

Assessing the Effectiveness of Dorsal Flap in Surgical Repair of Hypospadias by Tubularized Incised Plate Urethroplasty

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ABSTRACT

Background: Hypospadias is a congenital abnormality of the urethral meatus opening which is located anywhere along the length of the penis except the tip of the glans. The management of this congenital disease is surgical and comprises orthoplasty, urethroplasty, glanuloplasty and cosmetic correction. Urethroplasty is the key step of surgical correction of hypospadias. Tubularized incision plate (TIP) urethroplasty by dorsal flap is frequently used for distal hypospadias. The reason for the preference is usually wide acceptability of low post-surgical complications and optimum cosmetic results. Other techniques include urethral plate augmentation and urethral plate replacement.

Aims: The aim of this study is to assess the effectiveness of dorsal flap assisted TIP urethroplasty in patients with hypospadias of recruited population. The effectiveness will be measured against postoperative outcomes such as wound rupture, wound necrosis, meatal stenosis, and urethrocutaneous fistula formation.

Methodology: This prospective study was conducted on 11 primary hypospadias cases undergoing TIPU in Dr Ziauddin Hospital, Karachi for the period of one year from November 2020 to October 2021. The inclusion criteria included infants with distal and midshaft hypospadias with sufficient width of the urethral plate. Whereas individuals with proximal hypospadias or other factors complicating the surgical procedure were excluded from the study population.

Result: The total number of participants included was 11 children. The age of participants varied between 18 – and 28 months with a mean age of 24.2 ± 3.1 months. The meatus opening was seen at the distal end near the coronal sulcus in 8 participants whereas 3 participants showed preoperative meatus opening in the distal third of the shaft. An immediate follow up was done at 2 weeks intervals to assess wound health and situation. 1 out of 11 infants showed wound dehiscence which was immediately corrected. A late follow up was carried out after 2-3 years, no case presented with significant complications such as urethrocutaneous fistula or stenosis of the meatus.

Conclusion: the study shows measured the post-operative complications followed by TIP urethroplasty using a dorsal flap. Immediate complications showed a single case of wound dehiscence. Whereas all long term follows up after 2-3 years showed no significant complications. After predisposing the clinical outcomes of this research against and in favour of pre-existing literature, it is concluded that dorsal flaps assisted TIP urethroplasty is a safe surgical procedure and is effective in terms of avoiding postoperative complications in individuals with hypospadias.

Keywords: Dorsal flap, Hypospadias, Tubularized incised plate urethroplasty

INTRODUCTION

Hypospadias is a congenital abnormality of the urethral meatus opening which is located anywhere along the length of the penis except the tip of the glans and is medically defined as arrest or abnormal development of the urethra, penile foreskin, and chordae [1]. According to the opening of the meatus, hypospadias is characterized according to the size and location of the meatus opening. Sub coronal or distal hypospadias is associated with the opening of the meatus near the proximity of the glans, midshaft hypospadias is referred to as the opening of the meatus anywhere along the shaft of the penis, and proximal or penoscrotal hypospadias is characterized by the opening of urethral meatus at the junction of penis and scrotum [2]. Hypospadias is a congenital condition and is considered one of the most common congenital defects of males with epidemiological studies showing a prevalence of 1 in 200 births [3]. The aetiology of hypospadias is currently not well defined however recent establishment in the study shows that the aetiology of hypospadias is multifactorial with complex correlations between environmental factors, endocrine pathologies, and genetic influence [4]. Hypospadias is frequently complicated by the central curvature of chordae with a curvature of more than 15 degrees is considered a potential complication. The significance of this disease lies in the fact that when occurring along with cryptorchidism, a number of proximal hypospadias cases are found to be associated with abnormalities of sexual differentiation [5].

The management of this congenital disease is surgical and is usually carried out between 8 to 18 months [6]. The objects of surgical repair are more than one and therefore, multiple corrective

surgeries are performed to achieve surgical goals. The objectives of hypospadias surgery are as follows: Correct curvature of ventral chordee, the optimum position of meatus at the apex of glans, reconstruction of glans to have a conical appearance, appearance of the circumcised penis if surgeon chooses grafts or a circumferentially sound foreskin which is easily retractable, cosmetically pleasing outcomes of surgical repair [7]. The sequence of surgical repair in hypospadias is degloving of the penis, followed by corrective surgery of penile ventral curvature also known as orthoplasty, this procedure is followed by correction of urethral meatus opening called urethroplasty, after urethroplasty the glans are corrected to provide conical appearance and lastly any further cosmetic surgeries are performed to optimize the cosmetic outcomes of the surgical outcomes [8].

Urethroplasty is a key step in the surgical correction of hypospadias. The procedure as previously mentioned is aimed at correcting the position of the urethral meatus opening and approximating the urethra and glans. Many techniques are applied at correcting this positional defect between the urethra and glans. Tubularized incision plate (TIP) urethroplasty is frequently used for distal hypospadias and will be discussed. Other corrective procedures used for urethroplasty are urethral plate augmentation using inner inlay grafts which are indicated when the urethral plate is narrow [9], however, in cases when ventral curvature of the penis is more than 30 degrees and the urethral plate is of insufficient size, it is difficult if not impossible to perform urethroplasty with augmentation or tubularization. Such cases demand a complete urethral replacement followed by placement of

Byars flap and secondary tubularization, a procedure known as urethral plate replacement [10].

TIP procedure has been advocated for many surgical corrective procedures. The reason for the preference is usually wide acceptability of low post-surgical complications and optimum cosmetic results. A study conducted by Hueber studied 15 clinical cases of hypospadias with distal, midshaft, and proximal hypospadias. He performed a surgical repair on these 15 individuals ageing between years 1 to 18 years old. All the cases were treated by TIP urethroplasty using a dorsal flap. The follow-up results after surgery showed no significant complications except for meatal stenosis in one patient early after surgery [11]. When dorsal flap surgeries are compared with inlay island grafts a contrast in surgical outcomes was easily visualized. A study conducted by Aldeeb et al. in year assessed surgical outcomes of TIP urethroplasty and urethral plate augmentation and their post-surgical complications. The study included a sample size of 60 children with 30 children receiving each type of urethroplasty. The group which underwent TIP urethroplasty showed lower surgery times in comparison to urethral plate augmentation, the postoperative complications in the group treated with TIP urethroplasty using dorsal flap comprised of a single case of meatal stenosis, whereas in urethral plate augmentation wound dehiscence and distal urethrocutaneous fistula was documented [12]. This rationale for this study is to assess the effectiveness of dorsal flap assisted TIP urethroplasty in patients with hypospadias of recruited population. The effectiveness will be measured against postoperative outcomes such as wound rupture, wound necrosis, meatal stenosis, and urethrocutaneous fistula formation.

MATERIALS AND METHODS

This prospective study was conducted on 11 primary hypospadias cases undergoing TIPU in Dr Ziauddin Hospital, Karachi for the period of one year from November 2020 to October 2021. The inclusion criteria included infants with distal and mid-shaft hypospadias with sufficient width of the urethral plate. Whereas individuals with proximal hypospadias or other factors complicating the surgical procedure were excluded from the study population. These complications comprised ventral curvature of more than 15 degrees, individuals who have already undergone previous surgical repair of hypospadias or individuals who have been circumcised. The inclusion and exclusion of the study group were done after a detailed examination of patients. This examination included assessment of penis size, chordae, assessment of the urethral plate and ineffective distal spongiosum.



Figure 1: TIP urethroplasty employing dorsal flap for hypospadias management

The effectiveness of the use of dorsal graft was measured against postoperative complications such as infection of the surgical site, and meatal stenosis. Other factors such as wound rupture and continuous chordae were also considered. The surgical procedure was aimed at using urethral plate tubularization towards the distal end of hypospadias meatus. A tractional suture was placed at the glans. After placement of the catheter, incision lines were marked along the catheter and in sub coronal sulcus. Two initial vertical incisions were made along with the urethral plate near the meatus opening followed by sub coronal incision to allow degloving of the penis.

Following degloving of the penis, vertical incisions were deepened and extended towards the urethral plate to allow mobilization of wings of the glans after removal of the catheter. A midline incision was made of the urethral plate and mobilization of the urethral plate was carried out to receive a catheter. Distalization of the urethral plate and approximation of the urethral plate and glans was carried out by tubularization. This achieved the formation of neuro urethra. A dorsal flap was used to cover the neuro urethra and for its reinforcement. This was followed by glanuloplasty to achieve cosmetic outcomes for circumscribed penis.

RESULTS

The total number of participants included was 11 children. The age of participants varied between 18 – and 28 months with a mean age of 24.2 ± 3.1 months. All the participants went under dorsal flap TIP urethroplasty for distal and midshaft hypospadias. The meatus opening was seen at the distal end near the coronal sulcus in 8 participants whereas 3 participants showed preoperative meatus opening in the distal third of the shaft. An immediate follow up was done at 2 weeks intervals to assess wound health and situation. 1 out of 11 infants showed wound dehiscence which was immediately corrected. A late follow up was carried out after 2-3 years, no case presented with significant complications such as urethrocutaneous fistula or stenosis of the meatus. Dorsal grafts were assessed and were found to be healthy.

DISCUSSION

When assessing the outcomes of this clinical study against pre-existing literature, the effectiveness of TIP urethroplasty by dorsal graft was extensively studied for its role in decreasing post operative surgical complications. Shimotakura et al. extensively studied the correlation between TIP urethroplasty with dorsal flap and postoperative meatal stenosis and fistula formation. The sample size of the study included 100 clinical cases performed over 7 years. the patient was divided into two groups of 50 patients each based on the Snodgrass procedure with and without receiving a dorsal graft. The group which received dorsal graft showed postoperative complications were found in 4 individuals with 3 patients presenting with urethrocutaneous fistula and one patient with diverticulum. In contrast, the group which did not receive dorsal graft showed 15 postoperative surgical complications with 2 meatal stenosis, stenosis of neuro urethra in 6 patients, and 7 cases of urethrocutaneous fistula [13]. This study advocates for the outcomes of the present clinical result that urethroplasty was done by employing dorsal flap is associated with low and less severe postoperative outcomes.

It has been argued that urethroplasty performed by incorporating a dorsal flap is associated with improved cosmetic outcomes after hypospadias management. Babu et al. and Castañón et al, assessed the cosmetic outcomes following different types of urethroplasty. The study population included 77 individuals. 44 individuals underwent TIP urethroplasty with dorsal graft whereas 33 patients underwent other surgical urethroplasty techniques. The results of the study showed that cosmetic disfigurement was as low as 5.8% in cases managed by TIP urethroplasty with dorsal flap in comparison to 17.8% in other urethroplasty techniques [14, 15]. The result of the study shows that dorsal flaps are effective in minimizing postoperative complications of TIP urethroplasty procedure in hypospadias children.

A study conducted by Vu et al., Wani et. al, and Manasherova et al, assessed the functions of dorsal flaps for reinforcement of neuro urethra in patients undergoing urethroplasty. In a sample size of 37 patients undergoing TIP urethroplasty for hypospadias. The results of this study showed that long term studies showed two cases of meatal stenosis and one case of urethrocutaneous fistula. The results are however not much in contrast to the findings of this clinical article as only

showed one postoperative complication of wound dehiscence. The rate of postoperative complication was 8.1%, however, postoperative complications in this clinical article were 9.0% which is comparable. Another study conducted by Manasherova et al. assessed postoperative complications following TIP urethroplasty using inner inlay graft for hypospadias management. The study sample comprised 12 children. Post-surgery outcomes after 42 months of postoperative follow up showed no children had meatal stenosis or urethrocutaneous fistula formation which is similar to the findings of this study, however, Nerli et al. reported two cases of tear of skin on the ventral shaft with the post-surgical complication of 16.6% [16-21]. Findings of these clinical reports showed that significant postoperative complications were observed only in one study with meatal stenosis and urethrocutaneous fistula.

A further comparison of clinical findings of TIP urethroplasty employing dorsal graft was done with postoperative outcomes of urethral plate augmentation and replacement. A clinical study was conducted by Omran in the year 2021 to assess the postoperative complications following urethral plate augmentation. The assessment was made against significant complications at biannual postoperative follow-ups. The sample size of the study included 39 participants. The results of the study showed that augmentation performed by dorsal flap resulted in the postoperative complication of only 5.3% with only one patient presenting with urethrocutaneous fistula formation and wound dehiscence, whereas urethral plate augmentation performed by longitudinal Onlay flap showed postoperative complications of urethrocutaneous fistula formation in 5 patients, two patients presented at follow up with wound dehiscence and two individual had the complication of flap loss and diverticulum respectively [22].

The outcomes of the study conducted by Omran et al. reinforce the findings that augmentation performed with dorsal flap is associated with a lesser frequency of postoperative complications in comparison to other flap designs in the management of hypospadias. However, when reviewing the literature, certain characteristics are acknowledged to influence the outcomes of narrow urethral plate defects. It has been clinically assessed that an adequate width and type of urethral plate defect can influence the outcomes of urethral plate augmentation and TIP urethroplasty with a urethral plate width of more than 8mm shows a decreased frequency of postoperative complications and flat urethral plate are associated with lesser successful outcome [23].

CONCLUSION

The study shows measured the post-operative complications followed by TIP urethroplasty using a dorsal flap. Immediate complications showed a single case of wound dehiscence. Whereas all long term follows up after 2-3 years showed no significant complications. After predisposing the clinical outcomes of this research against and in favour of pre-existing literature, it is concluded that dorsal flaps assisted TIP urethroplasty is a safe surgical procedure and is effective in terms of avoiding postoperative complications in individuals with hypospadias.

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