

Original Article

Repair of large urethrocutaneous fistula with dartos-based flip flap: A study of 23 cases

Ashutosh Soni, Sanjay Sheoran

Dept. of Plastic Surgery and Burns, MP Shah Medical College and GG Hospital, Jamnagar, Gujarat, India

Address for correspondence: Dr. Ashutosh Soni, C-17, Medical Campus, MP Shah Medical College, Jamnagar - 361 008, Gujarat, India.

E-mail: drashutoshsoni@yahoo.co.in

ABSTRACT

The commonest complication of hypospadias repair is occurrence of urethrocutaneous fistulae. These fistulae may be caused by a variety of factors and occur in different sizes at various sites of the previous repair. Small fistulae are easier to close with local tissue and flaps but larger fistulae which are 4 mm or more in size are difficult to close because of the paucity of available tissues and chances of recurrence. A variety of methods have been described in the literature for the repair of urethrocutaneous fistulae with variable results. In this study of 23 cases, we have successfully repaired large urethrocutaneous fistulae using dartos-based flip flaps for their closure in the period from June 2001 to May 2006. These flaps can cover any fistulae from the penoscrotal region to the distal penile shaft. Dartos-based flip flaps are robust and vascularized and provide watertight closure and at the same time they are easy to elevate and leave no residual donor site morbidity.

KEY WORDS

Closure, dartos, hypospadias, urethrocutaneous fistula, watertight

INTRODUCTION

The most common complication after hypospadias repair is urethrocutaneous fistula with a reported incidence of 12.1 to 91%.^[1]

Urethrocutaneous fistula after hypospadias repair remains a frustrating problem for surgeons. Furthermore, with the improvement in suture materials and surgical techniques, such complications are increasingly unacceptable. The occurrence of urethrocutaneous fistulae precludes a goal of hypospadias surgery, i.e., an early one-stage repair of the defect.^[2]

During the last decade many principles of an ideal

repairing technique have been clarified. Delicate tissue handling, inversion of the urethral mucosa after excising the epithelialised tract of the fistula, a multilayer repair with well-vascularised tissues, avoiding overlapping sutures and non absorbable or thick suture materials, a tension-free closure, use of optical magnification and needle-point cautery for coagulation are currently considered mandatory.^[2]

Unfortunately, there is no one single perfect technique for repairing an urethrocutaneous fistula. Factors that may affect results of their repair may be the conditions of local tissue, duration of time after hypospadias repair, the number, location and size of the fistula, use of magnification, patient's age, previous fistula repairs and also the type of suture material used, skill of the operating surgeon and proper inversion of the edges etc.

Presentation at a meeting: Electronic presentation APSICON 2006
Place: Hyderabad. Date: 24th November 2006

Some failure rate is expected in every type of repair. By providing a watertight covering layer, the incidence of recurrence in urethrocutaneous fistulae repair can be greatly reduced specially in large urethrocutaneous fistulae.

The purpose of this study is to assess a watertight covering in repair of large fistulae 4 mm or more in size^[3] which are so prone for recurrence.

The use of dartos flap as a second layer for closure of hypospadias fistula has been previously established^[4] and we have used our flip flap modification of this dartos flap. Multilayer closure is important in urethral fistula repair. A scrotal dartos flap is well vascularised and easy to mobilize.^[4] It is a valuable tool to create this type of closure.

MATERIALS AND METHODS

We have operated on a total of 23 cases of large urethrocutaneous fistulae during June 2001 to April 2006. The age group of the patients ranged from three years to 21 years [Table 1].

All the patients underwent routine preoperative investigations. Out of the 23 patients, nine patients had undergone previous fistula repair one or more times by routine methods using adjacent local flaps. The size of the fistulae in our study ranged from 4-18 mm [Table 2].

All fistulae were measured using callipers in the anteroposterior length of the penis although all these fistulae were of ovoid shape with near equal dimensions all around. Most fistulae were located in the proximal and

mid-penile regions [Table 3]. Only one fistula in our series was of the penoscrotal variety; we did not encounter any other case of such proximal fistulae.

If a patient had more than one small fistula adjacent to one another, they were joined into a large single fistula and then repaired [Table 4].

In all patients a silicone catheter of size 6-8 French was kept as a stent for 10-14 days postoperatively. No suprapubic catheterization was used in any patient in this study.

All urethrocutaneous fistulae in our study were repaired after a minimum of six months after the last procedure (primary hypospadias repair or fistula repair), so that the scar tissue was mature. Urethral calibration was always used before surgery to exclude meatal or urethral strictures followed by assessment of the exact number and size of the fistulae by injecting methylene blue solution with the tip of a small syringe inserted in the terminal portion of the neourethra.

Operative technique

After administration of anaesthesia, painting and draping, the patient was catheterized with a silicone catheter of size 6-8 French. If there was more than one small fistula in close proximity or adjacent to each other, they were converted into a single large fistula.

Infiltration with xylocaine (2%) and adrenaline 1:200,000, in appropriate dose according to weight, was routinely done around the surgical field using a needle of 26 gauge. Initially turnover flaps were marked around the fistula so as to form the lining of the urethra (first layer of closure) [Figures 1 and 2]. Closure was done using 4-0 or 5-0 Vicryl[®] suture on a cutting needle and under loupe magnification.

Table 1 : Age distribution

Age group of patients	No. of cases (%)
Age group (yrs)	
3-6	5 (2.7)
>6-10	8 (34.8)
>10-14	6 (26.1)
> 14-18	2 (8.7)
>18-21	2 (8.7)

Table 2: Size of fi stulae

Size of fistula	No. of cases (%)
Size (mm)	
4	3 (13.04)
>4-6	8 (34.8)
>6-8	8 (34.8)
>8-12	2 (8.7)
>12-18	2 (8.7)

Table 3: site of fi stula

Site of fistula	Number (%)
Site	
Penoscrotal	1 (4.35)
Prox penile	12 (52.17)
Mid penile	7 (30.43)
Distal penile	3 (13.04)

Table 4: No. of fi stulae

No. of fistulae	Number of cases
Number of fistula	
1	14 (60.87)
2	5 (21.7)
>2	4 (17.4)



Figure 1: A large urethral fistula



Figure 2: First layer closure with turnover flaps



Figure 3: Dartos flip flap marked

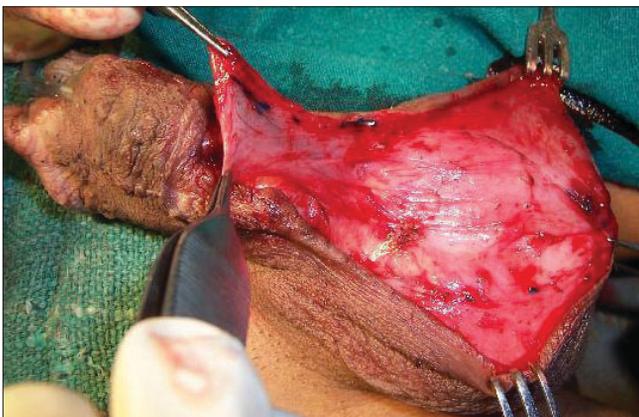


Figure 4: Dartos flip flap elevated

Then the dartos flip flap was elevated as follows: A midline skin incision was made extending from the proximal part of the fistula towards the scrotum. This incision was extended on to the scrotum up to a length of 1-1.5 cm more than the length from the distal end of the fistula to the penoscrotal junction.

This incision was just skin-deep until the subcutaneous dartos muscle was visualized. The scrotal skin was then undermined on both sides of the incision for about 1-1.5 cm on either side, and a tongue-shaped flap was marked

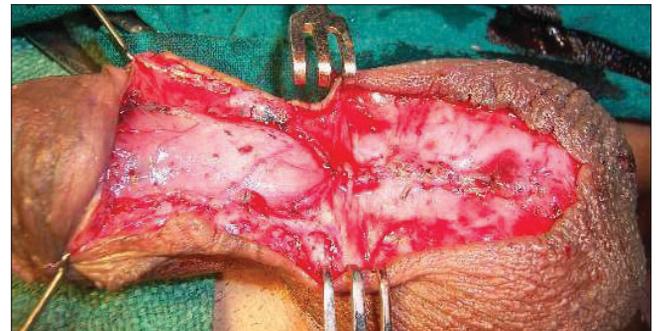


Figure 5: Fistula covered with dartos flap



Figure 6: Final skin closure over dartos flap layer

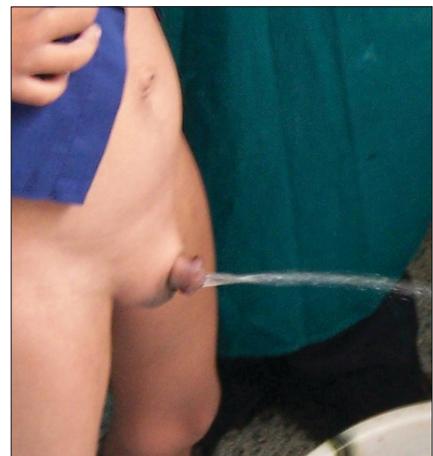


Figure 7: Patient passing urine (6 months post op)

[Figure 3] on the dartos; the length of this flip flap being 2-3 mm more than the length from the distal end of the fistula to the penoscrotal junction so as to overlap the fistula and its width also 2-3 mms more than the maximum width of the urethrocutaneous fistula.

This flap was elevated up to the penoscrotal junction [Figure 4] and flipped over the urethrocutaneous fistulae repair and sutured all around the fistula with interrupted Vicryl 5-0® [Figure 5] except towards the flap base. This formed the second layer of closure of the watertight robust and vascularised flap. The two edges of the cut donor dartos in the scrotum were then approximated and sutured together with Vicryl 4-0® interrupted suture and the scrotal skin was closed. Drains of silicone catheter of size 5 French were kept for drainage in the scrotum, which were removed after 48h. Finally, the penile skin was closed over the dartos flap and if found to be inadequate or under tension, the scrotal skin was advanced for tension-free closure over the dartos flap [Figure 6].

Sterile dressing was then applied. The silicone per urethral catheter was removed after 10-14 days.

RESULTS

All 23 patients were operated in this series with the dartos flip flap procedure, a minimum of six months after the primary hypospadias repair or fistula repair.

Two patients had recurrence of pinhole size fistula, out of which the one that was proximal penile healed spontaneously and one that was mid-penile later required closure with local tissues.

The follow-up of all these patients ranged from a minimum of five months to three years after the definitive repair. The scar over the scrotum was hardly visible with time and there was no other problem regarding the testis position or penile erection.

DISCUSSION

Urethrocutaneous fistulae are the most common complication after hypospadias surgery. Opposing suture lines are a well recognized risk factor in fistula formation.^[5] These are one of the major causes of morbidity following hypospadias repair. No matter how well designed the initial hypospadias procedure is, how gently the tissues are handled and how expertly the procedure is done,

fistulae continue to occur at an unacceptably high rate.^[6] The problem is exacerbated because urethrocutaneous fistulae not only occur but also recur, sometimes requiring many procedures in the same patient.^[7] In this series out of the total 23 patients, nine cases had already previously been operated for urethral fistulae by some other method of repair. Proximal hypospadias and re-operated cases are at greater risk of fistula formation.^[7]

High fistula rate in re-operated cases has also been observed by others.^[8-10] Previous surgeries lead to scarring and ischemic fibrotic tissue with poor healing and increased risk of fistula formation. Other risk factors include distal obstruction, poor surgical techniques, urethral diverticulae, overlapping suture lines and erection during early postoperative period.^[1,11-12]

As with hypospadias surgery, there are no perfect techniques for repairing urethrocutaneous fistulae. Many variables could influence the surgical management and outcome, i.e., the time of occurrence after urethroplasty, the location (glanular, coronal, mid-shaft, etc.), size (pin-point, large), the number and the conditions of local tissue.^[13]

In our study the maximum number of fistulae occurred in the proximal penile followed by the mid-penile region.

A common error observed is timing of fistula repair. Consensus and logic in this regard dictates a wait and see policy for at least six months after the last repair to enable the scars to mature and also the oedema and induration to subside.^[14] In the present study we operated all cases after waiting for a minimum of six months for the same reasons.

During the last decade many principles of an ideal repairing technique have been clarified. Delicate tissue handling, inversion of the urethral mucosa after excising the epithelialized tract of the fistula, a multilayer repair with well-vascularized tissues, avoiding overlapping sutures and nonabsorbable or thick suture materials, a tension-free closure, use of optical magnification and needle-point cautery for coagulation are currently considered mandatory.^[15] In all the cases we operated we used a fine cautery and loupe magnification to aid in better results. Our series had all cases of large urethral fistulae of 4 mm or more in size.

Numerous techniques have been devised to counteract this problem and the pursuit for an ideal one is still

going on. Among these techniques, the most common manoeuvre is to place some intervening layer of tissue between the neo urethra and the skin.^[16]

For recurrent fistulae, tissues from an unscarred area (tunica vaginalis or scrotal dartos layer) should be used to cover the fistula,^[7] a fact we have utilized for our cases.

The role of a waterproofing layer between the urethra and skin is well established in the prevention of fistula complication in hypospadias surgery. The common waterproofing techniques utilize subcutaneous tissue,^[17] dartos fascia,^[18] dartos muscle from scrotum,^[19] tunica vaginalis from the scrotum,^[20] de-epithelialised skin^[21] and Buck's fascia from the dorsal prepuce, as in standard Bracka's repair.^[9,13]

Dartos is a non striated muscle forming the second layer of the scrotum just below the skin; it regulates the temperature of the scrotal region.

The dartos flap is fibro-adipose tissue between the scrotal skin and tunica vaginalis layers with its vascular pedicle based at the penoscrotal angle. The flap reaches the distal penile shaft without tension.^[22]

Dartos flaps have been used for both the primary waterproofing of hypospadias repair and fistula repair^[23] as in our series where we have utilized the dartos flip flap for closure of these larger urethrocutaneous fistulae.

Our technique differs from others in the sense that we have taken dartos flaps and flipped them proximally over the fistula at their base.

CONCLUSION

The dartos flip flap reinforcement of the repair is an excellent method for closure of large urethrocutaneous fistulae with uniform results. The results were aesthetically good and there were no problems in erections. The patients had good urinary stream [Figure 7] with minimum recurrence of the fistula. The dartos flip flap is easy to mobilize and it provides robust and watertight coverage in large urethrocutaneous fistulae closure. The technique is easy to learn and reproduce and apart from the extra time taken in harvesting the dartos flap there are no other limitations or shortcomings.

We strongly recommend its use for all types of large

fistulae closure on any part of the penis and even at the penoscrotal region.

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Source of Support: Nil, Conflict of Interest: None declared.