

A prospective randomized comparative study on the use of ventral subcutaneous flap to prevent fistulas in the Snodgrass repair for distal hypospadias

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Abstract We evaluated the importance of urethral coverage using vascularized subcutaneous ventral flaps for the prevention of fistulas in patients undergoing distal hypospadias repair. Our prospective study included 130 patients, aged 9 months to 12 years, who underwent distal hypospadias repair using tubularized incised plate urethroplasty (TIPU), from January 2001 through January 2006. Patients were assigned to one of two groups by a computer-generated random selection: 65 patients underwent non-covered urethroplasty (NCU group); another group of 65 patients underwent covered urethroplasty (CU group) with a vascularized subcutaneous ventral flap. The results were evaluated by two pediatric surgeons unaware of the type of treatment each patient had undergone. Successful results were achieved in 99/130 patients (76.2%). We recorded 31 (23.8%) post-operative complications: 20 patients presented with a urethrocutaneous fistula (15 patients in the NCU group and 5 in the CU group); five with urethral stenosis (3 in the NCU and 2 in the CU group); and six with skin dehiscence of the preputioplasty (3 patients in each group). We analyzed the results using the χ^2 test and the only statistically significant difference between the two groups ($p < 0.05$) was in terms of incidence of fistulas. Urethrocutaneous fistulas seem to be the most frequent complication of distal hypospadias after TIPU repair. Urethral

coverage should be part of the Snodgrass procedure because it significantly reduces the formation of fistulas. A well-vascularized subcutaneous ventral flap represents, in our experience, a simple and optimal choice for the prevention of fistulas.

Keywords Hypospadias · Urethroplasty · TIPU · Fistula · Complication

Introduction

A large number of surgical techniques have been described for the repair of distal and proximal hypospadias.

The tubularized incised plate urethroplasty (TIPU) described by Snodgrass for hypospadias repair in 1994 has gained vast popularity in the last few years [1].

The advantages of the Snodgrass repair include use of the native urethral plate, in situ tubularization, elimination of skin flaps and applicability to many different variants of hypospadias [2, 3].

Several series have reported excellent functional and cosmetic results with the Snodgrass repair. However, the rates of fistula formation are still high, as high as 5% in large center studies and 16% in smaller ones [2, 4]. Other complications of the TIPU include meatal stenosis, which occurs in about 2% of cases, and partial glans or skin dehiscence in about 5% [5].

In this paper we perform a prospective randomized study to investigate the incidence of complications after TIPU repair in patients with anterior hypospadias, comparing two groups of patients with and without the coverage of the neourethra using a subcutaneous vascularized ventral flap.

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Methods

We performed this prospective study of the Snodgrass technique to evaluate the role of a neo-urethral coverage using a subcutaneous vascularized ventral flap, on the incidence of post-operative complications.

Approval was obtained from the Institutional Review Board and Ethics Committee of the “Federico II” University Medical School, and informed written consent was obtained from all parents.

Our prospective study included 130 patients aged 9 months to 12 years (median 26.9 months), who had undergone distal hypospadias repair from January 2001 through January 2006.

All patients had been operated on in the same institution by three different surgeons with comparable experience in hypospadias surgery.

Exclusion criteria for this study were the glandular form of hypospadias, previously operated patients, posterior hypospadias, severe penile curvature and severe penile rotation.

All patients presented with distal hypospadias, 116 (89.2%) with a coronal meatus and 14 (10.8 %) a sub-coronal meatus.

Patients were assigned to one of two groups by a computer-generated random selection system, as follows: 65 patients who had undergone a non-covered urethroplasty (NCU group), and 65 in whom a vascularized subcutaneous ventral flap had been adopted to cover the urethroplasty (CU group). In all the children, the hypospadias was repaired under general anesthesia. A blood-free zone was maintained during surgery with a penile tourniquet.

A 4× magnifying loop was used during surgery.

All patients underwent standard TIPU according to Snodgrass.

After completing the urethroplasty, a large ventral-based vascularized subcutaneous dartos tissue is used to cover the new urethra. The flap can be prepared on both the right and the left side.

The ventral-based vascularized pedicle is marked with traction sutures on the proximal shaft at a point that allows the pedicle to be reflected up into the glans to the distal aspect of the urethroplasty. Care must be taken not to devascularize the subcutaneous dartos flap or injure the urethra, which sometimes is thin and dysplastic. The dissection must terminate before the native meatus is reached, to avoid injuring the major vascular supply of the pedicle.

During the dissection of the ventral skin it is of paramount importance to leave intact all the sub-dermal vascularized tissue attached to the urethra and the lateral urethral corporeal grooves.

The flap is then fixed on both sides of the suture line of the neourethra, using 6/0 PDS detached sutures; this way

the neourethra is completely covered (Figs. 1–3). After securing the pedicle, a glanuloplasty is performed.

All patients underwent a suprapubic cystostomy, with a urethral split catheter placed in the neo-urethra, as diversion.

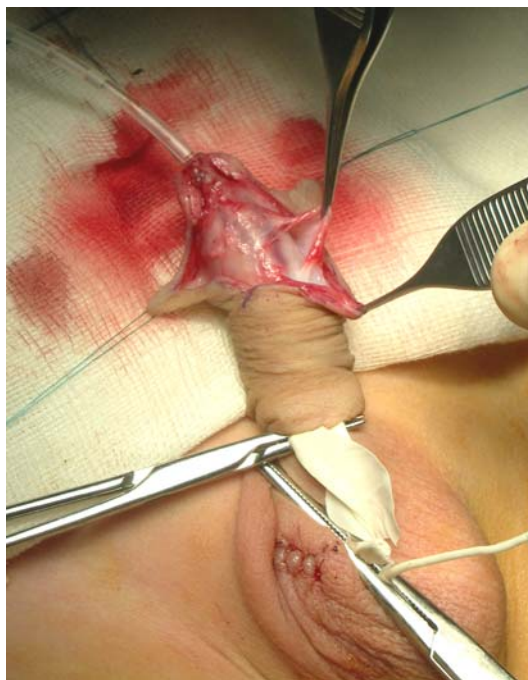


Fig. 1 The subcutaneous vascularized ventral flap is identified

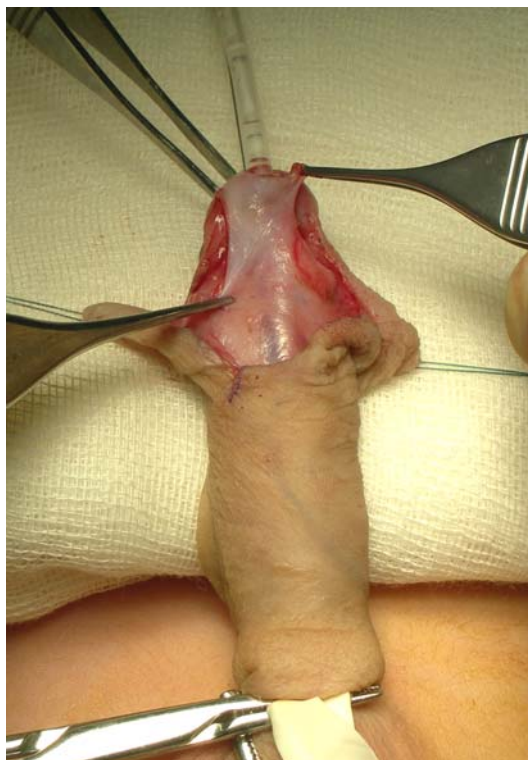


Fig. 2 The flap is prepared, care must be taken not to devascularize it during the dissection



Fig. 3 The flap is then sutured to the glans and the corpora cavernosa to completely cover the neourethra

The neo-urethra was created in all cases using a 6/0 running absorbable polyglyconate suture, and antibiotic treatment was given post-operatively until removal of the diversion.

After the urethroplasty a preputioplasty was performed in all patients (Fig. 4), and a compressive dressing was employed.

The urethral stent was removed in all patients on the fifth post-operative day, while the cystostomy was removed between 8 and 9 post-operative days.



Fig. 4 The preputioplasty is performed at the end of the urethroplasty

Once the diversions were removed, patients were discharged from hospital after free urination was observed.

Results

The results were evaluated by two pediatric surgeons not involved in the operation and unaware of the type of treatment the patients had undergone.

The criteria used to define surgery as successful were function, cosmetic result (defined as a vertical slit-like appearance of the urethral meatus on the tip of the glans, and a normal appearance of the penis), with no need for reoperation. Median follow-up was 24 months (6–60).

All the patients in our series underwent a complete follow-up.

Post-operative examinations included an interview with the parents and a physical examination that comprised uroflowmetry, performed on post-operative days 7, 30 and 180. Only in case of clinical stenosis was a urethral calibration performed. Surgery was successful and without complications in 99/130 patients (76.2%). We recorded 31 (23.8%) post-operative complications: 20 cases of urethracutaneous fistula [15 patients in the NCU group (11.5 %) and five in the CU group (3.8%)]; five urethral stenosis (3.8%) (3 in NCU and 2 in CU); six skin dehiscence of the preputioplasty (4.6%) (3 patients for each group). At follow-up three minor problems occurred, which we did not consider as true complication: we found a poor elasticity of the preputial ring in three cases (1 NCU; 2 CU) which was treated with corticoid cream for 3 weeks, with complete resolution of the inconvenient.

We have analyzed the results using the χ^2 test and the only statistically significant difference between the two groups ($p < 0.05$) was in terms of incidence of fistulas (Table 1).

As to the management of this complication, a primary suture of the fistula was performed in 17/20 patients (85 %), and a redo urethroplasty (10% redo TIPU, 5% redo island flap according to Scuderi) was performed in 3/20 patients (15%). Dehiscence was always treated by performing a hemi-circumcision.

Table 1 Total complications in our series (n 31)

Type of complication	NCU group	CU group	Total	χ^2 test
Fistula formation	15 (11.5%)	5 (3.8%)	20 (15.4)	$P < 0.05$
Stenosis	3 (2.3%)	2 (1.5%)	5 (3.8%)	NS
Dehiscence	3 (2.3%)	3 (2.3%)	6 (4.6%)	NS
Total	21 (16.2%)	10 (7.6%)	31 (23.8%)	–

NCU group, uncovered urethroplasty; CU group, covered urethroplasty

The occurrence of stenosis was successfully managed by a single meatal dilatation under anesthesia.

Discussion

Hypospadias is a common problem affecting approximately one every 300 boys [5, 6].

Urethracutaneous fistulas are the most common complication of hypospadias surgery and the coverage of the primary urethroplasty has been shown to decrease its incidence [7, 8].

The rate of fistulas in large hypospadias series seem to vary between 5 and 16% [2, 4, 9].

Many techniques have been described to achieve vascularized coverage of the urethroplasty.

However, most of the techniques describe rely on rather elaborate means, in addition to the fact that they are associated with potential harvesting complications [10–12].

As for the surgical procedure adopted to correct hypospadias, no single technique can be considered as standard. A number of techniques have been described for the repair of distal defects with a high primary success rate, and some of them do not require a suprapubic catheter [13–17]. However, the most widely used technique in the last 10 years has been the Snodgrass procedure, also called TIPU; in many centers it is the technique of choice for the correction of anterior hypospadias [16–18].

The complication rate after Snodgrass repair, as reported by Eliçevik et al. in 2004, is 23% in primary cases and 30% in secondary cases [3].

The aim of our study was to prospectively evaluate the role of a simple urethral coverage in patients operated using TIPU repair, in comparison to another group without coverage.

Indeed, in the international literature there are no reports of such comparisons, but above all, there are no reports of studies that have compared the two approaches in a prospective randomized way [3, 10, 12, 13].

Homogeneous data were achieved by analyzing only the data regarding distal hypospadias, i.e., the most frequent form of hypospadias, accounting for about 80% of cases [19, 20].

As for the urethral coverage, we decided to adopt the technique of the subcutaneous vascularized ventral flap already present in situ.

We adopted these two techniques (TIPU and subcutaneous ventral flap) for their relative simplicity, and the consistent availability of tissues necessary to complete the repair. In our opinion, in fact, the major advantage of these two procedures is that they can be easily mastered and performed even by less skilled surgeons approaching hypospadias surgery.

From the technical point of view, we believe that it is essential to adopt a magnifying loop during the dissection

phase, as this would enable the surgeon to spare the blood supply to the flap. In agreement with current literature, we observed that if a precise and accurate dissection is performed and the flap is well vascularized, the surgeon is able to cleanly cover the urethral suture line, as was the case in all the 65 patient in the CU group in our series [5, 21, 22].

Based on the results of our study, we conclude that the incidence of complications after TIPU repair is comparable (23.8% in our series) to the other series reported in the current literature [3, 23, 24].

However, analyzing the complication rate of the two groups separately, it adds to 16.2% for the NCU group and 7.6% for the CU group. As for the 5% stenosis rate in our series, it is probably due to the fact that we performed too deep a dorsal incision of the urethral plate.

In particular in our series if the incidence of stenosis and dehiscence between the two groups was statistically non significant, the incidence of fistulas, on the contrary, was significantly reduced in the CU group using a subcutaneous urethral coverage.

This suggests that a urethral coverage be performed as part of the Snodgrass procedure because it significantly reduces the formation of fistulas, as shown in our series [19, 25, 26].

As for the management of fistulas, in the majority of cases a simple suture can solve the problem and rarely is there need to perform a redo urethroplasty (15% of cases in our series) [5, 9, 27].

Another point that needs to be investigated is the role of the patient's age on the rate of complications; in fact according to Hensle et al., complications increase in parallel with age [27]. Today, a valid standard is that hypospadias repair be performed before the patient is 1-year-old, because this increases the success rate of the operation and minimizes the psychological effects on the child [3, 5, 15, 27]. To this regard, the median age in our study was 26.9 months, although we probably need to lower this age to reduce the incidence of complications.

In conclusion even if the concept of providing a second layer to protect neo-urethra from fistula formation is not new, our prospective comparative study clearly shows that even a simple ventral flap reduces fistula formation to a statistically significant extent [28–30].

In our experience TIP urethroplasty repair represents an effective procedure to treat patients with distal hypospadias. Urethracutaneous fistula is the most common complication of this procedure, and the interposition of well-vascularized tissue between the penile skin and the neourethra is essential for its prevention.

We believe that the vascularized subcutaneous ventral flap procedure is a simple technique, and represents, in our experience, an optimal way to prevent the formation of fistulas after TIPU repair of distal hypospadias.

We think that further studies are necessary to compare the results of the subcutaneous flap against other types of coverage such as dartos flap or dorsal flap, to evaluate whether there is a better technique to cover the neo-urethra sutureline and reduce the incidence of complications.

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