

EVALUATION OF CYSTOURETHROPLASTY *VIS-A-VIS* CAECOURETHROPLASTY TECHNIQUE IN BUFFALOES (*Bubalus bubalis*)

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ABSTRACT

The present experimental urothoplasty was undertaken in sixteen male buffalo calf models apparently in good health status using urinary and caecal grafts. The surgical technique was evaluated on the basis of clinical observation, determination of blood urea nitrogen, histopathological and post-operative complication for a period of 60 days post-operatively. Urethroplasty using formalin preserved urinary bladder and caecal grafts acted as a scaffold around which there was gradual regeneration of urethral tissue and resolution of grafted material by 60th post-operative day. However, both these techniques were worthy and feasible in buffalo calves, yet caecourethroplasty was preferred, because it was easier and safer than the cystourethroplasty.

Keywords: buffalo, cystourethroplasty, caecourethroplasty, urinary bladder, caecal graft

INTRODUCTION

Urethroplasty is an open surgical procedure for the repair of an injury or a defect in the walls of the urethra. Different grafts such as gut segments,

free facial grafts, polyvinyl silicone patch, peritoneum, omentum, gelatine sponge, OMS membrane, Teflon felt, free autologous preputial tissue, autogenous skin grafts, pedicle, autogenic, allogenic, xenogenic, synthetic and processed grafts, seromuscular graft, lyophilized human dura and formalin preserved buffalo duramater, urinary bladder grafts and intact caecum have been used for surgical repair of bladder and urethral defects both experimentally and clinically in man and animals (Kelami, 1971; Kudale and Hattangady, 1971; Prasad *et al.*, 1973, Sharma and Khan, 1978, 1980; Prasad *et al.*, 1980; Sharma and Agrawal, 1997 and Sengupta *et al.*, 1998).

It is obvious from the available literature that the clinical and experimental replacement of the urethra and ureter is not a new concept for human beings and canine but it has not been studied further in large animals. The paucity of literature on large animals as well as the high incidence of urethral calculi leading to rupture of the urethra have focused attention upon urethral substitution, which can be achieved with a suitable substitute if needed in many of the conditions: to repair the wall of the urethra when it is excessively damaged or badly replaced due to urethral calculi, violence or non-specific reasons; concurrent papilloma and / or carcinoma of the urethra; any anatomical defects

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of the urethral wall, like irreparable urethral fistula; urethral stenosis, stricture or ill development, congenital anomalies like hypospadias, epispadias, urethral diverticulum, urethrocele. Success attained with vesiculoplasty in humans, canine and bovine initiated this study on urethroplasty using urinary bladder and caecal grafts. Based on a research and experienced gained in urological surgery of buffalo calves either experimentally or clinically, the study was designed (Sharma and Khan, 1978; Sharma, 1995; Sharma and Agrawal, 1997, Ansari, 2002).

The damaged, diseased or congenital urethral defects have been corrected and substituted by preputial tissue. Various workers like Vyas *et al.*, 1987; Wessells and Mc Anich, 1996; Kocvara and Dvoracek, 1997 and Sengupta *et al.*, 1998 have replaced urethra partially or completely with preputial graft. Uroepithelium is known for its regenerating property (Bohne *et al.*, 1955). Therefore, the primary objective of urethroplasty is to provide an environment for regeneration of normal urethral tissue for urinary passage.

MATERIALS AND METHODS

Cystourethroplasty and caecourethroplasty were conducted in 16 healthy male buffalo calf models weighing about 80-115 kg. The animals were divided into two groups consisting of eight animals each. Formalin-preserved urinary bladder and caecal allografts were used as urethral prosthesis in Groups 1 and 2, respectively. Pre- and post-operative temperatures, pulse, respiration and blood urea nitrogen (Levine, *et al.*, 1961) using a photo-calorimeter were recorded in all the buffalo calves.

Urinary bladder and caecum obtained from buffalo calf cadavers were preserved in 10%

formalin solution for 15 to 30 days. The formalin preserved urinary bladder/caecal grafts were kept in running tap water for 24 h prior to grafting to remove formalin from them. Then the graft was kept in Povidine Iodine*** (Win-Medicare Ltd. N. Delhi.) solution for 2 h prior to grafting. The margin of the graft material was trimmed; mucosa and sub-mucosa were scrapped to prepare a graft of 3.5 X 1.5 cm. It was stored in normal saline before urethroplasty.

Xylazine* (Astra IDL Ltd. Bangalore) 0.05 to 0.2 mg/kg body weight was given intramuscularly. Ten milliliters of 2% xylocaine** (Astra IDL Ltd. Bangalore) was infiltrated on the line of incision. Post-scrotal urethroplasty was done in routine manner giving about 10 cm incision. The ventral wall of the urethra was excised for about 3.5 cm length and about 1.5 cm breadth. Bleeding vessels were ligated. A polythene tube about 2.5 mm diameter was passed inside the urethra towards the ischial arch into the urethra and the lower end of the polythene tube was passed through the urethra in anterior direction, to take out through the pre-preputial opening. The formalin-preserved seromuscular urinary bladder /caecal graft was placed over the excised urethra in such a position that the serous layer faced outside. Then four stay sutures were applied at the corners. Simple interrupted sutures were applied using chromic catgut no. 2/0 and Ethicon black braided silk no. 3/0 in both the groups. The protruding polythene tube was anchored with the silk thread at the preputial area. The cutaneous incision was closed giving Halsted suture using black braided silk no. 2. The cutaneous stitches were removed on the 8th post-operative day while the polythene catheter was allowed to remain in the urethra for 2 weeks. The operated buffalo calves were sacrificed on day 15, 30, 45 and 60 and materials were collected for

gross and histopathological studies (H&E stain).

RESULTS AND DISCUSSION

In cystourethroplasty, seven out of the eight buffalo calves survived subjected to urethroplasty. An initial rise of temperature, pulse and respiration was marked in almost all the animals after surgery, which might be due to tissue reaction. The same was observed by earlier studies in goats using caecal graft (Mukherjee, 1988) and PTFE, caecal and bladder grafts Shivaprakash (1990) and in dogs using peritoneal graft (Nair *et al.*, 1988) following urinary bladder reconstruction.

Estimation of blood urea nitrogen on days 1, 2, 3, 7, 14, 21 and 28 after reconstruction showed slight elevation from the pre-operative level. During the post-operative period clinical observation and the pattern of blood urea nitrogen level proved that there was no obstruction to the normal passage of urine. These findings on the blood urea nitrogen levels in operated buffalo calves were in agreement with the observation made in human beings, canine and bovine (Shoemaker and Marucci, 1955; Prasad *et al.*, 1973; Prasad *et al.*, 1979; Sharma and Khan, 1978, 1980; Nair *et al.*, 1988; Sharma, 1995) after partial reconstruction of the urinary tract experimentally and clinically. Gross observations, which were made during the study, could not detect untoward pathological changes in the wall of grafted urethral tissue except in one buffalo calf which died showing tympany. Histological examination of the tissue taken from the operated area of the urethra revealed gradual regeneration of the urethral tissues and resolution of the grafted material. There was lack of distinct epithelium

lining on the 15th post-operative day (Figure 1) but it was evident on the 30th post-operative day (Figure 2) and the epithelium of the urethra was creeping towards the graft side. On the 45th post-operative day (Figure 3), lymphocytic cells were moderate in number and there was gradual regeneration of uroepithelium and underlined connective tissues at the operated area. On the 60th post-operative day (Figure 4), all the inflammatory changes were minimal and there was complete regeneration of the uroepithelium over grafted tissue from the host side. This observation was in agreement with the results of Sharma (1995), who tried formalin preserved urinary bladder and terylene lined hemispherical hollow plastic balls as bladderprosthesis in experimental buffalo.

In caecourethroplasty, all the operated animals survived after the reconstruction. An initial rise of temperature, pulse and respiration for the first few days were noticed in almost all the animals, but these all became normal in due course. All the operated animals were taking feed normally after second post-operative day. Gross observation in few cases showed echymotic haemorrhage in the urethral mucosa and peelable necrotic foci on the caecal graft even up to the 45th post-operative day. This type of haemorrhage could be harmless as none of the animals showed any complications up to the 60th post-operative day. Necrotic foci which were present on caecal graft up to the 45th day were also observed by Prasad *et al.* (1973) and Sharma and Khan (1978, 1980) during intestinocystoplasty in canine and bovine. Histological examination on the 15th post-operative day (Figure 5), showed epithelial lining was not clearly discernible at the junctional zone. At the end of the 30th post-operative day (Figure 6), epithelium of the urethra was creeping towards the graft side and trying to overlap the grafted

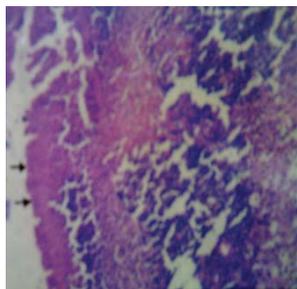


Figure 1. Photomicrograph from the grafted urethral junction using urinary bladder on 15 POD (H &E-150), showing not clearly discernible epithelium on of the urethral either side of the zone of junction and marked infiltration of lymphocyte.



Figure 2. Photomicrograph from the grafted urethral junction using graft on 30 POD (H&E-150), showing the epithelium creeping towards the graft side.



Figure 3. Photomicrograph from the grafted urethral junction using urinary bladder graft on 45 POD (H&E-150), showing gradual regeneration of the regenerated uroepithelium and underlined connective tissues.



Figure 4. Photomicrograph from the grafted urethral junction using graft on 60 POD (H&E-150), shows completely uroepithelium and surrounding tissue.

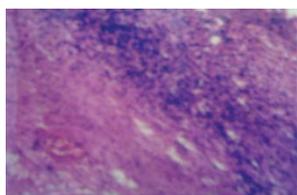


Figure 5. Photomicrograph from the grafted urethral junction using caecal graft on 15 POD using caecal graft on (H&E-150), showed epithelial lining was not clearly discernible at the regeneration of the junctional zone.



Figure 6. Photomicrograph from the grafted urethral junction 30 POD (H&E-150), showing the gradual urethral tissues.

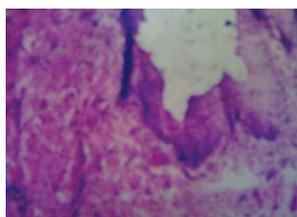


Figure 7. Photomicrograph from the grafted urethral junction using caecal graft on 45 POD using caecal graft on (H&E-150), showed gradual regeneration of transitiona uroepithelium.

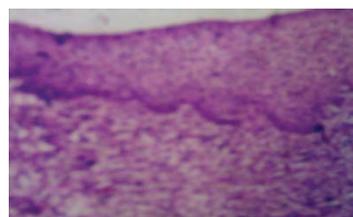


Figure 8. Photomicrograph from the grafted urethral junction 60 POD (H&E-150) showed well developed transitional uroepithelium.

tissue at the junctional area. On the 45th post-operative day (Figure 7), gradual regeneration of transitional epithelium was observed. The lymphocytes and the blood vessels were fewer in number. On the 60th post-operative day (Figure 8), the transitional epithelium of the urethra had completely developed and lymphocytes and blood vessels were scarce in number. Thus, the result of the study was agreement with the work of Sharma and Khan (1980) who described complete regeneration of uroepithelium over the caecal graft in buffalo on the 75th post-operative day during caecocystoplasty. Although both the techniques were successful in buffalo calves, caecourethroplasty was preferred because it was easier and safer to perform.

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