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EVALUATION OF ONE STAGE MODIFIED MATHIEU'S URETHROPLASTY FOR DISTAL PENILE HYPOSPADIAS IN BIHAR POPULATION

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Abstract

With an incidence of 1:300, hypospadias is one of the most common genital anomalies in male newborns. Hence the present study was planned to evaluate the one stage Flip- flap procedure to repair Distal Penile Hypospadias. Mathieu's technique (peri-meatal based flap) makes use of the urethral plate in the repair of anterior hypospadias, thereby creating an almost natural neo-urethra. In a circumcised baby or after previous unsuccessful repair, Mathieu's flap may be one of the few options left to repair anterior hypospadias.

A total of fourteen patients were included in this study. Their age ranged from 1-13 years, mean age was 4.9 years. Construction of neourethra is generally recommended to be completed before the school going age. The 14 cases of hypospadias are primary repaired by modified Mathieu's Flap technique to achieve both cosmetic and functional normality. An overall success rate of 87.5% was achieved and In the remaining 14% of the cases, success was achieved with only one additional procedure.

The protocol followed the recommended guidelines of surgery. The present study was planned in the Department of Plastic Surgery, Pulse Emergency Hospital, Patna, Bihar. Total surgeries done from Oct 2016 to Nov 2017 were included in the present study.

The present study concludes that in a developing country like India with rural patients having poor access to good healthcare facilities. One stage Repair is beneficial in many ways. The follow-up compliance of poor rural patients is extremely poor because they need to come to the urban cities for treatment. The authors have seen multiple cases where the patients have gone for the Chordee Correction (first stage of a two-stage repair) in childhood and then reported after a decade.

Keywords: Hypospadias, MAGPI, Mathieu flap, Single-stage repair, etc.

Introduction:

With an incidence of 1:300, hypospadia is one of the most common genital anomalies in male newborns [1]. Hypospadias is defined as an anomaly (hypo- or dysplasia) involving the ventral aspect of the penis [2]. These malformations mainly comprise of an abnormal ventral opening of the urethral meatus, an abnormal ventral curvature of the penis (chordee) and/or an abnormal distribution of the foreskin. The extent of the malformation varies.

The hypospadic penis is often anatomically similar to the normal penis, at least as far as the dorsal aspect is concerned. However, the ventral aspect is pathological: the development of the prepuce is incomplete, the formation of the urethral plate into a urethra is defective and the corpus spongiosum is deficient. Histologically, the urethral plate consists of well-vascularised tissue with large endothelial sinuses lined around an abortive urethral spongiosum. Fibrosis and cicatrisation are rarely available [4]. These characteristics make the urethral plate ideal for urethroplasty [5].

Surgical reconstruction is the only possible therapeutic option for hypospadias [2]. The primary objectives of the reconstruction are to create a vertically slit orthotopic meatus, straighten the penis in case of curvature and establish good cosmetic results that include a conically shaped glans. Other

important aspects for the reconstruction are to avoid shortening the penis and optimal skin coverage that excludes the use scrotal skin for coverage of the penis.

The optimal age for correction of hypospadia is between the 6th and the 24th month. Thanks to the possibility of topical application of dihydrotestosterone, it is possible to optimise the size of the penis at this early age of operation [13]. In the majority of cases, the operation can be done in one step. A two-step approach is rarely necessary, for example, in case of insufficiency of the urethral plate or hypoplastic skin as often found in Re-Do Hypospadias [14].

Successful hypospadia surgery incorporates the following steps: straightening of the penis (orthoplasty), reconstruction of the urethra (urethroplasty), the meatus (meatoplasty), the glans (glanuloplasty) and the skin of the penis as well as that of the scrotum whenever necessary.

The fact that there are over 250 methods of surgical correction of hypospadias described in the literature indicates that the “hypospadiologists” are still in search of the ideal technique. The statement: “There is nothing new in surgery not previously described” [15] is especially true as far as hypospadia repair is concerned, because many so believed new techniques were, as a matter of fact, originally described in historical documents and books.

In the 19th century, Dieffenbach [16] tried to reconstruct a neourethra through secondary epithelialisation by perforating the glans with a canula and therefore establishing a connection to the hypospadic urethra. Theofil Anger first used tubularised local flaps in the 19th century for hypospadia repair [17]. In 1875, Wood introduced the “meatal-based-flap-technique” that is the basic idea behind the Mathieu technique [18]. The idea of reconstructing the neourethra out of a vascularised island flap was also first described in the 19th century. In connection with this, Van Hook described the reconstruction of the neourethra with a dorsal preputial flap. The idea of using a free flap for urethroplasty is also not new. Towards the end of the 19th century, Nove-Josserand used skin grafts for the urethral reconstruction [19].

The above-mentioned techniques were further pursued and advanced in the 20th century. Ombrédanne created the neourethra out of a round local submeatal flap and covered it with a dorsal preputial flap [19]. Similar strategies were followed by Mathieu and Brown. Horton and Devine introduced the so called “Flip-Flap technique” for the correction of distal hypospadias that is favoured by certain surgeons up to date [20]. At the same time, techniques that preferentially use vascularised island flaps were also further pursued. The best known of these is undoubtedly the urethroplasty using a transverse preputial island flap as popularised by Duckett in 1980 [21]. Although several trials were performed in the 20th century with free flaps, buccal mucosa is the only regularly used graft at the moment [22].

The mobilisation and elongation of the urethra is an interesting concept, which can in some cases be used to avoid urethroplasty. Duckett's principle, which is also known as “MAGPI,” is based on this concept [23]. This idea too is not new and was first described by Beck in 1889 [24].Surgical techniques for repairing common distal hypospadias have been continuously developed as modifications have been devised to seek ways of minimizing complications and improving cosmesis. Of all hypospadias, 65–70% are distal lesions; established procedures to correct this problem are the Thiersch-Duplay, Mathieu, Mustardé, meatal advancement and glanuloplasty and tubularized incised plate (TIP) urethroplasty (Snodgrass manoeuvre) [25-31]. A technique with more universal applicability in most variants of distal hypospadias would be appealing. A vertically orientated slit-like meatus in the normal position on the glans is most consistently achieved with the modified Thiersch-Duplay urethroplasty and Snodgrass manoeuvre. However, in cases with a shallow glanular groove or flattened glans we have adopted the Mathieu parameatal based flap urethroplasty. In this study we have evaluated Modified Mathieu procedure for the repair of distal penile hypospadias. We assessed the operative technique and the duration, function, complications and cosmesis of the repair.

Methodology:

The present study was conducted in the Department of Plastic Surgery, Pulse Emergency Hospital, Patna, Bihar. Total surgeries done from Oct 2016 to Nov 2017 were included in the present study. Patients with chordee and previous history of hypospadias repair were excluded from the study. In 14 boys, no prior hypospadias surgery had been performed (Table

1). The age in this primary repair group ranged from 1 to 13 years and median age was 3 years. Of the 14 primary cases, the location of the meatus was coronal in eight, subcoronal in four and distal penile in two. Optical loupes with a magnification of × 2–3 were used during the surgical repair.

Diagnosis was made on clinical basis. On admission patients were thoroughly evaluated with history, physical examination and investigations. In every patient, complete blood examination, urine routine examination, renal function test, renal ultrasonography were done. Patients were observed for wound infection, oedema, fistula formation, tube disruption and meatal stenosis. Failure of procedure was considered if there was a fistula or tube disruption. Among the patients with successful repair cosmetic appearance of phallus was evaluated in terms of acceptance by the parents or adult patients. It was graded as poor, satisfactory or good.

TABLE 1:

Type of Hypospadias	= n	%age
Coronal	8	57.14
Subcoronal	4	28.57
Distal Penile	2	14.28

Table 2: Modified Mathieu's Meatal-based Urethroplasty for primary repair

No.	Age(years)	Type of hypospadias	Flap length	Complication
1.	2	Sub Coronal	1.5	-
2.	6	Coronal	1.3	-
3.	4	Coronal	1.4	-
4.	3	Sub Coronal	1.5	-
5.	10	Coronal	1.8	-
6.	1	Distal Penile	1.5	Dehiscence
7.	7	Coronal	1.6	-
8.	4	Coronal	1.3	-
9.	5	Coronal	1.5	-
10.	1	Coronal	1.2	-
11.	6	Sub coronal	1.8	-
12.	3	Coronal	1.3	-
13.	2	Distal penile	1.5	-
14.	4	Distal Penile	1.8	Fistula

Consecutive 14 boys with distal hypospadias, who had a flattened glans with a shallow groove and a poor inadequate urethral plate, underwent a Mathieu parameatal based flap repair. The hypospadias was coronal in 60%(8 cases), subcoronal in 30% (4 Cases) and distal -penile in 10% (2 Cases); this was the first attempt at hypospadias repair in all children. Penile torsion was present in 1 (10%) and none required correction of chordee by dorsal plication. The defect was repaired under general anaesthesia with perioperative caudal analgesia. A 5/0 polydioxanone monofilament absorbable suture was used in both groups for the urethroplasty.

In this study the Mathieu urethroplasty was undertaken using a flap with a mean width of 8 mm and a glanular urethra of 16mm circumference **[3, 8].**

Urinary diversion with Neleton catheter was used in all of the 14 boys. We assessed the operative technique and the duration, function, complications and cosmesis of the repair.

Operative Technique

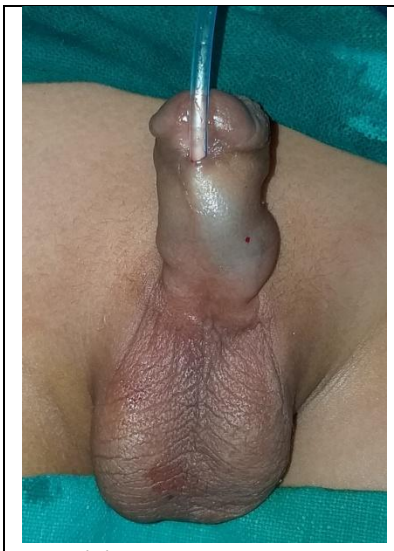
A stay suture was placed in the dorsal glans to aid in traction of the phallus. The length of the skin flap was determined by measuring the distance from the proximal edge of the meatus to the tip of the glans and then the ventral meatal-based skin flap was outlined (**Fig. 1** (a)).

A small silicone tube was inserted to protect the urethra. A circumferential subglanular skin incision was carried around dorsally and a pericoronal incision was also made to outline the ventral flap (**Fig. 1**(b)). A circumferential subglanular skin incision is carried around dorsally and a pericoronal incision is also made to outline the ventral flap. The flap was dissected off the underlying urethra by carefully tunneling the scissors between the flap and the urethra. The skin flap was elevated to preserve the perimeatal vascular supply in the subcutaneous tissue (**Fig. 1** (c)). Once the flap was dissected, two small traction sutures were placed in each corner. The skin of the penile shaft was then dissected free to the penoscrotal junction and an artificial erection was instituted to ensure the absence of chordee. Two paramedian incisions were outlined to extend to the tip of the glans. The lateral glans wings were dissected sufficiently laterally to allow them to come together in the midline without tension. A channel was then fashioned by excising some of the spongy tissue from the lateral wings in order to keep an adequate caliber of glanular urethra. Similarly, spongy tissue underneath the mucosal strip was excised sharply.

The flap is dissected off the underlying urethra by carefully tunneling the scissors between the flap and the urethra. The skin flap is elevated to preserve the perimeatal vascular supply in the subcutaneous tissue.

The proximal meatal-based skin flap was mobilized and anastomosed to the distal urethral plate with running 5/0 polydioxanone monofilament absorbable suture (**Fig. 1**(d)). In addition, subcutaneous tissue from the pedicle was sutured to completely cover the original suture line on each side to the depth of the glanular incision with several interrupted 5/0 polydioxanone monofilament absorbable suture (**Fig. 1**(e)). The lateral glans wings were then re-approximated over the neourethra, resulting in a rounded glans with a mid-glanular meatus (**Fig. 1**(e)).The lateral glans wings are reapproximated over the neourethra.The ventral aspect of the penis is covered by splitting the preputial skin in the midline and rotating these flaps ventrally.A tourniquet may have been placed temporarily at the base of penis if the bleeding was distracting.The ventral aspect of the penis was then covered by splitting the preputial skin (Byars' procedure) in the midline and rotating these flaps ventrally (**Fig. 1(f)**). A compression dressing was applied and left in place for 5 to 7 days.

Figure 1: Images of the Modified Matheu's Flip flap technique



Fig,1 (a) Preoperative

Fig.1 (b) Turnover Flip Flap

Fig.1 (c) Flip Flap turnover


Fig.1 (d) Neo-urethra


Fig.1 (e) Glanural Wings


Fig.1 (f) Post operative

Figure 2: (Case 2) Images of the Modified Matheu's Flap technique


Fig,2 (a) Preoperative


Fig.2 (b) after catheterization


Fig,2 (c) Neo-urethra


Fig.2 (d) Postoperative

Figure 3: (Case 3) Images of the Modified Matheu's Flap technique

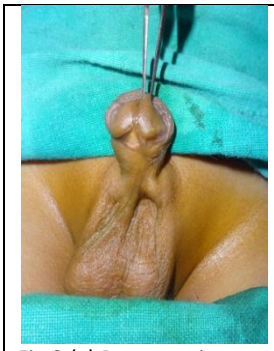

Fig,3 (a) Preoperative


Fig.3 (b) after catheterization


Fig,3 (c) Neo-urethra


Fig.3 (d) Postoperative

Fig. 4 (Case 4) Images of the Modified Matheu's Flap technique;


Fig,4 (a) Preoperative


Fig.4 (b) after catheterization


Fig,4 (c) Neo-urethra


Fig.4 (d) Postoperative

Fig. 5 (Case 5) Images of the Modified Matheu's Flap technique;

Fig.5 (a) Pre Operative

Fig.5 (b) Post operative

Results

A total of Fourteen patients were included in this study. Eight (57.14%) cases were coronal, Four (28.57%) cases were subcoronal and Two (14.28%) cases were distal penile hypospadias (Table 1).

In 12 of the 14 primary repair cases (81%), the meatal-based flap urethroplasty was successful in one stage (**Table 1)**. One of the remaining patients had small urinary fistulas, which were successfully closed as a single subsequent procedure. Dehiscence of the repair occurred in one patient, but he successfully underwent a similar procedure later.

An overall success rate of 87.5% was achieved at the first operation primary cases. In the remaining 14% of the cases, success was achieved with only one additional procedure.

Table 3: Cosmetic appearance after Modified Mathieu's Flap Technique.

Cosmetic appearence	=n	%age
Good	6	42.85
Satisfactory	8	57.14
Poor	_	-

Appearance was good in 6(42.85%) and satisfactory in 8 (57.14%) patients (Table 3). Overall success rate was 80%.

Discussion

With an incidence of 1:300, hypospadias is one of the most common genital anomalies in male newborns [31]. However the etiology of hypospadias remains unknown[32]. In the majority of cases abnormal meatus is situated at the glanular, coronal and subcoronal levels or in the distal part of the shaft[33,34-36].

A total of fourteen patients were included in this study. Their age ranged from 1-13 years, mean age was 4.9 years. Construction of neourethra is generally recommended to be completed before the school going age. Hundreds of methods have been described for the repair of hypospadias, all aimed at a functionally and cosmetically normal penis. Many of these methods were designed for the treatment of anterior hypospadias with minimal or no chordee, but various concerns about each of the methods have been expressed [37,38-40]. The use of a meatal based flap was first described by Mathieu in 1932 for anterior hypospadias. It is still a standard technique used by many surgeons in the repair of anterior hypospadias, and it is suitable even when the prepuce has been excised [41-43]. We routinely inserted a urethral stent and diverted the urine by hypospadiac meatus. Some surgeons have advocated Mathieu's repair without insertion of a stent, but the study by Hakim and colleagues reported a lower complication rate with stented compared to unstented Mathieu repair [41]. Similarly, Buson et al. noted a significantly higher complication rate in stentless compared to stented repair[43]. The stents were removed within 5-7 days if there was no complication. However, where there were complications like wound infection, urethrocutaneous fistula or flap necrosis the stents were left for longer to maintain adequate patency of the urethra while treating the complications. Overall hospital stay was long, though we would prefer and recommend a shorter duration. However, we had a peculiar situation because most of our patients preferred a few more days in hospital rather than frequent outpatient visits due to the high cost, risks and stress of long distance transportation.

Urethrocutaneous fistula remains the commonest complication after hypospadias repair and it occurred in 2 (12.5%) of our patients. With smaller sized sutures (subcuticular polyglycolic absorbable sutures),magnification and fine instruments, Mathieu's flap is known to have a fistula rate as low as 2%[44]. Careful preservation of the vasculature of the flap and non overlapping suture lines produce a watertight closure with minimal risk of fistula formation[46].The viability of Mathieu's flap is based on marginal blood supply from the base of the flap. If adherence to basic principles is not ensured, there could be meatal stenosis or flap necrosis. Meatal stenosis was not observed in this series. This may be due to the location of the meatus (subcoronal and distal penile) which precluded the use of flaps that may be too long. Also, using a wide flap could have contributed to the absence of meatal stenosis.
Introduction of the tubularised incised plate technique by Snodgrass for anteriorhypospadias repair should not make the Mathieu perimeatal based flap obsolete.

Some authors have reported better results with the Snodgrass procedure, but several others have reported no significant difference except for better cosmetic appearance of the meatus[45]. Therefore, both techniques are acceptable and effective for hypospadias repair, regardless of cosmetic result[46-47]. The surgeon's experience is considered a very important factor and it is recommended that surgeons should be wary of changing their technique[48].

CONCLUSIONS

Mathieu's flap remains a viable option in the repair of anterior hypospadias without chordee. With the current surge of interest in the tubularised incised plate method, we recommend that a surgeon's experience should guide the selection of technique. However, all surgeons involved in the management of hypospadias should update their knowledge and become acquainted with a variety of methods, as no single method will suffice for all cases.

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