

Double-Layer Dartos Flap for Neourethral Coverage in Tubularized Incised Plate Hypospadias Repair

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Abstract: Objective: To present our experience with double-layer dartos flap for neourethral coverage during tubularized incised plate urethroplasty in mid-shaft and distal penile hypospadias repair. **Materials and methods:** Between April 2008 and March 2012, 79 patients aged between 7 months and 11 years (mean 3.1 years) were enrolled for hypospadias repair. The position of the meatus was distal penile in 61 (77.2%) and mid-penile in 18 (22.8%). All patients underwent standard tubularized incised plate urethroplasty (Snodgrass), which was followed by covering of the entire neourethra with an overlapping double-layer dorsal dartos flap before glans closure. Patients were followed for at least 6 months (mean 1.3 year) to determine complications and cosmesis after surgery. **Results:** The mean operative time was 74.4 minutes. The mean hospitalization time was 5.91 days. Repair breakdown was encountered in 1 (1.3%), urethrocutaneous fistula in 1 (1.3%), meatal stenosis in 6 (7.6%) and mild penile torsion in 3 (3.8%). The urethral fistula was small and healed spontaneously. Meatal stenosis was severe in 1 patient and needed dorsal slit meatoplasty while in the other 5 the stenosis was mild and successfully managed by frequent urethral dilatation. All patients except the one with repair breakdown had acceptable cosmetic outcome. **Conclusion:** The results indicate that using double-layer dartos flap for neourethral coverage during tubularized incised plate urethroplasty is associated with low complication rate and provides satisfactory cosmetic results.

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Key words: Hypospadias; TIP urethroplasty; Double-layer; Dartos flap.

1. Introduction:

Hypospadias is one of the most common congenital defects affecting the external male genitalia [1,2]; affects between 1:125 and 1:300 live male births [3,4]; and 50% of them being of distal penile type [5]. The surgical goal for hypospadias repair is to construct a cosmetically appearing straight penis with a terminally situated slit like meatus. A large number of surgical techniques have been described for the repair of hypospadias. The tubularized incised plate (TIP) urethroplasty as described by Snodgrass [6] became the preferred technique for distal hypospadias repair, and gained worldwide popularity and acceptance [7-11]. The advantages of the TIP repair include in situ tubularization using native urethral plate, elimination of skin flaps and its applicability to many different variants of hypospadias. Despite its obvious surgical advances that it represents in hypospadias repair, urethrocutaneous fistulae are reported in up to 17% of cases [12]. There are several procedures for preventing this complication [10,13,14]. In the present study we evaluated our experience with double-layer dartos flap for neourethral coverage during TIP urethroplasty in mid-shaft and distal penile hypospadias repair.

2. Patients and Methods:

Clinical data: The medical records and operative notes of 79 patients who underwent primary TIP

hypospadias repair at our institutions from April 2008 through March 2012 were reviewed. All included patients were uncircumcised, had a well-developed urethral plate and underwent repair for the first time. Those with severe penile chordee and those with previous failed repair were excluded from the study. The hypospadias meatus was subcoronal in 38 (48.1%), distal shaft in 23 (29.1%) and mid-shaft in 18 (22.8%). The boys' age at surgery ranged from 7 months to 11 years (mean 3.1±2.68 years). Dihydrotestosterone gel was applied locally for 4 weeks in 6 patients with under-developed penis. The patients were admitted to the hospital, investigations like complete urine analysis, complete blood count, blood urea, serum creatinine and coagulation profile were done pre operatively.

Surgical technique: Surgeries were performed under general anaesthesia with tourniquet application to the base of the penis to minimize bleeding during surgery. Magnifying surgical eye loupe was used. The standard TIP urethroplasty was used with covering of the neourethra by double layers of well-vascularized dorsal dartos flap. Briefly, stay suture was applied through the glans penis for easy handling and traction. Circumferential skin incision was done proximal to the corona and extended from each edge of urethral plate. The penis was degloved with creation of a well-vascularized dartos flap. The flap was

separated from the preputial and penile skin (figure 2). Artificial erection was performed and orthoplasty was done as needed by dorsal tunica albuginea plication. The urethral plate was separated from the glans wings with two parallel, longitudinal, deep incisions. The urethral plate was incised from the glans tip to the hypospadiac meatus. The urethral plate was then tubularized over 6-8 Fr stent with absorbable 6/0 polyglactin continuous suture, without tension, in a running subcuticular fashion. The neomeatus was widely fashioned to prevent subsequent meatal stenosis. The dartos flap was incised longitudinally into two equal strips (figure 3). One of them was transposed ventrally, fanned out over the neourethra and secured to the opposite glans wings with simple interrupted absorbable sutures. The other strip was then transposed ventrally over the first strip in the fashion of overlapping bat wings and fixed to the other glans wings (figure 4). The glans wings were approximated in one or two layers by interrupted absorbable suture without tension (figure 5). Circumcision was done and skin was closed using interrupted absorbable suture. Finally, the urethral stent was secured to the glans. The dressing was done using Sofratulle wrap (Aventis Pharma, Ltd., Ponda), with mild compression to prevent hematoma formation and subsequent infection.

Post-operative care: All patients received parenteral broad spectrum antibiotic for 2 days followed by oral antibiotic until urethral catheter removal. Oxybutynin was given during the period of urethral stenting to prevent bladder spasm. The dressing was removed on the fourth post-operative day and wound left exposed. The urethral catheter was removed between 5 to 7 days after surgery and patients discharged home and called in the follow-up clinic one week later.

Follow-up: Patients were followed on a weekly basis for one month, then, monthly for at least 6 months (mean period of follow up was 1.31 ± 8.84 year). At each follow-up visit, patients were evaluated by history and local examination for urinary stream, cosmetic appearance of the penis and presence of complications.

3. Results:

Operative time ranged from 40 to 135 minutes with mean of 74.4 ± 24.9 minutes. Hospitalization time ranged from 5 to 8 days with the mean time of 5.91 ± 1.27 days. Out of 27 patients with ventral penile chordee, 6 patients needed dorsal tunica albuginea plication after penile degloving and release of the chordee tissue. No reported intra-operative complications. Post-operative complications were noted in 9 (11.4%) boys; however re-operation was required in only 2 (2.5%). Repair breakdown occurred in 1 (1.3%), urethrocutaneous fistula in 1 (1.3%), meatal stenosis in 6 (7.6%) and mild penile torsion in 3

(3.8%). The total number is greater than the actual number, as some patients had more than one complication. One patient with meatal stenosis had urethrocutaneous fistula and other one had mild penile torsion. In patient with repair breakdown, redo surgery was done after 10 months from primary repair with final acceptable result. The reported urethrocutaneous fistula was small, juxtacoronary, associated with meatal stenosis and completely healed and closed after frequent urethral dilatation. The meatal stenosis was tight and needed dorsal slit meatoplasty in 1 patient while in the other 5 the stenosis was mild and successfully managed by regular urethral dilatation. The final cosmetic outcome has been found to be satisfactory in all cases except the one with repair breakdown.



Figure 1. Juxtacoronary hypospadias in 14 months old boy.



Figure 2. The dartos flap was harvested from the dorsal preputial and shaft skin.



Figure 3. The dorsal dartos flap was incised into 2 equal strips.



Figure 4. The 2 dartos strips were created over the neourethra without overlapping of suture lines.

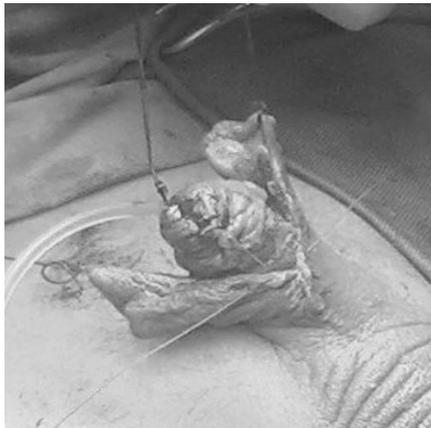


Figure 5. The glandular wings were closed without tension.

4. Discussion:

The current series represent our experience with TIP hypospadias repair over 4 years in 2 referral centers dealing with most cases of hypospadias in the province of Al-kharj, KSA. Our results were in accordance with previous global result patterns demonstrating that covering the neourethra in a TIP hypospadias repair with a double-layer of vascularised dorsal dartos flap decreases the possibility of fistula formation and associated with good cosmetic appearance.

Its versatility, simplicity, alongside the normally appearing meatus and glans, has made TIP urethroplasty the well-liked technique for treating distal and mid-shaft hypospadias [15]. The urethrocutaneous fistula remains probably the most significant frustrating problem after such surgery. Interposition of well-vascularized tissue between the neourethra and penile skin in order to avoid overlap of suture lines is essential to minimize fistula formation [16,17]. Without tissue interposition, the fistula rate ranged from 15 to 29% [18-20].

Different tissues and techniques have been described to achieve the vascularized coverage of suture lines. The most commonly used vascularized tissues are spongiosal tissue, tunica vaginalis, and dorsal/ventral dartos flap. The spongiosal tissue

provides good anatomical coverage of the neourethra and reconstructs a near normal urethra, but its use is limited, especially in mid-shaft hypospadias [21]. Tunica vaginalis may be used as second-layer coverage of the neourethra [22,23], but testis delivery to harvest the tunica vaginalis is time consuming and adds additional morbidity. Dartos flap is suitable for second-layer coverage of the neourethra. The dartos flap is composed of vascularized subcutaneous tissue that is dissected from the dorsal preputial and shaft skin. This flap can be easily harvested, as the tissue is available nearby and lining all the external genitalia. So, dissection can be extended till the base of the penis to obtain a suitable flap length and size.

There are different techniques for harvesting dartos flap. Retik and Borer [24] described covering the neourethra with an asymmetrical, torsional, subcutaneous dartos tissue flap harvested from the dorsal preputial and shaft skin. The drawback of this procedure was that it can cause some degree of glanular torsion that occurs when the dissected dartos flap is rotated laterally to cover the neourethra. Snodgrass [25] used a dorsal dartos pedicle flap from the dorsal prepuce for additional neourethra coverage, but button-holed and transposed to the ventrum; however he reported complications in 14% of his patients, mainly related to urethroplasty. Ventral dartos tissue is also used for neourethral coverage [26]. However, ventral skin is poorly developed; therefore it has not been offered for creating sufficient ventral dartos flaps.

Placement of overlapping double-layer, dorsal dartos flap over the neourethra in TIP urethroplasty has gained widespread acceptance and recommended by several authors. Most of the studies have reported encouraging results regarding low fistula rate and other healing problems, with good functional and cosmetic results [27-30]. Also, the superiority of double-layer, dorsal dartos flap protection over single-layer or flapless technique have been reported by several authors [16,17,32-34].

In the present study, we covered the neourethra with an overlapping double-layer of dorsal dartos flap. Urethrocutaneous fistula rate was (1.3%) as well as in others using the same technique. The low fistula rate has been attributed to the covering of the neourethra with double-layer allows better suture line separation and offers extra layer that will improve healing process and minimize the chance of fistula formation. It is unclear how urethrocutaneous fistula developed in spite of interposed double-layer flap. The presence of associated early meatal stenosis and complete healing of the fistula after urethral dilatation enhance the likelihood of meatal stenosis to be the cause of fistula. Also, the possibility of

associated other factors as local ischemia damage should be considered.

Another complication that can be reported with TIP hypospadias repair is meatal stenosis. Different reported series indicate the occurrence of meatal stenosis is between 0.7 and 17% in TIP repair [29, 32, 33]. The rate of meatal stenosis in the current series (7.6%) was in the range of that reported in other series. This drawback may be contributed to a technical error, including tight closing of the distal neourethra and efforts to elongate the neourethra to the tip of the glans [32]. Also, inadequate mobilization of glans wings and closure under tension may predispose to such a complication. There is an argument regarding routine urethral dilatation after TIP hypospadias repair. Elbakry [34] reported routine regular urethral dilatation after TIP hypospadias repair is important to prevent adhesions between both sides of the incised plate which can result in meatal stenosis and fistula formation. Other authors disagree and believe that routine urethral dilatation is unnecessary [32]. In our series, urethral dilatation was not performed routinely. However, 5 patients with meatal stenosis including the one with urethrocutaneous fistula were managed successfully with frequent urethral dilatation.

Also, under tension closure of glans wings can predispose to pressure ischemia in the neourethra and glans edges with subsequent repair breakdown. In our series repair breakdown was seen in one patient in the early period of study. We avoided this complication in subsequent cases by generous dissection of glans wings and fanning out of the distal end of dartos strips to reduce the bulk and pressure ischemia.

Penile torsion is another possible complication that may be observed after TIP hypospadias repair. This complication is more common with single lateral flap than overlapping double-layer flap. In a retrospective comparative study, Yigiter and co-authors [17] reported a significant reduction of penile torsion from 43.5 to 3.8% with the use of double-layer flap technique. In our series, penile torsion occurred in 3 (3.8%) cases; the degree of rotation was very low in all cases and nothing was applied. This complication may be attributed to asymmetrical application of flap strips.

We agree that 11.4% complication rate is high in our series; as some series achieved a 100% complication free success rate with our technique [28,35,36]. But, most of our complications are minor and re-operation rate was needed in only 2 (2.5%). Also, almost all complications occurred in the initial period of the study and may be related to technical insufficiency. Once we became aware by these complications and started to improve our technique, these complications have been overcome. We have had no postoperative

complications in the last 27 cases. This indicates that, the success of this technique affected greatly by surgeon's skill.

In recent years the cosmetic result of the repairs has become as important as the functional outcome of hypospadias surgery. We achieved a satisfactory cosmetic result. Also, we achieved straight penis in all patients with penile chordee and none of them showed residual or recurrent chordee during follow-up period. This might be attributed to our selection criteria because none of our patients had severe chordee.

Absence of randomization to compare double-layer with single-layer dorsal dartos flap or no flap technique is a major limitation of the present series. Also, multicentricity and different surgeons are other drawbacks of study. In spite of these limitations, our results shows the feasibility of TIP repair using double-layer dartos flap in safe manner.

Conclusions:

The results of the present series indicated that, using double-layer dartos flap for neourethral coverage during TIP urethroplasty is associated with low complications and provides satisfactory cosmetic results.

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