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Utilising an Ileal Segment in the Posterior Urethral Replacement Procedures Using Anal Sphincter to Provide Continence in Dogs

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Yilmaz, Y., Aydin, M., Bakir, B., Atilla, M.K., Odabaş, Ö., and Aydin, S. *Utilising an Ileal Segment in the Posterior Urethral Replacement Procedures Using Anal Sphincter to Provide Continence in Dogs.* Tohoku J. Exp. Med., 1998, **185** (4), 263-270 —— We aimed to replace an ileal segment in the place of posterior urethra using the anal sphincter as a continence mechanism. The experiment was carried on three male street dogs. In the first stage, only urethral replacement with an ileal segment was done and pulled through the anal sphincter in a male dog to see if anal sphincter would do any help for continence. A protruding stoma was created on the perineum. Perineal end of the ileal segment was sutured to the bulbous urethra in the other two male dogs to provide urethral patency in the second step of the operation. The dog in which the first operation was made gained continence on the 12th postoperative day. The other two male dogs, in which ileourethral anastomosis were made, became continent on the postoperative 12th and 15th days. No residual urine was found by catheterisation performed after urination. In controls, neither the stoma nor the anastomosis sites developed stenosis. This procedure may be applied in patients with complete incontinence who can not be corrected by any other surgical procedures, and a very good cosmetic result may be obtained. ———— urethral replacement; anal sphincter; continence © 1998 Tohoku University Medical Press

If posterior urethra together with the striated sphincter were removed or these structures were not functional due to any reason, i.e., complete scarring of the posterior urethra due to pelvic trauma, or failed antiincontinent procedures, a reliable continence mechanism and a posterior urethral replacement are to be needed. To obtain a reliable continence mechanism and to provide an easily catheterizable stoma, Mitrofanoff (1980) described the original appendicovesicos-

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tomy procedure. Refashioned appendix was used as a port for intermittent catheterization. This is a urinary diversion operation, and it is not accepted easily owing to its abdominal stoma (ugly body image) by humans of our country.

Placement of an artificial sphincter around the bulbous urethra together with the internal urethrotomy for posterior urethral stricture may be contrindicated owing to obliteration of the posterior blood supply to the corpus spongiosum. In these patients, incontinence could be managed with an artificial sphincter placed about the bladder neck. However, technical difficulty of that procedure should not be underestimated (Devine et al. 1992).

An ideal approach does not exists in the management of posterior urethral distraction injury associated with fracture of the pelvis and the damage of the sphincteric mechanism.

The aim of our study was to replace an ileal segment in the place of posterior urethra using the anal sphincter as a continence mechanism. Thus, voiding would be possible through it as if a native urethra was present.

Materials and Methods

This investigation conformed to the "Guide for the Care and Use of Laboratory Animals" published by the U.S. National Institutes of Health (1985).

The experiment was carried on three male street dogs. The dogs were 2, 3 and 5 years old, and their weight were 14, 16 and 19 kg, respectively. Anesthesia was performed using ketamin 20 mg/kg (PARKE-DAYIS, Istanbul, Turkey) and xylazine hydrochloride 3.5 mg/kg (BAYER, Istanbul, Turkey) intramuscularly. Ketamin 10 mg/kg was repeated hourly. Operations were performed via abdominoperineal approach.

The study was planned to be performed in two steps. Only urethral replacement with an ileal segment was done and pulled through the anal sphincter in a male dog to see if anal sphincter would do any help for continence. After that, the ileourethral anastomosis by perineal incision was performed in the other two male dogs. All dogs were weared pads in order to detect whether or not the continence was achieved.

The dogs were observed during the following three months.

First surgical step

At first, the posterior urethrectomy together with the prostate was performed. Circular muscles of the bladder neck were left intact. A 15 cm ileal segment was clamped and transected protecting its mesentery together with the arterial blood supply. The proximal end of the ileal segment was anastomosed to the bladder neck by running 2/0 chromic sutures. Twenty eight F Petzer catheter (SEWOON-MEDICAL, Seoul, Korea) was inserted through the neourethra into the bladder. A wide tunnel was then carefully opened by blunt finger dissection between the levator ani muscle, external anal sphincter muscle and anterior wall

of the rectum.

A semicircular transverse perineal incision 2 to 3 cm anterior to the anal verge was made. The sphincter and anterior wall of the rectum was identified by blunt dissection. The distal end of the small bowel together with a Petzer catheter was grasped and pulled down by a bowel clamp inserted through the space between the sphincter and rectum into the previously prepared tunnel. Care was paid not to tense the mesentery and not to divide the central tendon anterior to the sphincteric region. The 2 cm distal end of the bowel was placed subcutaneously. Nonabsorbable interrupted sutures were used, employing a rosebudding suture technique to create a protruding stoma, between the margins of the skin incision and the seromuscular layers of the small bowel.

After being sure about the absence of leakage thorough the anastomosis site, retrograde cystography was performed and the catheter was removed on the 7th postoperative day.

Second surgical step

The proximal end of the anterior urethra was dissected and spatulated through the inverted "Y" perineal incision, in the second step of our experimental study. A 10 F feeding tube was inserted into the bladder through the neourethra. The perineal end of the ileal segment and proximal end of the anterior urethra were sutured end to end using 3/0 vicryl sutures (Fig. 1). Subcutaneous tissue and perineal skin were covered and sutured onto the anastomosis site. So, a perfect cosmetic result was obtained.

Feeding tubes were removed on the postoperative 7th day.

Antibiotics were given to all dogs for seven days beginning with the operation day, and the stoma and the posterior neourethra was cleaned and washed with

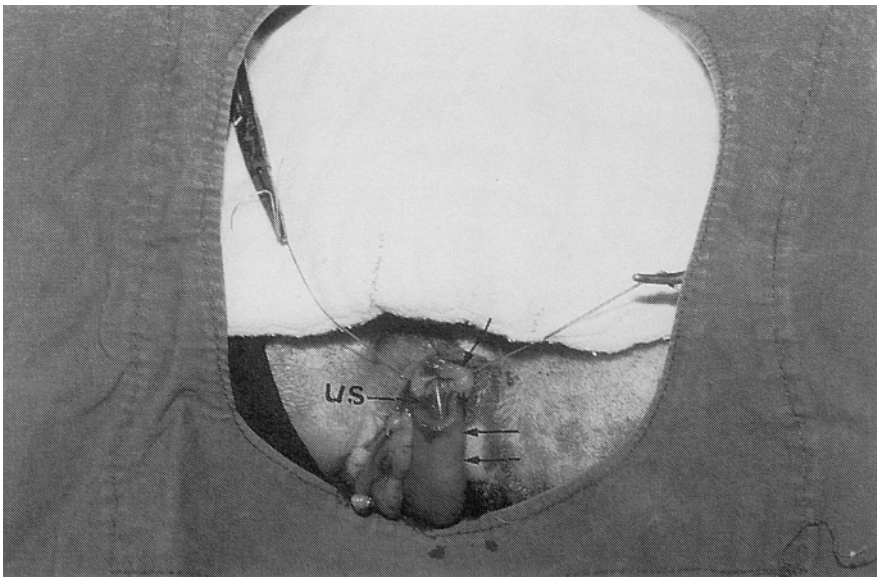


Fig. 1. Cut ends before ileourethral anastomosis, Arrow, proximal end of the anterior urethra; Arrows, ileal stump; us, urethral stent.

diluted polyvinylpyrolidone iod solution twice daily.

Results

The dog which underwent the first operation was not continent for five days following the removal of the catheter. However, it gained continence on the 12th postoperative day. On the neourethrocystography performed at the same day, the bladder and anastomosis site between bladder neck and ileum was seen perfectly. No residual urine was found by catheterisation performed after urination. But, the urination lasted for 2 or sometimes 3 minutes because of hesitancy or interruptions. In follow-up, stenosis occured neither in the stoma nor in the anastomosis site. Except for the first 5 days of postcatheterisation, neither urinary nor faecal incontinence occurred owing to the anal sphincteric dissection. This sample provided us that the anal sphincter was sufficient to achieve urinary continence.

Laboratory results which were obtained in the postoperative third week demonstrated that the blood and urine parameters were normal except pyuria.

The other two dogs which underwent ileourethral anastomosis operation became continent on the postoperative 12th and 15th days. On the neourethrocystography performed on the 20th postoperative day, the anastomosis sites were seen perfectly (Fig. 2), and no residual urine was found by catheterisation performed after urination in two dogs.

All dogs survived, and they presented the normal activity. Figs. 3 (A, B, C and D) demonstrate all sections of the operation schematically.

Comments

The sphincter mechanism can be severely affected by the injury that caused

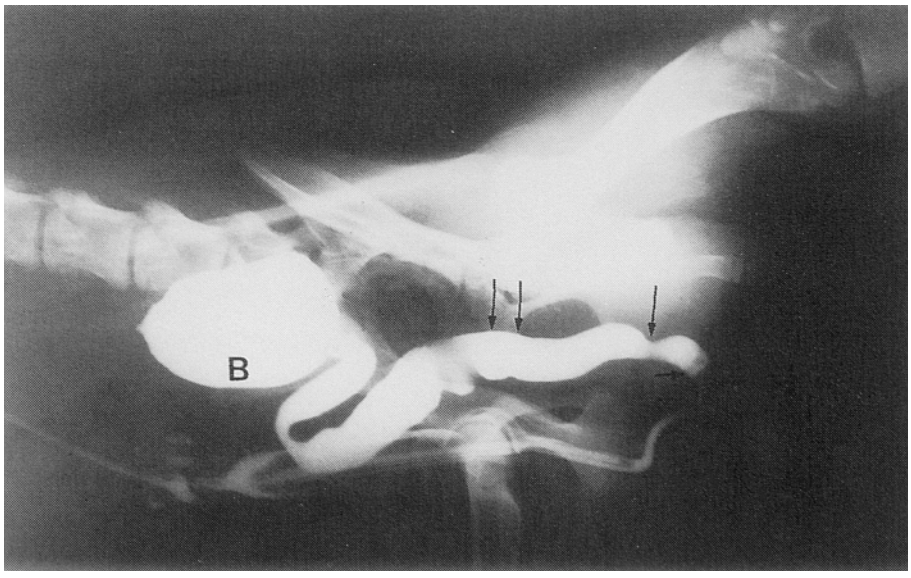


Fig. 2. Retrograde neourethrocystography. B, bladder; big arrows, ileum; one big arrow, sphincteric area; small arrows, ileourethral anastomosis site.

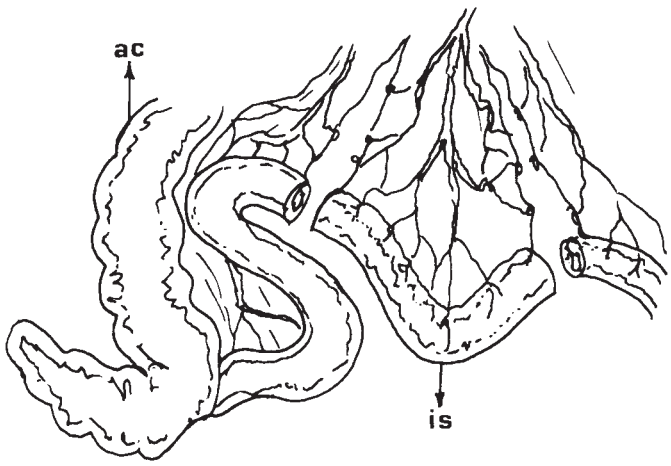


Fig. 3. Schematically illustrating the operation.
Fig. 3A, preparing the ileal segment. Ac, ascending colon; is, ileal segment prepared apart from ileocaecal valve.

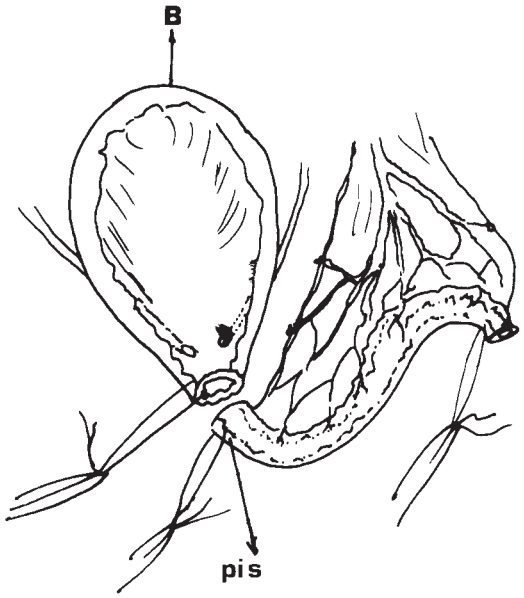


Fig. 3 B, anastomosing the bladder neck with the proximal end of the ileal segment. B, bladder; pis, proximal end of the ileal segment.

the stricture or by the reconstruction attempts. Should urethral reconstruction be necessary, it must be done with an awareness of the very real risk of external sphincter damage and hence incontinence (Devine et al. 1992). Otherwise, an artificial sphincter around the bulbous uretha or the bladder neck may be placed in those patients. However, the technical difficulty of that procedure should not be underestimated. Another alternative for the most difficult case is a continent bladder augmentation, with closure of the bladder neck (Devine et al. 1992). On the other hand, Mitrofanoff (1980) described his procedure in that the appendix was used as a catheterizable conduits in 1980, as well. The Mitrofanoff procedure was used in patients with intractable urinary incontinence (Jayanthi et al. 1995). In those patients, our technique may be applied as a final surgical procedure. Even if the urethral end is spatulated, the diameter of the ileum is larger than that

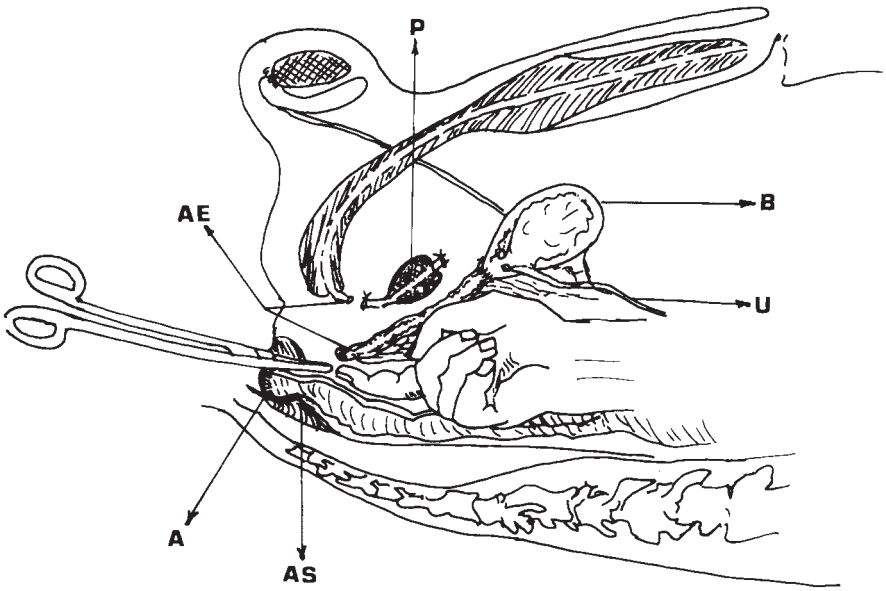


Fig. 3 C, removing the posterior urethra and prostate, and preparing the tunnel through the external anal sphincter. P, prostate; B, bladder; U, ureter; AS, anal sphincter; A, anus; AE, cut end of the bulbous urethra, and distal end of the ileal segment, which will be anastomosed.

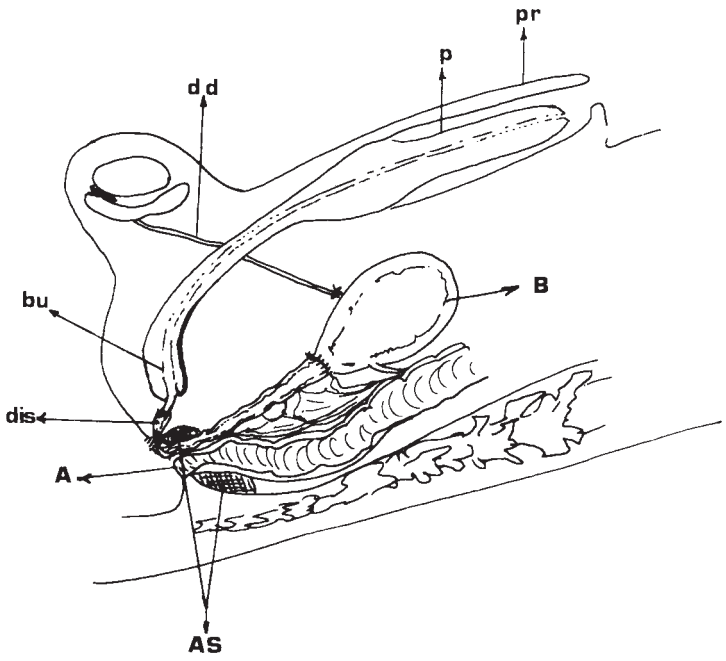


Fig. 3 D, completted operation. dd, ductus deferens; p, penis; pr, praeputium; B, bladder; AS, anal sphincter; A, anus; dis, distal end of the ileal segment; bu, bulbous urethra.

of the urethra, which sometimes recuires ileal tapering.

The anal sphincter was utilized as a continence mechanism in the urinary diversion techniques of Gersuny, Duhamel and Heitz-Boyer. In these techniques, the proximal stump of the sigmoid colon is brought down through the anterior portion (Gersuny) or posterior porsion (Duhamel) of the anal sphincter, or the proximal sigmoidal stump is brought down submucosally within the posterior

rectal wall beginning 5 or 8 cm apart from the anal verge (Heitz-Boyer) (Benson and Olsson 1992). These procedures have never been well accepted in the United States, owing to the urinary and faecal incontinence because of the anal sphincteric damage (Benson and Olsson 1992).

Perhaps, our operation may be accepted as a modification of Mitrofanoff's technique where appendix was brought up to the abdominal wall from the bladder. But we used an ileal segment instead of the appendix as a neourethra or urethral replacement (or conduit). Additionally we formed the stoma on the perineum in the first stage of the operation, and we performed a 2 cm subcutaneous perineal tunnel before suturing the ileal stump. The opening of the neourethra faced to the front allowing easy catheterisation if necessary. We also provided the urethral patency in the second stage of the operation.

Ileum is not as thick as the sigmoid colon, and thus it does not give harm to the anal sphincter mechanism as sigmoid does. As perineal ileostomy was made in the manner of a protruding stoma, the stomal stenosis probably did not occur during the three months observation.

Hensle et al. (1995) reported that they used the ileocaecal valve as a continence mechanism with a catheterizable tapered ileal stoma. These authors also reported that using the native bladder as part of the continent diversion in children with myelomeningocele was convenient. In the first step of our study, besides the native bladder being used as reservoir, the dog could urinate voluntarily owing to the anal sphincter used as continence mechanism.

These new techniques may probably be utilized in children with extrophy bladder whom the bladder reconstruction and/or augmentation have been achieved but their incontinence might have not been improved yet. These operations may be used in children with myelodisplasia as well. Of course anal sphincteric tone must be judged competent before electing these operations (Benson and Olsson 1992).

Acknowledgments

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References

1) Benson, M.C. & Olsson, C.A. (1992) Urinary diversion. In: *Campbell's Urology*, edited by P.C. Wals, A.B. Retik, T.A. Stamey & E.D. Vaughan, W.B. Saunders, Philadelphia, London, Toronto, Montreal, Sydney, vol. 3, pp. 2654–2720.
2) Devine, C.J., Jordan, G.H. & Schlossberg, S.M. (1992) Surgery of the penis and urethra. In: *Campbell's Urology*, edited by P.C. Wals, A.B. Retik, T.A. Stamey and E.D. Vaughan, W.B. Saunders, Philadelphia, London, Toronto, Montreal, Sydney, vol. 3, pp. 2957–3032.
3) Hensle, T.W., Kirsch, A.J., Kennedy, W.A. & Reiley, E.A. (1995) Bladder Neck Closure in Association with Continent Urinary Diversion. *J. Urol.*, **154**, 883–885.
4) Jayanthi, V.R., Churchill, B.M., McLorie, G.A. & Khoury, A.E. (1995) Concomitant

bladder neck closure and Mitrofanoff diversion for the management of intractable urinary incontinence. *J. Urol.*, **154**, 886–888.
5) Mitrofanoff, P. (1980) Cystostomie continente trans-appendiculaire dans le traitement des vessies neurologiques. *Chirurgie Pediatrique*, **21**, 297–305.
6) The U.S. National Institutes of Health (1985) Guide for the care and use of laboratory animals, NIH publication, No. 86–23, revised.