SPLIT ONLAY SKIN FLAP FOR THE SALVAGE HYPOSPIADIAS REPAIR

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ABSTRACT

Purpose: Following failed hypospadias repair absence of the penile foreskin, a shortage of ventral skin and residual chordee may all contribute to poor long-term results. We describe a technique called the split onlay skin (SOS) flap that has improved our surgical outcomes in boys requiring salvage hypospadias repair.

Materials and Methods: The SOS flap uses a transverse island of penile shaft skin that is mobilized on its vascular pedicle and rotated into position to the ventrum of the penis at the site of the urethral defect. The flap is transected transversely, and half of the flap is used as an onlay to repair the urethra and the other half is used for additional skin coverage where needed on the penile shaft. We treated 11 boys 30 to 124 months old (mean age 60.3 months) who had a mean of 2 previous failed hypospadias repairs. All 11 boys presented with complex combinations of urethrocutaneous fistulas, strictures or urethral diverticula.

Results: Of the 11 patients 6 (54.5%) had development of postoperative fistulas. Five of these fistulas were surgically closed with no further complications. One penoscrotal fistula closed spontaneously after 7 months. Mild chordee from contraction of the flap and a urethral diverticulum developed in 1 boy. At a mean followup of 24.5 months all patients, including those who underwent closure of the secondary fistula, were voiding well with excellent appearance.

Conclusions: In cases where little local tissue is present the SOS flap procedure is an excellent way to transfer healthy dorsal tissue to the ventrum for an onlay salvage urethroplasty while providing additional coverage of the urethral defect and a tension-free skin closure. Despite the high fistula rate we encountered following the initial SOS procedure, we endorse this technique because the transferred dartos provides additional tissue, which facilitates subsequent fistula repair. These boys can achieve a successful cosmetic result without incorporation of scrotal tissue or a free graft, which we believe leads to more predictable results.

KEY WORDS: hypospadias, fistula, cutaneous fistula, surgical flaps

Successful urethroplasty for a patient who has undergone previous failed hypospadias repair remains a surgical challenge. These redo procedures require continued adherence to the surgical principles of urethrocrotaneous fistula repair—sufficient time interval following failed repair, excision of the fistulous tract, closure of the urethral defect with mucocutaneous inverting sutures and overlay of the urethral repair with abundantly vascularized tissue. However, in some cases the absence of preputial skin, paucity of ventral skin and residual chordee may all contribute to the risk of failure following salvage hypospadias surgery.

We address the dual aims of completing a redo urethroplasty with an onlay island flap using residual penile skin while rotating adequate skin for ventral penile skin coverage. We present our experience with what we call the split onlay skin (SOS) flap for salvage hypospadias repairs.

MATERIALS AND METHODS

A total of 11 patients with 1 to 5 previous failed hypospadias repairs (mean 2.0) underwent SOS repair at our institution between November 2000 and July 2002. All of these boys presented with a persistent complex fistula and a paucity of ventral skin. A minimum of 1 year was allowed to elapse following the last failed repair before performing an SOS procedure.

In this procedure a glans traction suture is placed and a circumcising incision line is marked. The line is carried ventrally to the midline and then extended vertically to the penoscrotal junction. The release of this ventral tissue to allow the dorsal skin to flatten in an “open book” fashion facilitates proximal dartos mobilization with the island skin flap with minimal risk of damage to the pedicle to the dorsal skin flap. Lidocaine with epinephrine (1:100,000) is infiltrated along the marked line before incision. We then deglove the penis by creating a plane of dissection superficial to Buck’s fascia and avoiding injury to the preputial skin pedicle (part A of figure).

If the distal urethral coverage is particularly thin, or if a diverticulum is present along with a fistula, the urethra is trimmed. If the distal urethra requires reconstruction, we measure the length of the urethral defect to estimate the size of the skin flap that will be required for urethroplasty. The dorsal penile shaft skin is then carefully examined for redundancy, and a circumferential flap up to 1 cm wide and longer than the length of the urethral defect is outlined transversely. Interrupted 5-zero polypropylene stay sutures are placed and grasped so that the fold of tissue between the outlined skin flap and shaft skin is accentuated. The epithelium is divided with the initial incision and the flap is harvested in a plane that preserves the vascular pedicle. The midline incision of the ventral shaft skin com-
pleted earlier releases the base of the dorsal vascular mesentery and facilitates flap mobilization.

We then pass the dorsal penile skin flap over the glans through a buttonhole incision in the mesentery. We divide the flap transversely into superior and inferior segments after ensuring adequate vascularity to both segments (parts B and C of figure). We tailor one part of the flap to fit the urethral defect. The urethral segment is sutured into place with interrupted subcuticular 7-zero polyglactin sutures as an island onlay hypospadias repair (part D of figure).

After we reconstruct the glans we place a 6Fr catheter and begin the skin closure. A redundant dorsal prepuce is not available in these cases to cover the ventral skin defect. Therefore, after reapproximating the dorsal penile shaft skin we tailor the remaining segment of the dorsal skin flap to provide additional coverage of the ventral penile shaft (part E of figure). A Telfa (Tyco Adhesives, Franklin, Kentucky) and gauze dressing that compresses the penis and urethral stent against the lower abdominal wall with a Tegaderm (3M Health Care, St. Paul, Minnesota) polyurethane film dressing is applied and the patient is discharged home with prophylactic antibiotics.

RESULTS

Mean age of the 11 patients undergoing SOS repair was 60.3 months (range 30 to 124). These patients had a mean of 2.0 (range 1 to 5) previous failed hypospadias repairs and had recurrent fistulas (5 recurrent subcoronal, 5 proximal shaft or penoscrotal, and 1 coronal and penoscrotal). A total of 5 boys had meatal stenosis and 4 had persistent ventral penile curvature. One patient had a urethral diverticulum.

Following SOS repair 6 boys (54.5%) had development of a fistula (1 coronal, 2 distal shaft and 3 penoscrotal). Interestingly, 4 of the 6 post-SOS repair fistulas (67%) occurred in boys who had undergone more than 2 previous surgical repair attempts, while 2 (33%) developed in boys with only 1 previous attempt. Of these cases 1 penoscrotal fistula closed spontaneously, while localized fistula repair was performed in the other 5 without further complications. One boy with a distal shaft fistula also had development of a urethral diverticulum that was successfully corrected during the redo repair. Persistent mild chordee from contraction of the flap was noted in 1 boy, who ultimately underwent a fistula closure. The curvature was due to contraction of the cutaneous portion of the SOS flap but the flap was adequate for interposition following the fistula repair.

No patient had development of flap ischemia or infection. With a mean followup of 24.5 months (range 8 to 34) all patients had closure of the post-SOS fistulas, were voiding well and had a satisfactory cosmetic result.

DISCUSSION

An ideal salvage hypospadias repair should restore urethral continuity of adequate caliber, eliminate intrinsic or iatrogenic penile curvature and provide a cosmetically pleasing circumferential skin closure. Repeat hypospadias surgery is predisposed to failure if it relies on surgically damaged or inadequate tissue. We believe that the chances for success are improved if healthy skin from the dorsum or lateral tissues can be transferred to the ventrum.

Numerous techniques have been described to address this surgical challenge but no single approach has been universally applied. While we earlier concurred with commonly held opinion that free grafts could be used to repair long urethral defects, our longer term followup experience, and that of others, has been that excellent short-term results have sometimes evolved into disappointing long-term outcomes.2–4 Meatal based flaps and the tubularized incised plate urethroplasty
have been incorporated into the repair of hypospadias fistulas.\textsuperscript{5–7} The mental based flap (Mathieu “flip-flap”) repairs depend on the presence of adequate ventral skin that is absent in our patients. Similarly, the tubularized incised plate repair as a salvage procedure is most successful when the repair is performed on an unaltered urethral plate or covered with a second layer of dartos or tunica vaginalis.\textsuperscript{6,7}

Our preference is to preserve the urethral plate, if possible, and use penile skin in repairing the failed hypospadias repair. Our experience has been similar to that reported by Jayanthi\textsuperscript{8} and Simmons\textsuperscript{9} et al, that previously relocated penile skin may be successfully rotated as an island onlay flap to repair hypospadias fistula without vascular compromise and with consistently favorable outcomes. We have found that even following multiple previous failed hypospadias repairs enough penile shaft skin is usually present dorsally or laterally to transpose ventrally for an island onlay repair.

Asopa et al\textsuperscript{10} introduced the concept of dual use for the preputial skin flap in their description of the double-faced preputial island flap.\textsuperscript{11} They used a double-faced vascularized flap harvested from the dorsal prepuce, with the inner prepuce being used to construct a neourethra, while the outer prepuce spiraled to the ventrum covered the ventral penis.\textsuperscript{10,11} Duckett modified the repair but abandoned the technique largely due to an asymmetrical and bulky appearance.\textsuperscript{12}

Gonzalez et al continued the use of a single vascularized transverse preputial flap for onlay urethroplasty and as a ventral shaft skin patch for primary hypospadias repairs.\textsuperscript{13} The double onlay preputial flap involves ventral transposition of a total preputial island flap. The total flap is positioned so that the flap can be divided in the vertical plane into an outer flap surface that is sutured to the urethral plate to complete an onlay urethroplasty, with the remaining flap being trimmed to cover the ventral shaft skin defect.\textsuperscript{13}

The SOS flap we describe is used only for salvage hypospadias repairs where urethral stenosis or multiple fistulas require a complete open urethrotomy to reconstruct a surgically damaged distal urethral plate, and in boys where the ventral penile shaft skin is deficient. Our technique is unique in its dual use of previously manipulated penile skin that was mobilized during the initial repair. With our technique the rotated penile skin flap is transacted transversely, rather than vertically, so that the one portion is sutured to complete the onlay urethroplasty and the other portion serves to patch the ventral skin defect. We have found that incising the remnant skin along the ventrum proximally to the penoscrotal junction in all cases eases dissection of the dorsolateral skin flap by releasing the shaft skin and increasing visibility of the base of the vascular pedicle. We have also found that the 2 segments of the SOS flap are extremely versatile when care is taken, with optical magnification, to ensure that the split skin segment has an adequate vascular pedicle.

Recurrent urethrocutaneous fistulas, strictures and other complications occur frequently following salvage hypospadias repairs.\textsuperscript{1,8,14,15} Specifically, previous reports have attributed to the increased number of procedures required to treat failed hypospadias repairs when relocated penile skin is used as an onlay flap.\textsuperscript{8,15} Our fistula rate of 54.5%, although higher than what we have experienced following most secondary repairs, was not unexpected in this subset of older boys with previously manipulated tissue, extensive scarification, absent ventral skin and multiple fistulas. However, the advantage of having transferred skin with underlying dartos tissue as a ventral patch during the SOS repair was clear, in that it allowed simple closure of the fistula with mucosa inverting absorbable sutures and additional layers of previously transferred dartos tissue. Ultimately, while 1 fistula closed spontaneously, 5 of the patients who underwent post-SOS fistula repair required only a single additional procedure. We believe that without transfer of the healthier lateral or dorsal skin and dartos tissue the subsequent simple fistula closure would have failed.

\textbf{Conclusions}

In cases where little local tissue is present the SOS flap procedure enables the transfer of healthy dorsal tissue to the ventrum. Splitting the skin and the pedicle, as described, provides additional mobility to the flap, which allows 2 skin segments to be used independently. This method provides additional coverage of the urethral defect and a tension-free skin closure. Despite the high fistula rate that we encountered following the initial SOS procedure, we endorse this technique because the transferred dartos tissue that would not otherwise be available facilitates the subsequent fistula repair. In this way a complex repair is converted to a simple one. These boys can achieve a successful cosmetic result without incorporation of scrotal tissue or a free graft, which we believe leads to more predictable results.

\textbf{References}