

## **Ventral Based Double Dartos Flap in Tubularized Incised Plate Urethroplasty Along with Foreskin Preservation**

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### **ABSTRACT**

*Background:* Since the original description of Tubularized Incised Plate Urethroplasty (TIPU) for hypospadias repair, several authors introduced some modifications to decrease the rate of fistula formation. The use of dorsal based dartos flap either single or double was extensively described in the literature with good results. However, flap-associated complications were also reported. Therefore, the aim of the present study was assessment of the outcome using ventral based Double Dartos Flap (DDF) in different types of primary hypospadias using TIPU repair.

*Subjects and Methods:* The study included 124 patients who had primary TIPU repair for different types of hypospadias. Ventral based DDF was used in all cases as an intermediate barrier between the neourethra and the skin. Foreskin resection was postponed three months later for future use in cases of reoperation. The position of urethral meatus was distal in 87 (70.2%), middle in 34 (27.4%) and proximal in

decrease the incidence of fistula formation. Furthermore, foreskin preservation is essential to preserve its underlying dartos for reoperation in cases of fistula formation.

## SUBJECTS AND METHODS

Between October 2010 and October 2014, 124 patients underwent primary hypospadias surgery using TIPU repair. The mean age was  $17\pm 25$  months (range 6-120 months) (Table 1). All cases were uncircumcised and were managed by TIPU repair and ventral-based overlapping DDF with foreskin preservation. Three months later, circumcision was performed after exclusion of fistula formation. The position of urethral meatus was coronal in 34 (27.4%), sub-coronal in 53 (42.7%), mid-shaft in 22 (17.7%), proximal penile in 12 (9.7%) and penoscrotal in 3 (2.4%) with bifid scrotum. Informed consent was obtained from all patients' sponsors and the procedure and possible risks were explained thoroughly according to declaration of Helsinki. Complications that occurred after this technique were reported as: Fistulas, dehiscence of glans, penile rotation, meatal stenosis and skin necrosis.

### *Surgical procedure Figs. (1-8):*

The surgical procedure began with the placement of a 5/0 polyglactin glans traction suture and insertion of 6F catheter (8F to 12F catheter for boys older than 5 years). All patients underwent standard TIPU according to Snodgrass [3] Figs. (1-4). After completing the urethroplasty, ventral dissection was performed immediately under the shaft skin to preserve ventral dartos. The ventral dartos flap was harvested from both sides of the new urethra and extended proximally to 2-4mm below the native meatus. A transverse back-cut was performed at the proximal and distal ends of each dartos flap to create "butterfly wings" of both dartos flaps to allow simple transposition and extensive coverage of the neourethra Fig. (5). The left dartos flap was transposed medially and distally to cover the new urethra and was tracked into the lateral recesses of the raised right glans wing Fig. (6). It was sutured to glans and tunica albuginea underneath by interrupted simple stitches using 6/0 polyglactin. The right dartos was also transposed medially and distally to overlap the left one and sutured with underlying glans and left dartos along with tunica albuginea by interrupted stitches using 6/0 polyglactin Fig. (7). Glansplasty started using 6/0 polyglactin stitch at coronal margin followed by a single subepithelial layer of approximately three interrupted 6/0 polyglactin stitches

to the meatus. Skin and mucosal collar were closed using interrupted 6/0 polyglactin Fig. (8).

A dressing was applied and the stent allowed dripping into diapers for 7 days. Antibiotic prophylaxis was routinely used during the postoperative period. Three months later, circumcision was achieved after exclusion of fistula formation.

### *Statistical analysis:*

Statistical analysis was performed using SPSS software version 16 for windows. Numerical data are summarized as mean  $\pm$  SD. Categorical data are summarized in numbers and percentages.

## RESULTS

The mean follow-up was  $18\pm 19.5$  months (range 5-36 months). Complications occurred in 15 patients (12.1%): Fistulas in 6 (4.8%), meatal stenosis in 5 (4%), glanular dehiscence in 2 (1.6%) and skin necrosis in 2 (1.6%). There were no recorded cases of penile rotation. All fistulae occurred at the level of the native hypospadiac meatus. None was associated with meatal stenosis. They were completely healed and closed spontaneously except in 2 (1.6%) patients who required further surgery for fistula closure. Patients with meatal stenosis had regular urethral dilatation that was treated conservatively without meatotomy. Patients with glanular dehiscence had spontaneous wound healing and glansplasty was done during circumcision for aesthetic correction of the glans. Skin necrosis was minimal and recorded in 2 (1.6%) patients that healed spontaneously without surgical intervention.

Table (1): Patients' data.

|                            | No. (%)                                 |
|----------------------------|---|
| Total no. of patients      | 124                                     |
| <i>Mean age:</i>           |   |
| Position of meatus         | $17\pm 25$ months (range 6-120 months). |
| <i>Distal:</i>             |   |
| Coronal                    | 34 (27.4%)                              |
| Sub-coronal                | 53 (42.7%)                              |
| <i>Middle:</i>             |   |
| Mid-shaft                  | 22 (17.7%)                              |
| Proximal penile            | 12 (9.7%)                               |
| <i>Proximal:</i>           |   |
| Penoscrotal                | 3 (2.4%)                                |
| <i>Complications:</i>      |   |
| Total no. of complications | 15 (12.1%)                              |
| Urethrocuteaneous fistula  | 6 (4.8%)                                |
|                            | 3/87 (3.4%) in distal                   |
|                            | 2/22 (9.1%) in mid-shaft                |
|                            | 1/12 (8.3%) in proximal penile          |
| Meatal stenosis            | 5 (4%)                                  |
| Glanular dehiscence        | 2 (1.6%)                                |
| Skin necrosis              | 2 (1.6%)                                |
| Mean follow-up             | $18\pm 19.5$ months (range 5-36 months) |

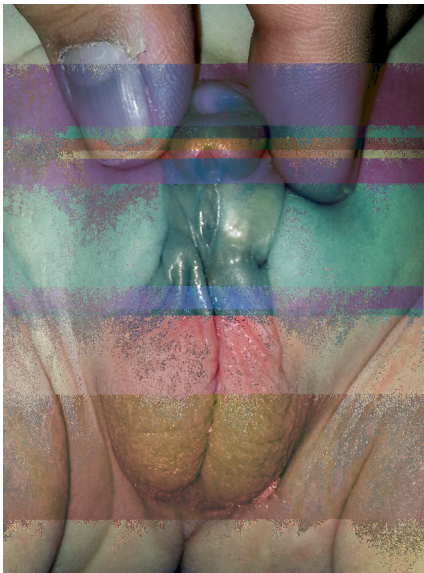


Fig. (1): 11-month-old boy with penoscrotal hypospadias, severe chordee and bifid scrotum.



Fig. (2): Markings of TIPU repair and multiple Z plasty for bifid scrotum.

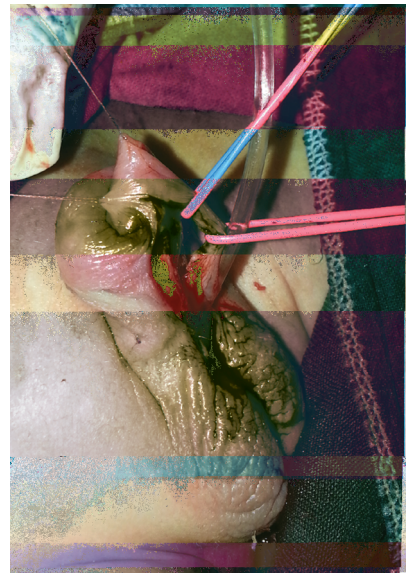


Fig. (3): Mobilization of urethral plate and corpus spongiosum from corpora cavernosa for penile straightening.

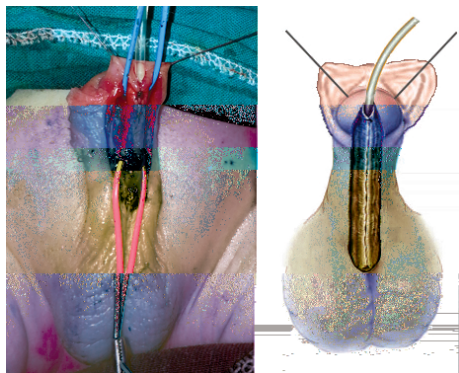


Fig. (4): TIPU repair using two-layer closure of urethral plate.

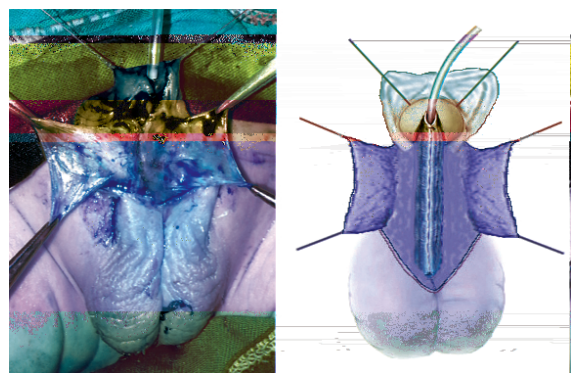


Fig. (5): Raising the ventral dartos from each side of the neourethra. A transverse back-cut is performed at the distal and proximal ends to create "butterfly wings".

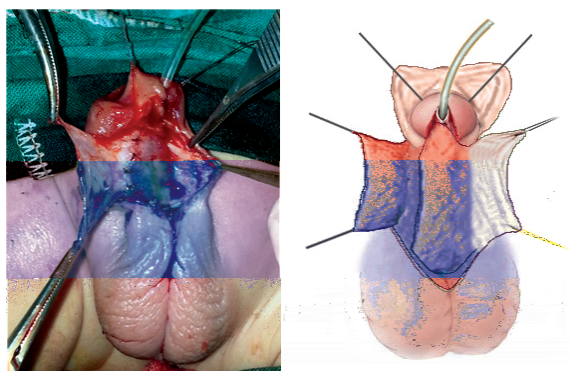


Fig. (6): The left dartos is transposed medially and distally to cover neourethra.

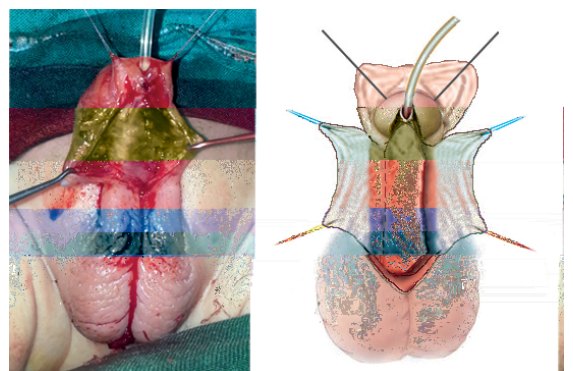


Fig. (7): The right dartos is transposed to cover the left dartos and sutured to lateral recess of left glans wing.





Fig. (8): Glansplasty and skin closure using interrupted 6/0 polyglactin.

## DISCUSSION

TIPU hypospadias repair popularized by Snodgrass, reliably creates a slit-like, vertically oriented meatus and a functional neourethra using a native urethral plate. These observations, in addition to its versatility and relative simplicity, account for the popularity of the procedure [1,3,21,22]. The success of this procedure is based on providing well vascularized urethral plate with good muscular backing, rich in nerve supply and with gland forming capability [23]. Furthermore, healing of the incision in the dorsal urethral plate during TIPU occurs by re-epithelialization with normal tissue ingrowth [24]. However, urethrocutaneous fistulas are still reported as the most frequent complication [7,25]. Fistula formation begins early in the healing process after ventral urethral repair where factors that predispose to fistula formation are incorporation of urethral mucosa in the ventral repair and rapid migration of urethral mucosa and skin epithelium into suture tracts [26]. The observation of Bleustein et al., [24] that inflammatory and desmoplastic reactions are more prominent around suture material along the ventral urethral closure is also important since these reactions may help explain fistula formation. Accepted fistula rates in large hypospadias series are 2 to 14% [27].

One of the most important factors to avoid the occurrence of fistulas is the application of a protective intermediate layer between the neourethra and the skin [28]. In fact, flapless urethroplasties have a higher risk of fistula development: A 13 and 15% incidence of fistulas was reported in two studies after TIPU alone [29,30].

Many refinements have been introduced to decrease the risk of fistula formation after using the classic TIPU repair. Some authors have used adjacent spongiosum tissue to reinforce the neourethra as second-layer coverage [2]. Although the spongiosal tissue provides good anatomical coverage of the neourethra, its use is limited especially in mid-shaft and more proximal hypospadias. Tunica vaginalis tissue may be used as an alternative for second-layer coverage [31,32], but testis delivery to harvest the tunica vaginalis is time consuming and adds additional morbidity. Moreover, severe postoperative scrotal infection and penile torque (which was exacerbated by the cremasteric reflex) occurred after a tunica vaginalis flap was used [31,33]. Other protective intermediate layers such as external spermatic fascia flaps, tunica vaginalis and scrotal dartos flaps have been described as intermediate layer [28,34,35].

Since Retik et al., [36] employed the dartos flap as a covering layer between the neourethra and the penile skin. It has been the mainstay to avoid the occurrence of urethrocutaneous fistula in hypospadias repair. The flap was harvested from the dorsal aspect and rotated ventrally around the shaft to cover the urethroplasty. The drawback of this procedure was that it could cause penile rotation as the flap rotates around one side of the penile shaft. To avoid this rotation, Snodgrass transposed it ventrally in a buttonhole fashion to cover the neourethra [37]. Although this technique has achieved a 100% fistula-free outcome with Djordjevic et al., [8,38] fistula occurrence was as high as 3% for others [39] and not infrequent in various reported studies [25,40].

Kamal [10] described dorsal based DDF for more protection of the urethra against fistula development rather than a Single Dartos Flap (SDF). His technique was based mobilizing dorsal dartos flap after splitting to cover urethroplasty ventrally. He reported no fistula formation in 42 patients after using this technique. Since this date, other authors have reported their experience using similar technique with excellent results [11, 12,41,42].

On the other hand, a ventral based dartos flap was also used to cover neourethra. Smith [43] performed TIPU for repair in 64 patients, and used ventral based SDF for covering the neourethra in 56 patients with no fistula formation. Later on, Furness [44] reported that of the 111 patients with reconstruction using ventral based SDF which was reflected up to cover TIPU in distal hypospadias and was successful in 109 (98.2%) with only two patients developing fistula formation. Soygur et



al., [45] adopted the ventral based SDF along with mucosal collars and obtained satisfactory results with a fistula rate of 8.3%. Savanelli et al., [46] compared two groups of patients with distal hypospadias treated respectively with and without ventral based SDF after TIPU repair; the authors found significant differences in fistula occurrence, with better results in patients treated with "covered TIPU".

Cimador et al., [47] published their prospective randomized study comparing different types of dorsal preputial dartos flap (Group A) and ventral dartos flap (Group B) in terms of complications in patients undergoing TIPU repair in distal hypospadias. Group A patients were furthermore stratified into three subgroups: A1, laterally twisted preputial flap; A2, ventrally twisted flap in a buttonhole fashion; and A3, preputial flap divided in two wings and laterally twisted. Group B patients were divided in two subgroups: B1, single layer flap; and B2, double layer flap. They found that the overall complications rate was 36.8% in Group A versus 27.4% in Group B. The overall incidence of fistula formation in Group B was less than Group A (12.3% and 17.5%, respectively). Nevertheless, significant differences were observed in subgroups. The use of ventral based DDS showed a significant decrease in terms of fistula rates if compared with a SDF (2.7% and 22.2%, respectively). They confirmed the advantage in the use of a DDS flap if compared with a single flap, and interestingly, the difference seemed more significant if a ventral dartos flap was used. In our study, results were very close and showed the incidence of fistula formation in distal hypospadias was 3.4% while the overall incidence in different types was 4.8%. On the hand, the incidence of fistula formation in other types of hypospadias in our study was relatively high as 9.1% in mid-shaft and 8.3% in proximal penile. However, no comparable data were available in the literature regarding the use of ventral based DDF in other types of hypospadias than distal. Interestingly found in results of Cimador and his colleagues that ventral based DDS had less fistula rates than dorsal based (2.7% and 22%, respectively). Their results that were published during our study period shared the same recommendations that ventral based dartos had better outcome than dorsal based dartos in fistula rate and risk of penile rotation, which was recorded also in other studies using dorsal based dartos [48,49]. Many authors explained the advantages of ventral based dartos as simple technique and a nearby vascular dartos with no harvesting related complications [44,45,47].

Glans dehiscence in the presence of the dartos flap is a rare complication [3], but Elbakry [29] affirmed that the dartos flap should not be used because it hindered tension-free closure of the glans flaps and increased the risk of glans dehiscence. Therefore, the presence of a double dartos layer to protect the neourethra could have a greater risk of glans dehiscence. This finding was not noticed in our study as we had 1.6% only 3.6% in Safwat et al., [50] study. This could be explained by deep dissection of the glans wings to obtain good mobility for later closure and to accommodate DDF.

Meatal stenosis is another complication that may be observed after TIPU procedure. Published data indicate the occurrence of meatal stenosis to

*Conclusions:*

The use of ventral based DDF in TIPU repair for different types of hypospadias is a safe procedure with minimal complication rates. The ventral based DDF is simple, close and can be easily transposed on the neourethra. It also avoids the risk of penile iatrogenic rotation as compared to preputial flap. Secondary preservation of the prepuce can provide a better chance for treating patients undergoing reintervention and in cases of additional complications related to hypospadias.

*Conflict of interest:*

The authors declare no conflict of interest. The author don't feel there are conflicts, disclosure of relationships and interests affords a more transparent process, leading to an accurate and objective assessment of the work.

*Ethical considerations:*

The study received ethical approval from the local research ethics committee of Faculty of Medicine, Suez Canal University. The study had been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

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