

## Research Article

# Comparison of Modified Mathieu *versus* Standard Tubularised Incised-Plate Urethroplasty for Distal Hypospadias Repair

Naeem M, Khan MK\*, Shah G, Izhar M and Qayyum A

Assistant Professor of Pediatric Urology Institute of Kidney Diseases, Hayat Abad Medical Complex, Peshawar, Pakistan

**\*Corresponding author:** Muhammad Kamran Khan, Assistant Professor of Pediatric Urology Institute of Kidney Diseases, Hayat Abad Medical Complex, Peshawar, Pakistan

**Received:** June 28, 2021; **Accepted:** July 15, 2021;

**Published:** July 22, 2021

## Abstract

**Objective:** To compare the outcomes of modified Mathieu versus standard tubularised incised-plate urethroplasty for distal hypospadias repair.

**Materials and Methods:** This prospective comparative study was conducted on 54 cases affected by distal hypospadias presenting to Institute of Kidney Disease, Hayatabad, Peshawar from February 2015 to June 2020. The inclusion criteria was patients with distal hypospadias (coronal, sub-coronal, or distal penile), age range of 15 to 60 months. Cases with severe chordee/ventral curvature, history of previous hypospadias repair, and poorly developed urethral plate were excluded. The patients with distal hypospadias were divided into two equal groups: in-group I repair done with Mathieu procedure plus incision of the urethral plate (modified Mathieu) and in-group II repair was performed with Tubularized Incised Plate (TIP). The principal author performed functional and cosmetic assessment at follow up visits which includes; denovo meatus; size and pressure of the stream; and complications like meatal stenosis, urethral cutaneous fistula. Fisher Exact test was used to compare categorical variables between the two groups and student t test for continuous variables.

**Results:** The mean age of the study was 38.13±12.55 months. The operating time was less in TIP than modified Mathieu procedure statistically (P=0.036, 95% CI=0.315, 9.02). In modified Mathieu procedure the sprayed stream of micturition was higher (n=4, 14.8%) while in TIP procedure the frequency of narrow stream was higher (n=4, 14.8%). The difference was statistically significant (P=0.054). Only in modified Mathieu procedure the meatus shape was round in 4 (14.8%) cases and the results were statistically different (P=0.038). Post-operative fistula was higher TIP (n=6, 22.2%) than modified Mathieu (n=1, 3.7%) statistically (P=0.043). Only in TIP procedure postoperative meatal stenosis was found in 5 (18.5%) and the difference was statistically significant (P=0.019).

**Conclusion:** The modified Mathieu technique can improve the cosmetic outcome through creation of slit-like meatus, low incidence of fistula and meatal stenosis than tubularized incised plate urethroplasty in the repair of distal hypospadias.

**Keywords:** Mathieu technique; Tubularized incised plate; Distal hypospadias; Meatal stenosis

## Introduction

In the external genitalia of males, one of the frequent congenital anomaly is the hypospadias. Incidence of hypospadias is one in 300 live births. Usually the paediatric urologists carried out some surgical procedures to correct this malformation [1]. The classification of hypospadias is based on the degree of severity and position of the meatus, into proximal, mid-shaft, and distal forms. The distal forms comprised of 70-80 % [2]. The orifices of hypospadias are in coronal and sub-coronal areas in 80% of patients [3].

For function and cosmetic purposes, the surgical repair is needed [4]. Myriad of surgical repair techniques are in practice to correct anomaly of hypospadias. But the two techniques are widely practiced;

one is perimeatal-based flap (termed as Mathieu) and other is Tubularized Incised Plate (TIP) urethroplasty [5]. The main demerits of Mathieu procedure that it creates horizontal, rounded shape meatus, which is less appealing than the slit-shape meatus, created with tubularized incised plate urethroplasty. For last twenty years, the popularity of Mathieu procedure is decreasing than TIP and can be attributed to simplicity and the good slit-shape meatus created with tubularized incised plate urethroplasty [6]. But on the other hand, TIP urethroplasty is associated with 33% incidence of urethral-cutaneous fistula and also stenosis of meatus requiring dilatation on regular basis. Urethral-cutaneous fistula is more difficult to treat with thin urethral plates and flat glans [7]. So the Mathieu technique is modified by addition of incision to the urethral plate creating hypospadias with

a narrow original meatus and improved cosmesis [8].

A previous study conducted by Khalil et al. [3] comparing the outcome of Mathieu versus TIP technique for primary distal hypospadias on 66 cases in age range of 15 to 60 months. Their results showed that the postoperative fistula was significantly higher in TIP than Mathieu technique statistically significantly ( $P=0.004$ ). Amin sharifi et al. [9] conducted a study on comparing 2 urethroplasty techniques and reported that modified Mathieu procedure had less incidence of meatal stenosis and urethra-cutaneous fistula and better cosmetic outcome. According to them 25%, complication rate was found in TIP group and no in the modified Mathieu procedure group. Another study showed that the incidence of wound dehiscence in Mathieu and TIP procedure was 3.7% and 4.2%, respectively. And the results were not statistically significant [6]. A meta-analysis reported that urethral stricture was less in Mathieu technique (2%) than TIP (5%) and the results were statistically significant ( $P<0.01$ ) [10].

Distal hypospadias is severe congenital anomaly needing repair for functional reasons. However, there is lack of consensus on technique of repair. There is lack of local literature on this subject in our population. The results may vary among populations due to genetic, ethnic and environmental factors. So the aim of this study was to compare the outcomes of two techniques (modified Mathieu and TIP) for repair of distal hypospadias.

## Materials and Methods

This prospective comparative study was conducted on records of 56 cases affected by distal hypospadias presenting to IKD, Hayatabad, Peshawar from February 2015 to June 2020 after obtaining written approval from hospital ethical review committee. The inclusion criteria were patients with distal hypospadias (coronal, sub-coronal, or distal penile), age range of 15 to 60 months and Pakistani nationals. Cases with severe chordee, history of previous hypospadias repair, poorly developed urethral plate were excluded.

The patients with distal hypospadias were divided into two equal groups: in-group I repair was done with modified Mathieu procedure and in-group II repair was performed with TIP. Only two cases were drop out from study one from each group, so the final sample size was 54 (27 cases in each group).

The principal author performed functional and cosmetic assessment at follow up visits which includes; denovo meatus; size and pressure of the stream; and complications like meatal stenosis, urethral cutaneous fistula, and neourethral disruption.

### Details of modified Mathieu technique

Using the general anesthesia traction suture of 5-0 vicryl was placed on dorsal surface of glans. Measurement was done between hypospadias and glans tip. Catheter was used as a tourniquet. An incision of U-shaped was made for measured distance. The base of the flap was wider than tip. On lateral sides, 2 incisions were given to urethral plate and were made deep in the glanular portion to create the glanular wings. An incision in midline was performed from within the new meatus to glans tip and little beyond the premeatal site. Completion of urethroplasty was done through suturing of the perimeatal-based skin flap with the urethral plate ends over proper size urethral catheter with vicryl suture (6-0) in a sub cuticular way

to the glans tips. The two suture lines were covered with harvested dartos flap. Symmetrical closure was done of glanular wings over new urethra with vicryl (6-0) in 2 layers. Penile skin was used to cover the shaft of the penis. A dressing containing gentamicin was applied and injectable cephalosporin was advised for seven days. After one week catheter was removed. Follow up done on weekly basis for 3 to 6 months.

### Details of TIP technique

A dermal incision of circular fashion was given 2mm inferior to hypospadias meatus, degloving of penis, the parallel to plate incision was made from within the hypospadias meatus and extension was made to the mid-glans. Tabularization of the urethral plate was initiated proximally, and closure was done in double layers with vicryl (6-0). New meatus was created on catheter having 2F bigger than urethral stent. The neourethra was covered by flap harvested from the prepuce and lastly glanuloplasty was done. A urethral stent was placed upto 10 days along with compressive dressing.

Statistical analysis was done in SPSS version 22. Frequencies and percentages were calculated for qualitative variables while mean and SD was computed for continuous variables. Fisher Exact test was used to compare categorical variables between the two groups and student t test for continuous variables.  $P \leq 0.05$  was the level of significance for all analysis.

## Results

The mean age of the study was  $38.13 \pm 12.55$  months with range from 13 to 60 months. The operating time was less in TIP ( $92.92 \pm 6.522$  minutes) than modified Mathieu procedure ( $96.18 \pm 8.048$  minutes) and the results were statistically significant ( $P=0.036$ , 95% CI=0.315, 9.02). The age between the two groups was not different statistically ( $P=0.991$ ) (Table 1).

In modified Mathieu procedure the sprayed stream of micturition was higher ( $n=4$ , 14.8%) and one case had narrow stream ( $n=1$ , 3.7%). While in TIP procedure the frequency of narrow stream was higher ( $n=4$ , 14.8%). The difference was statistically significant ( $P=0.054$ ). Only in modified Mathieu procedure the meatus shape was round in 4 (14.8%) cases and the results were statistically different ( $P=0.038$ ). Post-operative fistula was higher TIP ( $n=6$ , 22.2%) than Mathieu ( $n=1$ , 3.7%) statistically ( $P=0.043$ ). Only in TIP procedure postoperative meatal stenosis was found in 5 (18.5%) and the difference was statistically significant ( $P=0.019$ ) (Table 2).

## Discussion

In our study, we made comparison of two techniques in the repair of distal hypospadias; the first technique was the original TIP urethroplasty and the second was modified Mathieu technique (with an incision in the urethral plate). Our main finding were that the operating time was less in TIP than modified Mathieu procedure, sprayed stream of micturition was higher in modified Mathieu procedure while in TIP procedure the narrow stream was higher, only in Mathieu procedure the meatus shape was round in 4 (14.8%) cases, post-operative fistula was higher TIP than modified Mathieu, and only in TIP procedure postoperative meatal stenosis was found in 5 (18.5%).

Hypospadias is sort of congenital anomaly of male external genital

**Table 1:** Comparison of operating time and age between modified Mathieu and tubularised incised-plate urethroplasty.

Group		Mean ± SD	P-value*	95% CI
Operating time (Minutes)	Modified Mathieu (n=27)	96.18 ± 8.048	0.036	0.315, 9.02
	TIP (n=27)	92.92 ± 6.522		
Age (Months)	Modified Mathieu (n=27)	38.11 ± 12.807	0.991	-6.957, 6.88
	TIP (n=27)	38.15 ± 12.53		

\*Student t test; TIP: Tubularised Incised-Plate Urethroplasty.

**Table 2:** Comparison of Stream of micturation, morphology of new meatus, Postoperative fistula, and postoperative meatal stenosis between modified Mathieu and TIP procedure.

		Mathieu-IP		TIP		P-value*
		N	%	N	%	
Stream of Micturition	Single Normal Stream	22	81.5	23	85.2	0.054
	Sprayed Stream	4	14.8	0	0	
	Narrow Stream	1	3.7	4	14.8	
Morphology of New Meatus	Slit-Like	23	85.2	27	100	0.038
	Rounded	4	14.8	0	0	
Postoperative Fistula	No	26	96.3	21	77.8	0.043
	Present	1	3.7	6	22.2	
Postoperative Meatal Stenosis	No	27	100	22	81.5	0.019
	Present	0	0	5	18.5	

\*Fisher Exact test.

organ. Many techniques have been documented in literature for its surgical correction [11]. The Mathieu procedure was introduced in 1932 for repair of distal hypospadias and remained popular due to its less complication rate (<4%) in most case series but its application was limited in repair of mid-shaft hypospadias [11,12]. TIP urethroplasty was introduced by Snodgrass in 1994 and remained popular among surgeon for distal and proximal hypospadias. The disadvantages associated with it are urethrocutaneous fistula, meatal stenosis, and regular need for urethral dilatation [13].

Our study showed that there was no statistical difference in the ages of both group showing the comparability of baseline characters of the current study. In our study, the operating time was less in TIP than modified Mathieu procedure. Similar results were found in previous study [3]. Similarly, another conducted on 100 cases on the comparison of these two techniques has also reported similar findings [14].

Our findings showed that in modified Mathieu procedure the sprayed stream of micturition was higher (14.8%) while in TIP procedure narrow stream was higher (14.8%) statistically (P=0.054). Khalil et al. [3] reported that the frequency of sprayed stream of micturition was higher in modified Mathieu procedure (5.9%) while in TIP procedure, narrow stream was higher (15.6%) and the results were statistically significant. These results are similar to our findings. Similarly, another previous study reported the main disadvantage associated Mathieu procedure is round shape of meatus, which is less appealing [15].

Our study showed that only in modified Mathieu procedure the meatus shape was round in 4 (14.8%) cases a while none was found in TIP technique (P=0.038). Khalil et al. [3] study reported the incidence of 11.8% round shape only in modified Mathieu and no such complication was found in TIP technique. These findings are

also in consistent with our findings.

Our investigations found that post-operative fistula was higher in TIP technique (22.2%) than modified Mathieu (3.7%) statistically (P=0.043). Khalil et al. [3] reported the frequency of post-operative fistula in TIP to be 2.9% and in modified Mathieu was 18.7%. These findings are also similar to our study. However, a study conducted by Aminsharifi et al. [9] reported less frequency of fistula (2.9%) formation in Mathieu technique. The difference can be due to different selection criteria, as they did not include distal penile hypospadias. The surgeon experience and case complexity can be other factors responsible for difference.

Our findings showed that only in TIP procedure postoperative meatal stenosis was found in 18.5% and the results was statistically significant (P=0.019). Similar findings were reported by Khalil et al. [3] Similarly Aminsharifi et al. [9] also reported reduced rates of meatal stenosis in modified Mathieu.

## Conclusion

The modified Mathieu technique can improve the cosmetic outcome through creation of slit-like meatus, low incidence of fistula and meatal stenosis than tubularized incised plate urethroplasty in the repair of distal hypospadias.

## References

- Bhandarkar K, Garriboli M. Repair of distal hypospadias: cosmetic or reconstructive? *Urol*. 2019; 7: 89-95.
- McDougal WS, Wein AJ, Kavoussi LR, Partin AW, Peters CA. *Campbell-Walsh Urology 11<sup>th</sup> Edition Review E-Book*: Elsevier Health Sciences. 2015.
- Khalil M, Gharib T, El-shaer W, Sebaey A, Elmohamady B, Elgamel K. Mathieu technique with incision of the urethral plate versus standard tubularized incised-plate urethroplasty in primary repair of distal hypospadias: A prospective randomised study. *Arab J Urol*. 2017; 15: 242-247.

4. Long CJ, Chu DI, Tenney RW, Morris AR, Weiss DA, Shukla AR, et al. Intermediate-term follow-up of proximal hypospadias repair reveals high complication rate. *J Urol.* 2017; 197: 852-858.
5. Elbakry A, Hegazy M, Matar A, Zakaria A. Tabularized incised-plate versus tabularization of an intact and laterally augmented plate for hypospadias repair: A prospective randomised study. *Arab J Urol.* 2016; 14: 163-170.
6. Zhang Y, Shen Z, Zhou X, Chi Z, Hong X, Huang Y, et al. Comparison of meatal-based flap (Mathieu) and Tubularized Incised-Plate (TIP) urethroplasties for primary distal hypospadias: A systematic review and meta-analysis. *J Pediatr Surg.* 2020; 55: 2718-2727.
7. Wang F, Xu Y, Zhong H. Systematic review and meta-analysis of studies comparing the perimeatal-based flap and tabularized incised-plate techniques for primary hypospadias repair. *Pediatr Surg Int.* 2013; 29: 811-821.
8. Snodgrass WT, Bush N, Cost N. Tabularized incised plate hypospadias repair for distal hypospadias. *J Pediatr Urol.* 2010; 6: 408-413.
9. Aminsharifi A, Taddayun A, Assadolahpoor A, Khezri A. Combined use of Mathieu procedure with plate incision for hypospadias repair: a randomized clinical trial. *Urol.* 2008; 72: 305-308.
10. Winberg H, Arnbjörnsson E, Anderberg M, Stenström P. Postoperative outcomes in distal hypospadias: a meta-analysis of the Mathieu and tubularized incised plate repair methods for development of urethrocutaneous fistula and urethral stricture. *Pediatr Surg Int.* 2019; 35: 1301-1308.
11. Elbakry A. Further experience with the tabularized-incised urethral plate technique for hypospadias repair. *BJU Int.* 2002; 89: 291-294.
12. Hayashi Y, Sasaki S, Kojima Y, Maruyama T, Tozawa K, Mizuno K, et al. Primary and salvage urethroplasty using Mathieu meatal-based flip-flap technique for distal hypospadias. *Int J Urol.* 2001; 8: 10-16.
13. Holland A, Smith G. Effect of the depth and width of the urethral plate on tubularized incised plate urethroplasty. *J Urol.* 2000; 164: 489-491.
14. Hamid R, Baba AA, Shera AH. Comparative study of Snodgrass and Mathieu's procedure for primary hypospadias repair. *Int Schol Res Notic.* 2014; 2014: 1-6.
15. Yesildag E, Tekant G, Sarimurat N, Buyukunal SC. Do patch procedures prevent complications of the Mathieu technique? *J Urol.* 2004; 171: 2623-2625.