

EXPERIENCE WITH REPAIR OF HYPOSPADIAS USING BLADDER MUCOSA IN ADOLESCENTS AND ADULTS

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ABSTRACT

From July 1984 to January 1994, 113 hypospadias operations were performed using a free bladder mucosa graft. There were 31 primary cases and 82 secondary cases in which prior operations had been done. The meatus was penile in 33 patients, penoscrotal in 72 and perineal in 8. The cosmetic and functional results were satisfactory. Postoperative complications included 8 fistulas that required closure and 6 cases of stenosis treated by dilation. Our results suggest that hypospadias repair with a bladder mucosa graft is feasible and reliable. The technique has been performed successfully in the most complex as well as simple cases in adults and adolescents.

KEY WORDS: hypospadias, urethra, tissue transplantation, bladder

Hypospadias repair remains a challenge to urologists because of the high complication and failure rates. Many operations have been devised for correction of hypospadias, most of which provide a satisfactory result when performed carefully. However, all of these procedures are subject to complications and are liable to break down if the technique is not meticulous. Since the initial attempt by Memmelaar,¹ reconstruction of the urethra with bladder mucosa has gained wide acceptance among urologists for the treatment of various complex and severe cases of hypospadias.²⁻⁴ We present our experience with bladder mucosa hypospadias repair in 113 adults and adolescents.

METHODS AND MATERIALS

Between July 1984 and January 1994, 113 patients underwent hypospadias repair with a free bladder mucosa graft. Patient age ranged from 13 to 29 years (mean age 17.1 years). There were 31 primary cases in which adequate foreskin for urethral reconstruction was lacking and 82 secondary cases in which a prior operation had been performed elsewhere. The meatus was penile in 33 cases, penoscrotal in 72 and perineal in 8. Nine patients had undergone cystostomy during a previous operation, including 2 with a bladder mucosa graft repair. Followup ranged from 3 months to 2 years. All repairs (primary or secondary) were performed as a 1-stage procedure except in 1 patient with male pseudohermaphroditism and severe hypospadias.

Surgical technique. A traction suture is inserted into the glans slightly dorsal to the tip to avoid interference with later construction of the glans meatus. A circumferential incision is extended around the coronal sulcus beginning dorsally. It is important to leave enough skin next to the corona to avoid a suture line exactly at the corona. The incision is brought down and circumferentially around the native urethral meatus. The penis is freed completely from the skin by starting dissection bluntly on the dorsum of the penis. In this way a plane is developed easily just above Buck's fascia between the subcutaneous tissue and corpora. The chordee is completely released as proved by artificial erection. The terminal part of the urethra is freed from the underlying corpora cavernosa. Often the last bit of the urethra is deliberately sacrificed to avoid placing an anastomosis in this poor quality area. In reoperative cases the old repairs are discarded. Electrocautery is used for hemostasis.

After the urethral bed is well prepared for implantation of the graft, the bladder is distended with saline instilled through a previously placed catheter and approached through a vertical suprapubic skin incision. The bladder muscle is incised transversely down to the underlying mucosa. The muscle of the bladder wall may be grasped with Allis clamps to facilitate better exposure, and a plane is developed easily between the mucosa and the bladder wall muscle. Four quadrant stay sutures are placed in the mucosa to outline the graft for harvest before the bladder is entered. The graft is 10% longer and 20% wider than needed. In some cases the previously exposed and bulging mucosa may burst unexpectedly before dissection is completed, resulting in an immediate bladder collapse and considerably complicating further dissection, which should proceed with great patience until an appropriately sized area of mucosa has been reached. The damaged bladder mucosa graft is carefully mended intact before tubularization.

The mucosa graft is fashioned loosely around a 12 to 20F multiple perforated silicone rubber tube (depending on patient age) with the mucosal surface directed inward. A running, inverting 7-zero nylon suture is used for construction of the neourethra, which is done simultaneously with closure of the bladder and suprapubic incision by a separate team. A Malecot catheter is used for suprapubic drainage.

The graft is set in its bed with the suture line facing the dorsal aspect of the penis. The anastomosis of the proximal end of the graft to the urethra is widely spatulated. The stent within the graft extends only a few centimeters above the proximal anastomosis. Two or 3 pairs of sutures are placed on each side of the graft to anchor it on the shaft, with each pair 1 to 1.5 cm. apart to maintain immobilization of the graft and a desired urethral caliber after the stent is removed (fig. 1). The glans is tunneled with a core removed to achieve an adequate meatal position through which a 20F sound fits loosely. The graft is trimmed to a length adequate to reach the meatus but it is best to err on the generous side. The stent is secured with a nonabsorbable suture to the tip of the glans and trimmed 2 cm. distally. The graft is covered in 2 layers with subcutaneous tissue and skin. One skin flap is swung across the midline in the ventrum and sutured up to the corona to avoid superimposition of the suture line and the graft (fig. 2). When ventral skin is inadequate for this rotation the dorsal skin is split down the midline, permitting rotational flaps to be fashioned around each side. Excess skin is trimmed to arrive at a more aesthetically pleasing result.

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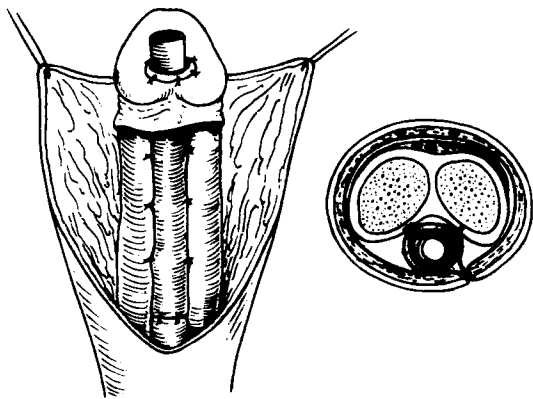


FIG. 1. Graft is anchored to shaft by 2 or 3 pairs of fine sutures

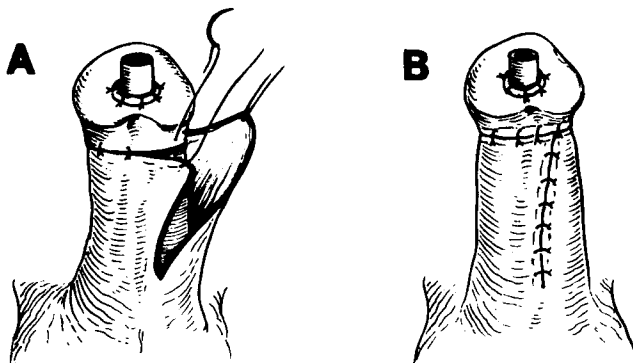


FIG. 2. A, 1 skin flap is swung across midline in ventrum and sutured to corona. B, 2 flaps are approximated.

To avoid suture removal at a later date, which may hurt the patient and also is painstaking, 6-zero nylon suture is used to close all subcutaneous tissues and skin. The penis is covered with layers of gauze held in place with sutures. The traction suture is fixed to the abdomen with strips of elastic adhesive to keep the penis erect. Estradiol benzoate (2 mg. twice a day) is given intramuscularly for 1 week postoperatively. Prophylactic parenteral antibiotics are administered in every patient for 5 days postoperatively. The dressing is left for 5 to 7 days, during which time accumulated secretions and blood are compressed from the urethra twice a day by gentle squeezing of the urethra forward and aspiration with a syringe. The stent is removed on day 10 and the patient is allowed to void shortly afterwards. The suprapubic tube is removed on postoperative day 12.

RESULTS

In 99 patients (87.6%) the cosmetic and functional result was satisfactory without need for subsequent manipulation. A total of 14 patients (12.4%) had complications: 8 (7.1%) had a urethrocutaneous fistula (5 proximal and 3 coronal) that was closed at a later date on an outpatient basis and 6 (5.3%) had a stricture requiring dilation (2 in the neomeatus and 4 at the junction of the native urethra and graft). An 18-year-old man who had been reared as a girl until he presented to us had complete perineal hypospadias and undescended testes. The phallus was small with severe chordee. The scrotum was bifid with the appearance of labial swellings. The hooded foreskin was depleted. The patient requested reconstruction of the external genitalia as a man. A staged repair was necessary. At stage 1 the chordee was straightened and the penis was lengthened completely. Urethroplasty with blad-

der mucosa and orchiopexy were done 3 months later. Unfortunately, bladder bleeding developed 2 days postoperatively. A Foley catheter was inserted for bladder irrigation until bleeding ceased 9 days postoperatively. The Foley catheter was removed 15 days postoperatively and a small fistula developed, which was closed 6 months later.

DISCUSSION

Our urology department for adults admits only patients older than 12 years, which gives us more of a chance to treat repeat cases (cripples) and relatively older patients. Bladder mucosa is an easily accessible material for urethroplasty. We used bladder mucosa for hypospadias repair only when there was inadequate prepuce for either a vascularized flap or a free preputial graft. Previous cystostomy and even a prior bladder mucosa graft procedure do not preclude another mucosal graft harvest. Although we did experience difficulties in dissection marked by adherence between the bladder muscle and mucosa, which is somewhat troublesome and may cause mucosa perforation, this can be overcome by dissecting with extra patience or simply by evading the scarred site if there is an unoperated area of bladder wall beyond the scar where enough bladder mucosa is expected to be secured. Perforation of the mucosal graft caused by the dissection, when carefully mended, did not seem to increase the risk of fistula formation.

Emphasis on certain points of technique seems warranted. It is important to close the new urethra by well vascularized layers of subcutaneous tissue and skin for the graft to heal. Overlying suture lines should be avoided to minimize the possibility of fistula formation. An anchor suture of the graft to the shaft is presumably beneficial to prevent graft stenosis and failure by decreasing graft mobilization and shrinkage during healing. When tunneling the glans penis, incising a core of glans skin is necessary. The objective of the technique is to provide a raw surface for anastomosis and subsequently to minimize the risk of meatal stenosis.

The reported incidence of meatal problems with bladder mucosa is 24 to 100%,⁵⁻⁹ including meatal stickiness, hypertrophy, prolapse and stenosis. Some of these problems are considered to be unique to bladder mucosa as a urethral substitute. The exposed bladder mucosa undergoes a process of metaplasia, development of mucin-secreting glands and eventually squamous changes. During the hypertrophic period, the meatus may extrude, prolapse and even lead to stenosis. Squamous changes will gradually stabilize the meatus.^{7,9} Early followup demonstrated a sticky and irritated meatus in most of our patients, which, however, gradually resolved to a normal-appearing meatus at 2 years. Only 2 patients had occlusion requiring dilation. We considered our technique to be the main contributor to this lower incidence of meatal stenosis, including wide glans tunneling and coring, the relatively longer duration that the stent was indwelling and especially anchor suturing of the graft to the shaft, which may prevent graft prolapse through the meatus. The relatively older patient age in this setting may also contribute to the improved results, as they have a well developed glans allowing for generous tunneling and coring. Based on our outcome, we agree with Mollard et al that the combined mucosa and skin graft, designed by Ransley et al to avoid meatal extrusion and its consequences,⁵ does not seem to be necessary.⁶

Accumulated secretions and blood in the new urethra are favorable culture media for bacteria growth. We routinely expel secretions from the urethra by squeezing and aspiration during the initial postoperative days. This maneuver is obviously beneficial to control the complications of fistula and stenosis. Our experience with 113 bladder mucosa grafts for hypospadias repair in the adult and adolescent has led us to believe that this technique is reliable, has a low complication rate, provides a satisfactory functional and cosmetic result,

and is the initial choice of technique for correction of severe hypospadias marked by a long urethral gap or by failure of previous operations.

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EDITORIAL COMMENT

This is a remarkable series of adults undergoing bladder mucosal urethroplasty, 75% of whom underwent a secondary procedure. The results are outstanding compared with recent reviews (references 7 and 9 in article). Meatal problems are so prevalent in other experience that the authors have carefully evaluated why their meatus cases do so well. They have made several important points: 1) the tunneling and coring of the glans are generously made to a caliber of 20F, 2) a longer duration of stenting (10 days) is allowed and 3) anchoring sutures of the graft to the shaft may prevent graft prolapse through the meatus. Further study of the protocol to understand the better results reveals that they give estradiol (2 mg. twice a day intramuscularly) for 1 week. In addition, for 1 week they compress the urethra twice daily by gentle squeezing and aspirate the secretions from the stent, which has multiple perforations. This fact implies that the patients are in the hospital for this period, a postoperative management that would not be acceptable in our country. Nevertheless, these details may contribute to the fine results.

We abandoned bladder mucosa grafts in favor of buccal grafts. We have had little problem with the buccal grafts everting at the meatus, and the fistula and complication rates have been lessened. Harvesting of the graft is tolerated much better than the cystotomy required for a bladder graft. The details of this technique are well outlined. The authors should be commended for the fine results.

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