial, in location. A simultaneous castration and amputation of scrotum was considered necessary as the latter would suffer from constant irritation if urine comes in contact with it at every urination.

With nothing to lose but much to gain, the surgical creation of an urethral fistula at the post scrotal or ischial level is worthy of attempt in all cases of recurrent urethral obstruction in male dogs. Carcinomatous affections of the penis and prepuce and fractures of os penis are the other surgical conditions where this operation is indicated.
CHAPTER VII

SUMMARY.

Cases of urinary obstructions due to calculi are not uncom-
mmon in domestic animals. No fool-proof therapy is available to
the present day in clinical cases nor there is a way of preventing
their occurrence. Many veterinarians have tried and reported the
surgical creation of a permanent urethral fistula, at different
levels, along the course of the urethra, as a measure of preventing
the recurrence of urethral obstructions.

In this study urethrostomy was performed below the ischial
arch and behind the scrotum, in six and two dogs respectively, and
the results reported.

This surgical procedure is indicated not only in cases of
recurrent urethral obstructions, but also in surgical conditions
like cancer of penis and prepuce, fracture of os penis (8), and
strictures of distal urethra, in dogs.

The application of this technique is well worth trying in
bovines and ovines, because this malady is very common and is of
great economic significance. Irreparable lacerations, malignant
growths of penis and sheath are the other surgical conditions, in
these species, where this procedure is indicated.

Finally it may be said, as had already been reported by
previous workers, that surgical creation of a permanent urethral
fistula at the post scrotal or ischial level, is possible, and is
worthy of attempt whenever indicated.