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Original Research Article

Use of fibrin sealant and tunica vaginalis flap in the repair of urethro-cutaneous fistulas: experience in a tertiary care centre

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ABSTRACT

Background: Urethro-cutaneous (UC) fistulas are one of the most common complications after hypospadias surgery. To repair a UC fistula, an experienced surgeon with vast knowledge in the field of hypospadias is essential. Various techniques of UC fistula repair have been described. We share our experience in the use of fibrin sealant and tunica vaginalis flap as intermediate cover in UC fistula repairs.
Methods: Our objective was to evaluate the efficacy of fibrin sealant and tunica vaginalis flap in urethro-cutaneous fistula repair in those patients where dartos flap is not available. Total 40 patients were retrospectively evaluated and segregated into the fibrin sealant group and the tunica vaginalis flap group. All repairs had been done by the same surgeon with 6-0 polyglactin suture at least 6 months from the primary repair. The re-fistulation rate was noted in both the groups.
Results: Re-fistulation rate was 20% for tunica vaginalis flap and 70% for fibrin sealant. The general re-fistulation rate with the use of dartos flap is 20-30% at our institute.
Conclusions: We concluded that tunica vaginalis flap as intermediate cover gives good results in urethro-cutaneous fistula repair.

Keywords: Fibrin sealant, Hypospadias, Tunica vaginalis, Urethro-cutaneous fistula

INTRODUCTION

Urethro-cutaneous (UC) fistula is one of the most common and also the most frustrating complication after hypospadias surgery. The fact that it occurs and recurs has potential physical and psychological consequences to the patient and his family.[1] The general reported rate of UC fistulas is around 0-30% depending on severity of hypospadias, surgical technique and experience of operating surgeon.[2] Attempting to close the fistula without understanding the failure mechanisms can be dangerous. Factors influencing fistula repair are number, size and location of fistulas, condition of local tissue and time after hypospadias repair. Different techniques of hypospadias have different rates of fistula formation. The most commonly used techniques of hypospadias repair in our institute are Snodgrass tubularised incised urethroplasty (TIP) repair, Byar's staged repair and the island onlay repair.

UC fistula closure is always done using an intermediate layer between the urethroplasty and skin suture lines. Different intermediate tissues used in the repair are dartos muscle, tunica vaginalis, fibrin sealant, dorsal prepucial flap etc. In our institute, we routinely use dartos muscle as intermediate layer. But in some situations, enough of dartos muscle may not be available for intermediate cover. In that situation, we either use tunica vaginalis or

fibrin sealant. We have made a retrospective review of the results of both these techniques used in our intitutes in the last 3 years.

METHODS

The standard technique used to repair urethro-cutaneous fistulas in our institute is a urethroplasty with 6-0 polyglactin suture with local dartos muscle as intermediate cover. Subcuticular, longitudinal continuous sutures are taken. Skin is closed with simple sutures. In some patients however, the local dartos muscle is not available for mobilization. In these cases, other intermediate tissues need to be considered. We commonly use tunica vaginalis flap and fibrin sealant. Which one to use is decided by the surgeon depending on the individual patient characteristics such as nature of local tissue, fibrosis and vascularity of the tissue.

Tunica vaginalis flap used was raised using a separate scrotal incision and raising the flap with the base medially. It was tunneled subcutaneously and sutured to the spongiosa covering the suture line of the urethra.

The fibrin sealant used had two components: human fibrinogen (50-90 mg/ml) and human thrombin (800-1200 IU/ml). The two components were available in sealed glass containers stored at 4^0C. They were both brought down to room temperature, then attached to a special dispensing syringe, in which the components were constituted together and applied over the suture line. After waiting for 5 minutes to let it set, skin was closed over it.

A total of 40 patients between ages 1 and 12 years operated over the past 3 years were retrospectively evaluated. They were divided into fibrin sealant group and tunica vaginalis flap group. Repair of all the fistulas was done by the same surgeon. In all cases, 6-0 polyglactin suture was used for urethroplasty. All fistulas were repaired at least 6 months from the time of primary hypospadias repair. A written informed consent was taken from parents of all the patients.

RESULTS

Snodgrass repair and Byar's staged repair were the most often used techniques of primary repair leading to the fistula. Out of 40 patients, 19 had distal penile hypospadias and had undergone Snodgrass repair as the primary surgery. 17 had undergone Byar's staged repair.

Patients were evaluated on post-operative day 10 by removing the urethral stent and observing the urinary stream. Patients were followed up at 1 month and 3 months after surgery. The urinary stream was re-assessed after 3 months. Patients were categorized into those passing urine in single stream and those having a recurrent fistula. Results observed have been divided into those obtained with tunica vaginalis flap repair and those obtained with the use of fibrin sealant (Table 1).

Table 1: Re-fistulation rate with fibrin sealant and tunica vaginalis flap.

Type of primary hypospadias repair	Fibrin sealant (n=20)		Tunica vaginalis flap (n=20)	
	Single stream	Re-fistula	Single stream	Re-fistula
Snodgrass repair	6	6	5	2
Byar's Staged repair	0	6	9	2
Onlay flap	0	0	2	0
Mathieu's flip flap	0	2	0	0
Total	6	14	16	4

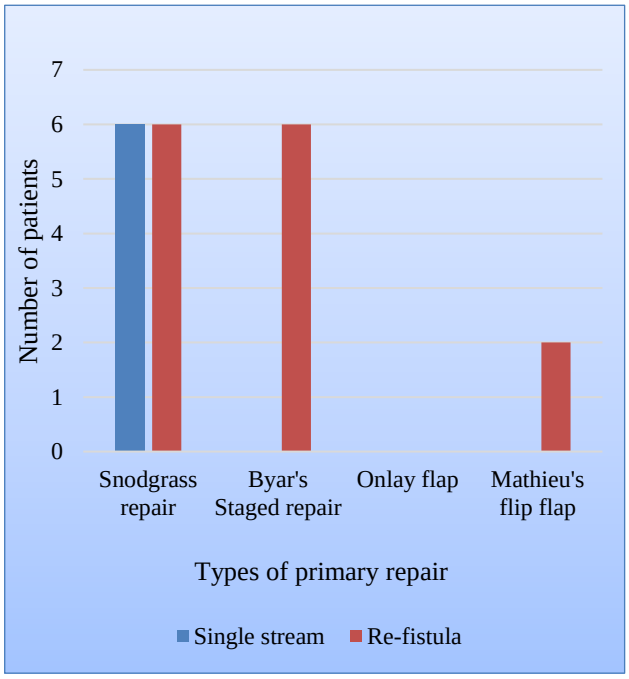

Figure 1: Results of fibrin sealant.

In those patients in whom fibrin sealant was used, the overall rate of re-fistulation was more as compared to patients passing urine in a single stream. Out of 20 patients, only 6 patients, in whom the primary repair was Snodgras repair, passed urine in a single stream. 14 patients had recurrent fistulas (70%).

In those patients where tunica vaginalis flap was used, most of the patients passed urine in a single stream. Rate of re-fistulation was much less (20%). Out of 20 patients, 16 passed urine in a single stream. 4 had developed recurrent fistulas.

In the standard technique that we use, the general re-fistulation rate with the use of dartos muscle flap is 20 to 30% for similar type of fistula.

Table 2: Re-fistulation rate according to site of fistula.

	Fibrin sealant		Tunica vaginalis flap	
Site of fistula	**Single stream**	**Re-fistula**	**Single stream**	**Re-fistula**
Coronal/ Subcoronal	4	6	8	2
Others	2	8	8	2

The results have also been assessed according to the position of the UC fistula. Since coronal and subcoronal fistulas are inherently technically difficult to repair, they are categorized separately from the other fistulas[3]. The number of coronal/subcoronal fistulas repaired by either technique is the same, though the results are better with tunica vaginalis flap (Table 2).

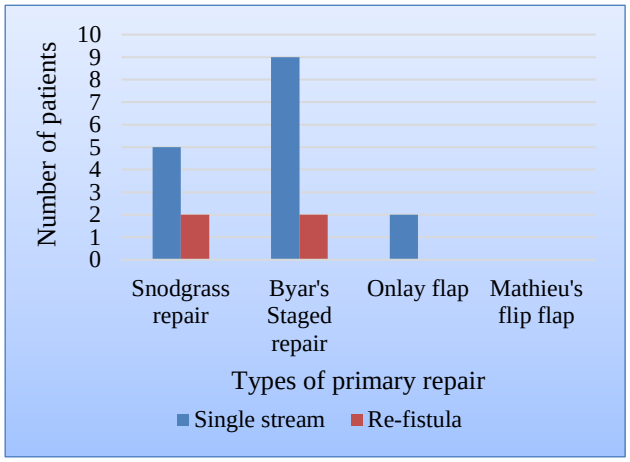

Figure 2: Results of tunica vaginalis flap.

Combining both results together, it can be further stated that no matter what the procedure of primary repair or the site of the urethro-cutaneous fistula, a tunica vaginalis flap as the intermediate cover gives good results.

DISCUSSION

As mentioned above, urethro-cutaneous fistula formation is the most common complication of hypospadias repair. The most common site of fistula is the site of the original meatus. Fistula formation occurs most commonly between 7th and 10th post-operative day.[4]

There are many ways to classify UC fistulas. According to size, fistulas can be either pin-point, small (<4mm) or large (>4 mm).[5] All our patients had small fistulas. The two main causes of fistula formation are infection and ischemia. Other causes include an inadequate procedure, poor tissue handling, distal obstruction and type of suture material used for urethroplasty.[6] Some of the important preventive measures that can be taken to prevent fistula or recurrent fistula formation are delicate tissue handling, delicate instruments, incorporation of healthy tissue, multilayer repair with well-vascularized tissues, avoiding overlapping sutures and non-absorbable or thick suture materials, a tension-free closure, use of optical magnification and needle-point cautery or bipolar cautery for coagulation.[7] The most important of these is use of protective intermediate layer like tunica vaginalis, dartos muscle, de-epithelialized skin, fibrin glue, dorsal subcutaneous preputial flap, external spermatic fascia etc.[8]

In the most common technique that we use to close UC fistulas in our institute, we freshen the edges of the fistula and assess the condition of the local surrounding tissue. If the local dartos muscle is healthy, it is mobilized from one side and placed over the urethroplasty before closing the skin.

In cases where the local dartos muscle is not available for mobilization, we use tunica vaginalis flap. We harvested it by a separate transverse scrotal incision with the base of the flap being medially. A subcutaneous tunnel was created from the scrotum to the fistula site and the flap was sutured to the spongial tissue covering the urethral suture line. Meticulous dissection was done to preserve the blood supply of the flap and prevent formation of any hematoma. Flap necrosis occurs if the blood supply is jeopardized, which did not happen in any of our patients. The flap was of adequate length so that there was no stretch on the tissue. The flap was also kept lax enough so that there is no twisting of the penile shaft and it is not stretched even when the penis is erect. If this is not ensured, there can be penile torsion or chordee, which was not seen in any of our cases.

Very few authors have used fibrin glue to repair UC fistulas, contrary to its more common use in other surgical specialties and sub-specialties. It forms a stable, hemostatic, fibrin clot which is biocompatible and degradable over a period of time. It is not associated with inflammation or tissue necrosis. It promotes angiogenesis, and gets fixed an adherent to the tissues, preventing urinary extravasation from the genitourinary tract. It works best when the vascularity of the tissue to be repaired is good. If the repaired tissue is prone to ischemia, fibrin sealant is not very efficacious.

We have done a retrospective study and reviewed our results with the use of both tunica vaginalis as well as fibrin sealant in fistula repair. Snow et al were the first to use tunica vaginalis flap in the repair of primary hypospadias as well as in U-C fistula repair.[9] Since then, many studies have been conducted in which tunica flap has been used.[10-12] Advantages with the use of tunica vaginalis flap is that it is thin, elastic, expandable, highly vascular, easy to harvest and close to the penile shaft. Tunica vaginalis free graft has also been used in repair of fistulas. Tunica vaginalis flap has an advantage of

preservation of its blood supply.[13] Infrequent complications reported with this technique are scrotal hematoma and abcesses.[14] But none of these were reported in any of our patients. Our experience with tunica vaginalis flap was also quite good, with a recurrent fistula rate of 20%.

Studies using fibrin sealant have shown mixed results. Gabriela Ambriz-González et al reported decreased urethro-cutaneous fistula rates as well as fistula recurrence rates with the use of fibrin sealant in their study.[15] Kinahan et al and Evans et al have also found favourable results with the use of fibrin sealant.[16,17] But Sánchez-Sagástegui F et al found that fibrin sealant did not diminish the risk of recurrence of urethra-cutaneous fistulas.[18]

CONCLUSION

Considering above results, we would conclude that tunica vaginalis flap is a very good intermediate cover in the repair of urethro-cutaneous fistulas in cases where local dartos muscle is either not available or not healthy for use.

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