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BLADDER RECONSTRUCTION BY ILEOCYSTOPLASTY

(With 2 Figures)

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إعادة هيكلة الجهاز البولي بعد قطع جزئي للمثانة

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الطريقة المثلى لأجل إعادة هيكلة الجهاز البولي بعد قطع جزئي للمثانة يشكل تحدي لجراحي الجهاز البولي. هذه الدراسة تمثل الوصف التطبيقي التجريبي وكذلك التوافق النسيجي لزرع قطعة من نسيج المعى الدقيق منزوع المخاطية مع تجهيزه الدموي ، لإعادة بناء مثانة كاملة القدرات جديدة، بعد ثلاث سنوات من المتابعة.

SUMMARY

The optimal mode of urinary tract reconstruction following cystectomy continues to challenge the urologic surgeon. We describe the experimental application and histological compatibility of the demucosalized ileum with his vascular supply, in the reconstruction of continent neobladder, after three years postoperative follow up.

Key words: *Bladder reconstruction, demucosalized ileocystoplasty, urology, dog.*

INTRODUCTION

Urologic procedures for bladder augmentation are performed most commonly for neurogenic bladder dysfunction or clinically contracted bladder (Smith and Swierzewisk, 1997). This is done to increase the bladder capacity and lower the storage pressure between intermittent catheterization (Duel *et al.*, 1998; Bleustein *et al.*, 2001). A wide variety of operation techniques has been described, including the use of small intestine (ileocystoplasty) (Perito *et al.*, 1993), large intestine (colocystoplasty) (Kato, 2002), and stomach (gastrocystoplasty) (Raz *et al.*, 1993; Bluestein *et al.*, 2000; Perek *et al.*, 2001). The

intestinal smooth muscle encircling intact tubular segments of intestine is capable of generating high intraluminal pressures and it is now generally accepted that bowel segments should be "detubulased" that is, opened and reconfigured as a cup or patch before being incorporated into the reconstructed bladder (Thomas, 1997). All these procedures are based on isolation of a portion of the gastrointestinal tract on its native vascular supply (Bjording and Howard, 1989). Various complications have been described arising from enteral bladder augmentation. These include electrolyte abnormalities, urinary stone disease, nutrition disturbances, hematuria syndrome, and malignancy (Shoemaker and Marucci, 1955; Shekarriz *et al.*, 2000). To eliminate some of these complications, an international research effort is currently directed at devising effective alternative to conventional enterocystoplasty, using intestine from which the epithelium has been removed (seromuscular enterocystoplasty) (Atala *et al.*, 1992). To our knowledge, the technique described here is the first example successfully performed in dogs with long-term follow up.

MATERIALS and METHODS

Four local breed dogs; male and female weighting 15 to 20 kg, were used for the experiment. The surgical operation was carried out under general anaesthesia using atropine sulphate (1mg/b.w) intramuscularly as a preanaesthetic followed, 10 minutes later by intramuscular administration of a mixture of xylazine (5mg/kg) with ketamine (15mg/kg). Abdominal incision was performed in the middle line, post umbilical in the female dog. In the male dog, a paraprepuccial incision was used. The prepuce was retracted laterally, and a midline abdominal incision was made through the linea alba.

The bladder was isolated from the abdomen with moistened laparotomy towels. A retention suture was placed at the cranial end of the bladder, and a second suture was placed at the caudal end of the planned incision. The bladder was emptied by cystocentesis using a 22-gauge needle and syringe. After partial resection of bladder, an ileum segment of the size of bladder defect was isolated together with its vascular supply. The intestinal segment was opened in a longitudinal fashion along its antimesenteric border; the mucosa was removed with a curette and fastened to the remaining bladder under straight tension with four fixation sutures (Fig.1). After complete suturing with interrupted 0 chromic catgut sutures (Fig. 2; Photo A), the intestinal edges were joined

by end to end anastomosis with simple interrupted 2-0 polyglactin 910 (vicryl). The abdominal closure was carried out in the usual manner. Fluid and electrolyte deficits were corrected and antibiotic therapy was continued in the postoperative period. The bladder was kept empty for 2 to 3 days by intermittent catheterization. After 24 hours, gradual feeding was done.

The animals were studied after 3 years. The dogs were sedated with intravenous sodium pentobarbital (60 mg/kg). Samples of the anastomotic area, bladder and intestinal cloth were taken for histological evaluation. This last has been performed by staining paraffin slides with hematoxylin-eosin.

RESULTS

The total operative time was approximately 3 hours, with minimal blood loss and no intraoperative complication. Our experimental dogs survived to the third year. Postoperatively, all the dogs had an uneventful recovery. Resumption of physical activity and oral intake occurred on postoperative days 1 and 7, respectively.

The performance of ileocystoplasty requires adherence to basic surgical tenets and must include the following basic prerequisites: (a) atraumatic mobilization of the bladder, (b) isolation and exclusion of an appropriate length of ileum on the broad, well-vascularized mesenteric pedicle, (c) re-establishment of bowel continuity, (d) construction of tension-free, muscular-to-muscular ileovesical anastomosis and bladder stenting, and (e) proper reconstruction of the stoma.

The histological sections taken through the anastomoses between the bladder and demucosalized intestinal segment showed a complete integration of cloth intestinal with the bladder (Photos D, E, F). We can also observe that the demucosalized ileum incorporated in the bladder has conserved its structure (Photo C). The demucosalized ileocystoplasty has re-established the bladder capacity but the original bladder cloth has not been affected (Photo B).

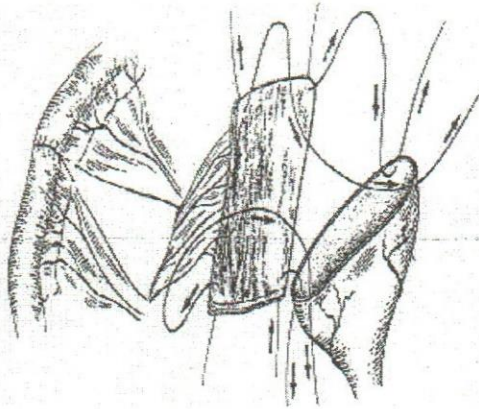


Fig. 1: A segment of terminal ileum is isolated on its blood supply.

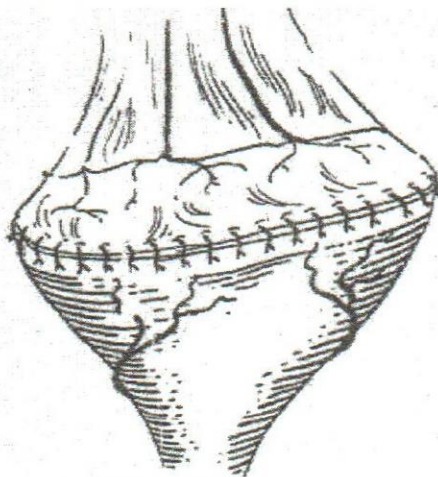


Fig. 2: The segment of ileum is opened on the antimesenteric border and the patch thus is sutured to the margins of the opened bladder.

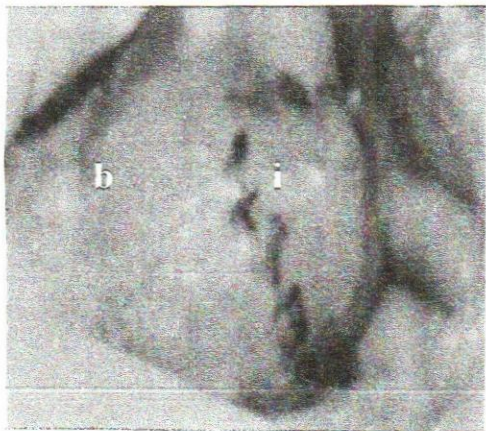
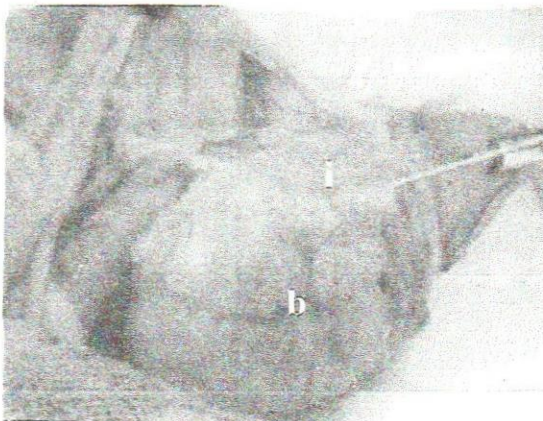




Photo A/1: Bladder after ileocystoplasty (first case).

Photo A/2: Bladder after ileocystoplasty (second case).

Photo A/3: Bladder after ileocystoplasty (third case).

Photo A/4: Bladder after ileocystoplasty (fourth case).

We can observe the segment of ileum (i) with his native blood supply sutured to the bladder (b).

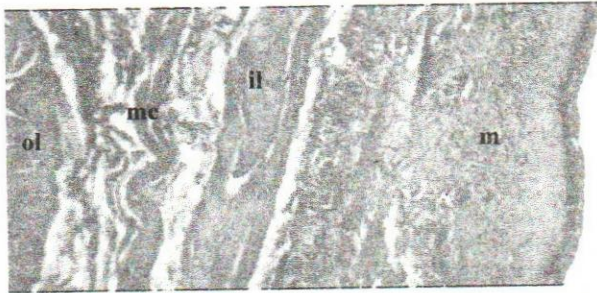


Photo B (Gx10): Slide of bladder tissue showed normal constitution.

- (ol) outer longitudinal layer of the muscularis.
- (mc) middle circular layer of the muscularis.
- (il) internal longitudinal layer of the muscularis.
- (m) mucosa.



Photo C (Gx10): We can observe in this slide taken from the intestinal grafts that the mucosa has not been completely destroyed and the muscular layer is entirely conserved.

- (ic) internal circular layer of the muscularis
- (ol) outer longitudinal layer of the muscularis.
- (m) mucosa.

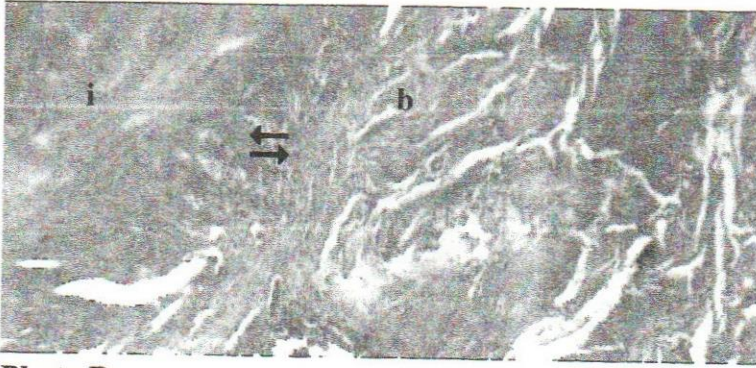


Photo D:



Photo E:

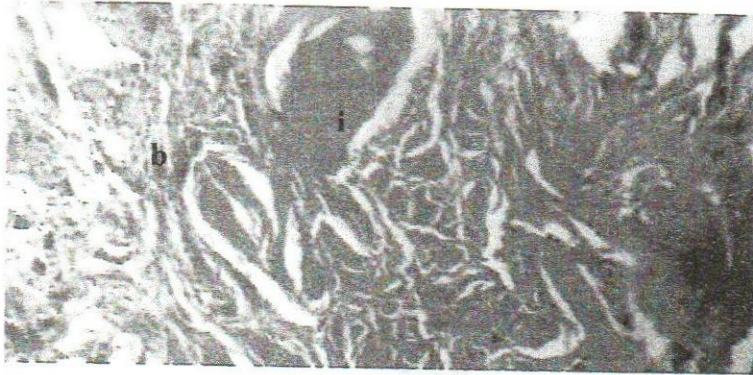


Photo F:

Photos D, E, F: Histological findings of ileocystoplasty. Hematoxylin-eosin slide of anastomosis area seen under low power (10X). The arrows delineate the anastomosis between intestinal tissue (i) and bladder (b) (photos D, E). We can observe in the transversal section the fusion of the muscular layer in bladder (photo F).

DISCUSSION

Surgical treatment of patient with a neurogenic or congenitally malformed bladder has moved from incontinent urinary diversion to continent reconstruction to allow independence from external devices. This is important for the physical and social well being of human (Shoemaker and Marucci 1955). Different bowel segments have been used with variable results and complication rates (Shekarriz *et al.*, 2000). Short and long term complication such as mucus production, stone formation, spontaneous perforation, metabolic disturbance, bacteriuria, and malignancy can mostly be attributed to the fact that intestinal epithelium is poorly adapted to prolonged contact with urine (Thomas, 1997). In the present study, we have demonstrated that the use of demucosalized ileum for auto augmentation has decreased these complications.

After resection of large portion of small intestine, maldigestion, malabsorption, diarrhoea induced by fatty acids or bile salts, bacterial overgrowth, and gastric hypersecretion may occur. The anorexia or vomiting in the presence of fever, and abdominal tenderness, indicate anastomotic leakage and peritonitis (Ellison, 1998). In our study, non complication related to the partial resection of ileum has been observed. Others have described bladder augmentation using demucosalized stomach but long term follow up has not been established. Our operation technique provides adequate working space to perform the reconstruction with minimal potential for devascularization injury of the augmented bladder.

Augmentation cystoplasty plays a central role in establishing a low pressure reservoir, but attention to upper tract drainage and continence are equally important. The complication and reintervention rates are relatively high. Long-term follow-up is necessary because of the persisting potential for problems. The small intestine segment is suited for use as autologous tissue substitute to cover defects of the liver, kidneys, spleen, abdominal wall and bladder, and can be used as transplant for the oesophagus, ureter and bladder and to cover a diaphragmatic hernia.

With our limited experience, we believe that bladder augmentation using a demucosalized ileocystoplasty offers a good alternative to other surgical treatments in patients with bladder defects. The results of our study indicate that demucosalized ileum segment can be incorporated in the bladder with no long term complication.

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