

Comparative Study between the Meatal-Based Flap “Mathieu” Technique and Tubularized Incised Plate “Snodgrass” Urethroplasty in Treatment of Distal Hypospadias

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ABSTRACT

Background: Hypospadias is unique among the common congenital anomalies in having different techniques for the correction of a single condition.

In 1928, Mathieu described a surgical technique to repair distal penile or anterior hypospadias in a single operation. Since then, and due to the successful results achieved, the technique has been popularized by many authors. Tubularized incised plate “Snodgrass” urethroplasty (TIP), was first described in 1994 by Snodgrass. Following that report, clinical experiences from many institutions had shown that the technique is applicable to essentially all cases of distal hypospadias, without concern for the specific meatal configurations.

The Aim of this Work: Is to compare between the meatal-based flap “Mathieu” technique and Tubularized Incised Plate (TIP) “Snodgrass” urethroplasty in treatment of distal hypospadias regarding success rates, types and incidence of complications and advantages of each technique.

Patients and Methods: Forty two patients with distal hypospadias were studied in the Department of Pediatric Surgery, Cairo University. Patients were blindly assigned into two random groups. For 21 patients (group I) meatal-based flap “Mathieu” technique was used and for the other 21 patients (group II) tubularized incised plate (TIP) technique was done.

Results: The mean duration of surgery was shorter for the “Snodgrass” procedure than for the Mathieu repair. With range of 6-27 months follow-up, the total number of complications of Mathieu and Snodgrass repair were 5 (23.8%) and 4 (19.0%), the fistula formation rates were 14.3% and 9.5%, the metal stricture formation rates were 4.76% and 4.76%, and the complete disruption rates were 4.76% and 4.76%, respectively.

Secondary surgery was required in 19.0% of cases of the first group and in 14.3% of cases of the second group.

There was no difference between both groups regarding mean hospital stay and time of stent withdrawal.

Conclusion: Both Mathieu and TIP repair proved to be effective and reliable methods for reconstructing a neourethra in cases of distal hypospadias. In this study, TIP gave less

incidence of complications and less incidence of secondary surgery than Mathieu technique. Cosmetic appearance of the external meatus was highly satisfactory with TIP urethroplasty.

INTRODUCTION

The incidence of hypospadias has been calculated to be 3.2 in 1000 live male births, or approximately 1 in every 300 male.

Anterior hypospadias constitutes 71%, middle 16%, and posterior 13% [1]. Hypospadias is unique among the common congenital anomalies in having different techniques for the correction of a single condition [2].

In 1928, Mathieu described a surgical technique to repair distal penile or anterior hypospadias in a single operation. The results of this technique were first reported in 1932 [3]. Since then, and due to the successful results achieved, the technique has been popularized by Kim & Hendren [4], Gonzales et al. [5], Belman [6,7] and Rabinowitz & Hulbert [8].

In the 21st century, the single stage flip-flap procedure of Horton and Devine and the meatal-based flap technique of Mathieu seem to be the most popular “local-flap techniques” for distal types of hypospadias without chordee or with minimal chordee [9].

Tubularized Incised Plate “Snodgrass” urethroplasty (TIP), first described in 1994 by Snodgrass [10]. Following that report, clinical experience from many institutions has shown that the technique is applicable to essentially all cases of distal hypospadias, without concern for the specific meatal configurations [11].

The aim of this work is to compare between the meatal-based flap “Mathieu” technique and

Tubularized Incised Plate (TIP) "Snodgrass" urethroplasty in treatment of distal hypospadias regarding operative time, postoperative follow up, success rates, functional and cosmetic results, types and incidence of complications and advantages of each technique.

PATIENTS AND METHODS

Forty two patients with distal penile hypospadias were studied in the Department of Pediatric Surgery, Cairo University. Patients were blindly assigned into two random groups. For 21 patients (group I) meatal-based flap "Mathieu" technique was used and for the other 21 patients (group II) tubularized incised plate (TIP) technique was done.

For each patient general examination was done for associated anomalies. Local examination was done for skin quantity, external urethral meatus and presence of chordee. Investigations were done including bleeding and coagulation times, complete blood count, liver and kidney functions and urine analysis with culture and sensitivity.

Intraoperative artificial erection test revealed straightening of the organ in all patients to exclude cases with chordee. The suture material used in urethroplasty was polyglactin 6-0. For all patients: no diversion was done and urethral stent was left for one week postoperatively. Concealing dressing was used for three days. Then exposure of the wound and soaking it with povidon iodine was done for all patients.

Mean period of follow up was 13 months with a range of 6 months to 27 months. All patients were assessed for current voiding status, cosmesis, complications and any additional procedures required to correct those complications.

Meatal based flap was done as described by Rabinowitz and Hulbert [8]. The technique used is shown in Figs. (1,2).

Tubularized incised plate "Snodgrass" urethroplasty was done as described by Snodgrass [10]. The technique used is shown in Figs. (3,4).

RESULTS

This study has been conducted in the department of Pediatric Surgery, Cairo University Children Hospital.

The study subjects included 42 cases of distal hypospadias. Patients were blindly assigned into two random groups. For 21 patients (Group I),

Mathieu technique was done and for the other 21 patients (Group II), TIP technique was used. Age of patients at operation is shown in Table (1) and Fig. (5).

Classification of patients according to type of hypospadias is shown in Table (2) and Fig. (6).

Mean operative time was 1 hour and 15 minutes in group I and 1 hour and 5 minutes in group II.

Distribution of postoperative complications among the studied cases, in both groups is shown in Table (3).

Concerning group I, 3 patients had postoperative fistulas (14.3%), one patient had complete disruption (4.76%) and one patient had postoperative meatal stenosis (4.76%), which was responded to simple dilatation by parents. Five patients suffered from postoperative complications (23.8% of this group). Four patients were scheduled for secondary repairs, constituting percentage of 19.0% of this group.

Concerning group II, 2 patients had postoperative fistulas (9.5%), one patient had complete disruption (4.76%) and one patient had postoperative meatal stenosis (4.76%), which was also responded to simple dilatation by parents. Four patients suffered from postoperative complications (19.0% of this group). Three patients were scheduled for secondary repairs, constituting percentage of 14.3% of this group.

Regarding the shape of external urethral meatus in group I, it was rounded in 11 patients, vertically positioned in 5 patients and horizontal (fish mouth or bucket handle meatus) in 4 patients. One patient had complete disruption and one patient had meatal stenosis. In group II, external urethral meatus was vertically positioned in 15 patients and rounded in 4 patients. One patient had complete disruption and one patient had meatal stenosis.

DISCUSSION

Hypospadias is one of the most challenging problems in surgery. The past two decades have ushered in an era of new operations and variations of older ones, which, when coupled with technical advancements and improvements in management, have redefined the aims of the surgeon, who now strives to create a normal penis with a minimum complications [1].

Since 1928, when Mathieu described his technique, many surgeons reported their experience with this technique [4-8,12-18].

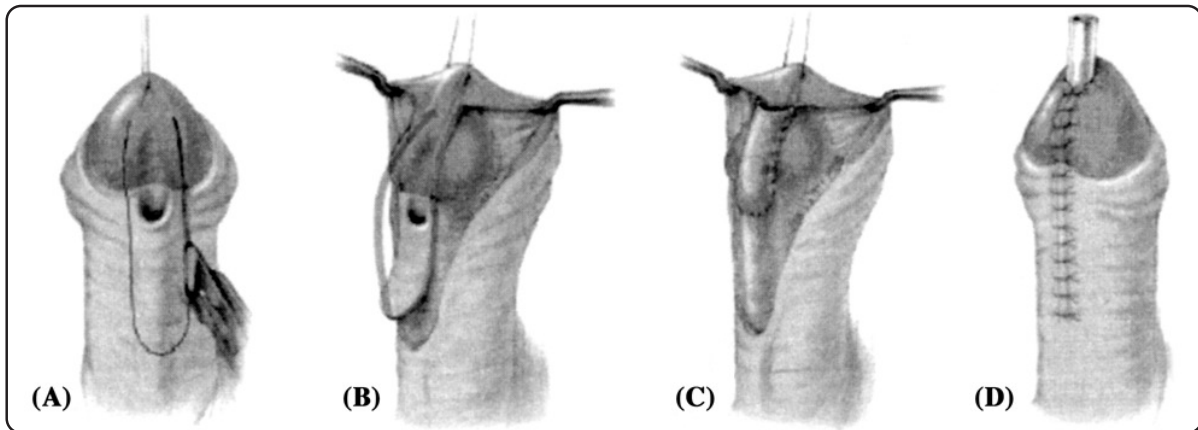


Fig. (1): A: Meatal based skin flap is incised. B: The flap is elevated. C: Lateral glans flaps are elevated, the meatal based flap is flipped distally and urethroplasty is performed with continuous subcuticular 6-0 polyglactin. D: Lateral glans flaps reapproximated in midline with interrupted sutures. Redundant dorsal hood is used for skin coverage. Quoted from: "Hypospadias" in: *Pediatric Urology*, pp 713-728, 2001 [1].

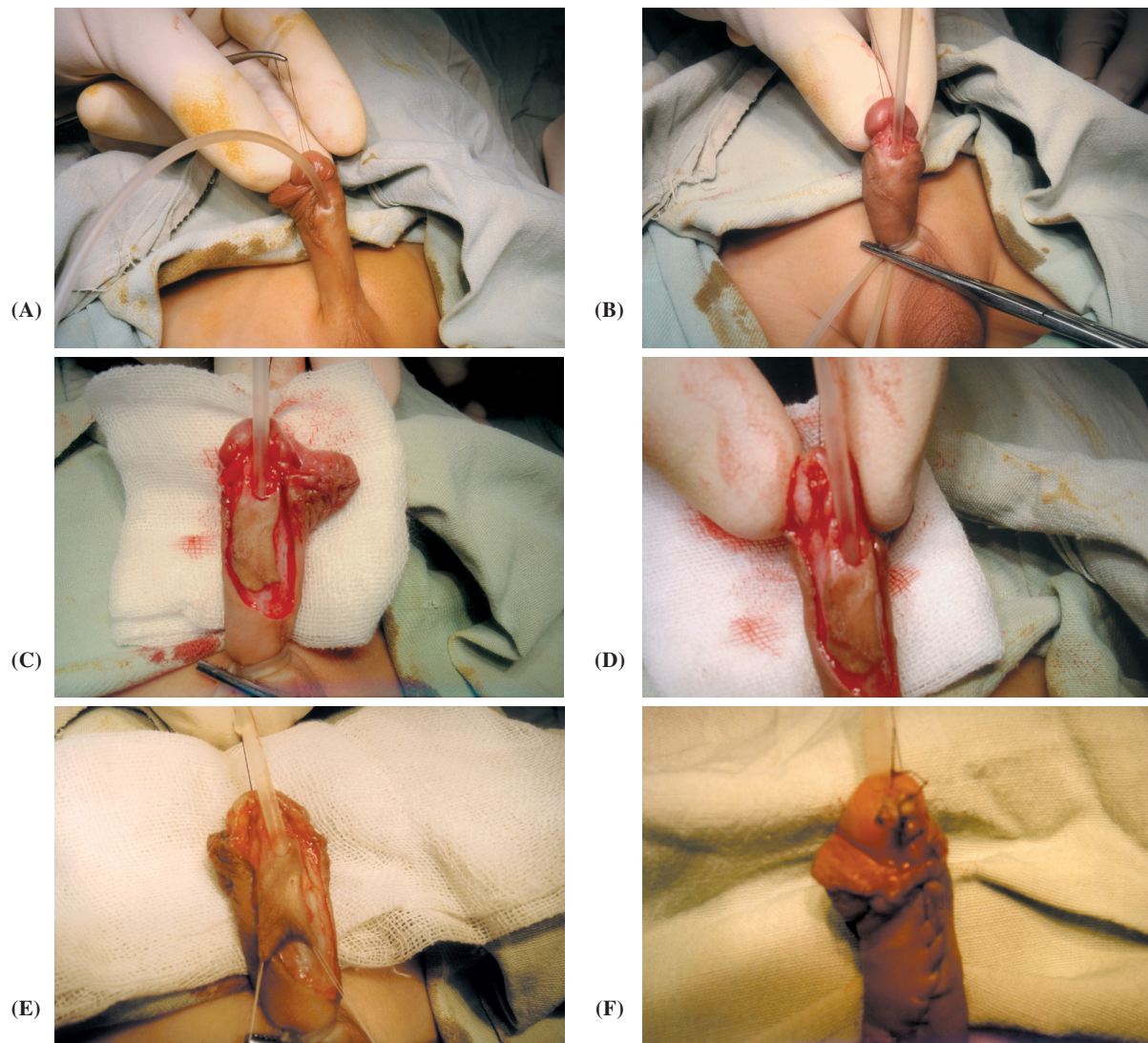


Fig. (2): Intraoperative photos for one case of the study (group I) A: Anterior penile hypospadias. B: Tourniquet is applied. C: Meatal based skin flap is incised. D: Parallel balanic incisions are made. E: The flap is elevated. F: Lateral glans flaps reapproximated in midline with interrupted sutures. Skin is closed.

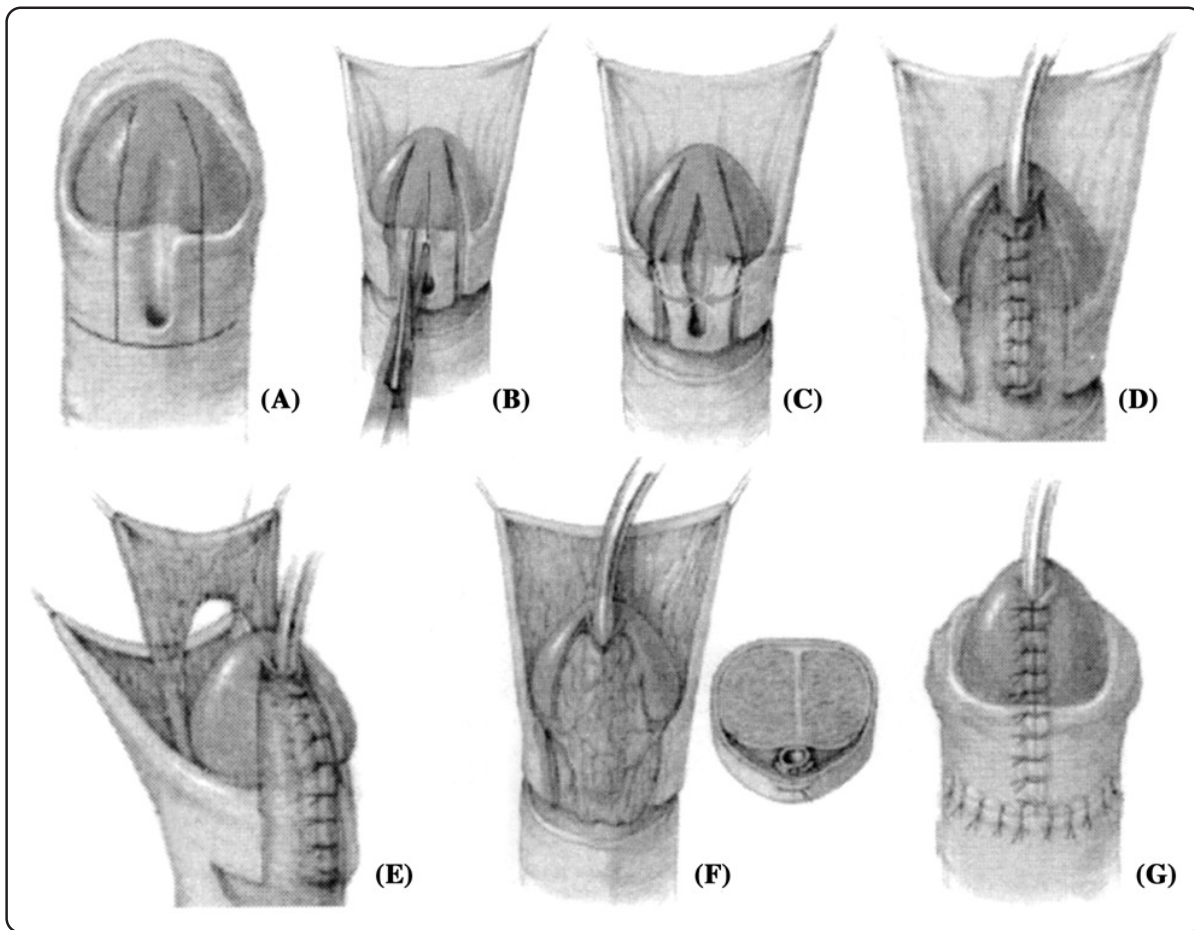


Fig. (3): TIP for hypospadias repair. A: Vertical lines indicate incisions along the lateral margins of the urethral plate. B: Glandular wings have been mobilized. C: Relaxing incision widens the urethral plate. D: Urethral plate is tubularized with running subepithelial absorbable suture (note the large oval neomeatus). E: A preputial flap obtained from dorsal prepuce is transposed ventrally to cover the entire neourethra. F: Approximation of the glans wings. G: Skin closure is completed. Quoted from: “Hypospadias” in: *Pediatric urology*, pp 713-728, 2001 [1].



(A)



(B)

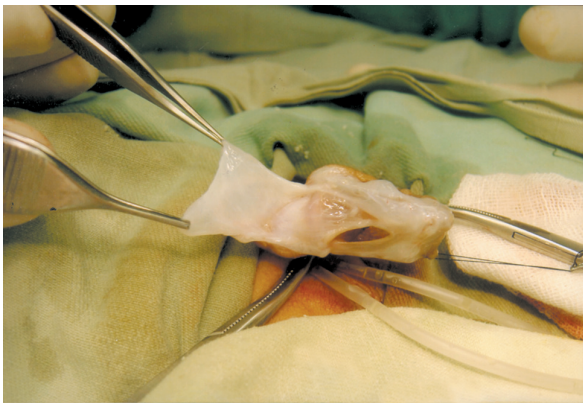
Fig. (4): Intraoperative Photos for one case of the study (group II). A: Postcrotal hypospadias. B: Incisions along the lateral margins of the urethral plate.



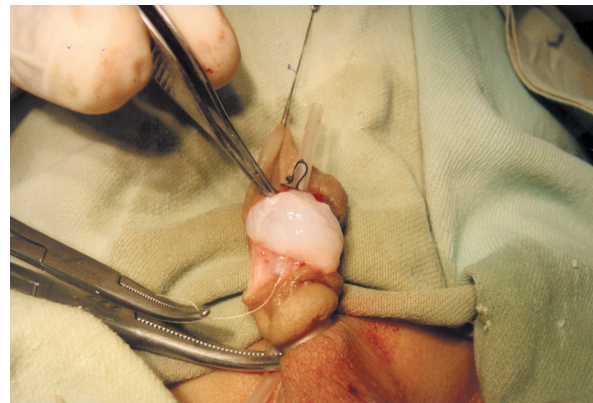
(C)



(D)



(E)



(F)



(G)



(H)

Fig. (4): C & D: Urethral plate is tubularized with running subepithelial absorbable suture. E & F: A dartos pedicled flap obtained from dorsal prepuce is transposed ventrally to cover the entire neourethra. G: Approximation of the glanular wings. H: Skin closure is completed.

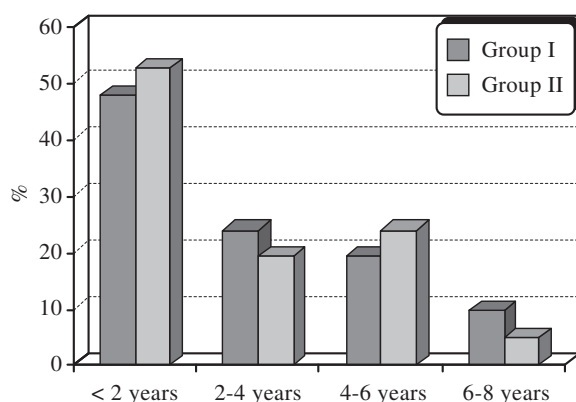


Fig. (5): Age distribution at operation.

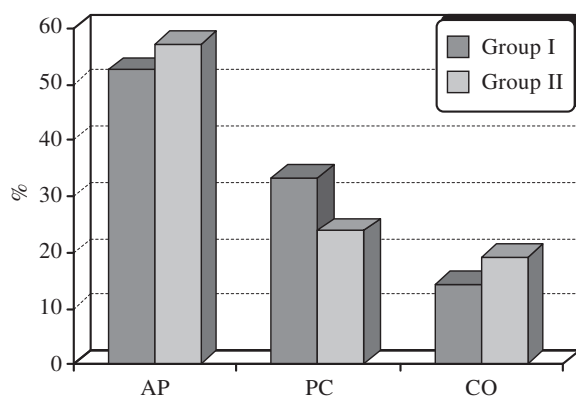


Fig. (6): Type of hypospadias.

Table (1): Age at operation.

Age	Group I		Group II	
	No.	%	No.	%
< 2 years	10	47.6	11	52.4
2-4 years	5	23.8	4	19.1
4-6 years	4	19.1	5	23.8
6-8 years	2	9.5	1	4.7
Total	21	100.0	21	100.0

Table (2): Type of hypospadias.

	Group I		Group II	
	No.	%	No.	%
Anterior penile (AP)	11	52.4	12	57.1
Postcranal (PC)	7	33.3	5	23.8
Cronal (CO)	3	14.3	4	19.1
Total	21	100.0	21	100.0

Table (3): Postoperative complications.

Type of complication	AP		PC		CO		Total			
	I	II	I	II	I	II	I		II	
							No.	%	No.	%
Fistula	2	1	–	1	1	–	3	14.3	2	9.5
Meatal stenosis	–	–	1	1	–	–	1	4.76	1	4.76
Proximal stricture	–	–	–	–	–	–	–	0	–	0
Complete disruption	–	1	1	–	–	–	1	4.76	1	4.76
Total	2	2	2	2	1	–	5	23.8	4	19.0

In Mathieu Repair, Several Technical Points are to be Considered:

- The width of the proximal flap has to be larger (2.5-3mm) than the width of the glanular flap.
- A fine scissor is used to get the maximum amount of vascularised subcutaneous tissue, which is attached to the proximal flap. This is one of the important tricks of this procedure.
- In order to make a bloodless dissection and to obtain vascularised and mobilized glanular wings, this dissection should be done at the tissue plane of the corpus spongiosum.
- Each lateral border is anastomosed with 6-0 or 7-0 vicryl or PDS subcuticular running sutures, which has the advantage of inverting the edges, thus reducing the risk of fistula formation.
- At this point, it is advised to add a protective layer to prevent fistula formation.

Today, many surgeons prefer to use subcutaneous tissue which is attached to the flip-flap to cover the neourethra in the Mathieu technique [6,12,16,17]. If there is no enough tissue attached to the flap, wrapping the neourethra with the vascularised dartos tissue from the inner surface of the preputial foreskin can prevent fistula formation.

In this study, subcutaneous tissue was used to cover the neourethra in all cases of Mathieu repair.

Tubularized Incised Plate “Snodgrass” Urethroplasty (TIP), first described in 1994 by Snodgrass [10]. This technique is based on the fact that, incision of the glanular aspect of the urethral plate always widens it sufficiently for tubularization without supplemental skin flaps. Accordingly, TIP can be routinely performed for distal hypospadias regardless of the specific location or appearance of the meatus [19]. This was observed in this study as tubularization was achieved in all cases after

incision of the urethral plate. A dartos pedicled flap obtained from dorsal prepuce is transposed ventrally to cover the entire neourethra in all cases of TIP repair. This is an essential step in TIP urethroplasty.

Snodgrass (TIP) urethroplasty results in a functional urethra. Calibration of the neourethra consistently shows it to be at least 10-12 F, regardless of urethral plate width before incision [19].

Borer et al., have found TIP urethroplasty applicable to essentially all cases of distal hypospadias [20].

Urinary diversion after hypospadias repair is a point of controversy. Gough et al., did not recommend catheterless technique due to the incidence of immediate dysuria and an apparent increase in late complications [13]. Hakim et al., recorded complications rate with no significant statistical difference between catheterized and non catheterized patients [14]. In this study: no diversion was done for all patients and urethral stent was left for one week postoperatively.

Unfortunately, the ideal dressing for hypospadias repair remains elusive, to judge by the many varieties of dressing currently in use. In this study: concealing dressing was used for three days. Then exposure of the wound and soaking it with povidon iodine was done for all patients.

The mean duration of surgery was shorter for the Snodgrass procedure than for the Mathieu repair. With range of 6-13 months follow-up, the total number of complications of Mathieu and Snodgrass repair were 5 (23.8%) and 4 (19.0%), the fistula formation rates 14.3% and 9.5%, the metal stricture formation rates 4.76% and 4.76% and the complete disruption rates 4.76% and 4.76%, respectively.

Incidence of complications in this study is comparable to those reported by other investigators [21,22]. Secondary surgery was required in 19.0% of cases of the first group and in 14.3% of cases of the second groups.

There was no difference between both groups regarding mean hospital stay and time of stent withdrawal.

Hair-bearing urethra may be the most distressing complication of the Mathieu operation. Longer flaps are not only at risk for devascularisation with complications of distal stenosis and stricture but also may incorporate hair-bearing skin.

In this study, cosmetic appearance of the external meatus was highly satisfactory in the Snodgrass group.

“Half-moon” or “bucket-handle” meatus is not a real complication but an important and distressing aesthetic problem in Mathieu operation [18].

Snodgrass (TIP) urethroplasty repair creates a vertically oriented, slit neomeatus that closely resembles the normal urethral meatus. This outcome does not depend upon the preoperative anatomy of the hypospadiac meatus or upon its location [23].

Conclusion:

Both Mathieu and TIP repair proved to be effective and reliable methods for reconstructing a neourethra in cases of distal hypospadias.

In this study, TIP (Snodgrass urethroplasty) gave less incidence of complications and less incidence of secondary surgery than Mathieu technique.

Cosmetic appearance of the external meatus was highly satisfactory in group II (Snodgrass urethroplasty).

Clearly the most important elements for successful hypospadias outcome are delicate tissue handling, familiarity with mobilizing flaps and compulsive attention to detailed characteristics of plastic surgical principles.

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