

Original Article

Is the Snodgrass technique suitable for different types of hypospadias? Single-center experience

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Cite as: Afzal M, Ansari GA, Tabash A, Alghnnam RH, Ahmed AM, Alkhazal AS. Is the Snodgrass technique suitable for different types of hypospadias? Single-center experience. J Pediatr Adolesc Surg. 2024; 2: 69-73.

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ABSTRACT

Background: Hypospadias is a congenital penile defect and Tubularized Incised Plate (TIP) urethroplasty is a widely accepted option to repair this defect. Our experience about the outcome of hypospadias repair by this technique is discussed.

Methods: This is a retrospective analytical study consisting of 80 cases, conducted between May 2017 to December 2019 at the Department of Pediatric Surgery, Maternity, and Children's Hospital Dammam. All the cases with anterior, middle, and posterior hypospadias, who underwent Snodgrass TIP urethroplasty, were included in the study. The same surgeon performed all the operations. The follow-up period lasted for 2 years, after surgery and the final outcome of the procedure was recorded, based on the observations.

Results: The age range of the patients varied between 1 to 9 years. Anterior hypospadias constituted 64 (80%) cases followed by middle hypospadias 13 (16.25%), and posterior hypospadias 3 (3.75%). By type, glanular hypospadias was the most common 30 (37.5%), followed by sub-coronal 19 (23.75%), coronal 15 (18.75%), mid-penile 11 (13.75%), proximal penile 2 (2.5%) and penoscrotal hypospadias 2(2.5%). Scrotal hypospadias was the least common type, 1 (1.25%). Overall complications that required re-intervention occurred in 16 (20%) cases. Urethrocutaneous fistula (UCF) which occurred in 7 (8.75) cases was the most common complication, followed by meatal stenosis in 4 (5%) and glans dehiscence and urethral stricture 2 in each (2.5% each). Total repair disruption was the least common complication that was noticed in 1 (1.25%) case. Functional and cosmetic results were judged as satisfactory.

Conclusion: For hypospadias repair, TIP urethroplasty is the procedure of choice for anterior hypospadias with excellent results. It is also quite suitable with middle hypospadias and acceptable for posterior hypospadias for selected cases. The overall complication rate is low and also offers very good functional and cosmetic results.

Keywords: Hypospadias, Snodgrass urethroplasty, TIP urethroplasty, Complications.

INTRODUCTION

Hypospadias a congenital anomaly of the urethra characterized by a meatal opening sited proximal to its normal site develops as the urethral plate could not tubularize completely.[1,2] Other features include: ventrally deficient skin; dorsal hooded skin; and penile curvature.[3] The incidence is 1 in 200-300 live births.[4] An abnormal penis causes emotional trauma to the family as to the potency and fertility concerns.

A functional penis with a normal cosmetic appearance is the goal of treatment.[1] Over 300 surgical procedures

have been used and others are still evolving, but the complications are still as many as 50% including urethrocutaneous fistula, glans dehiscence, meatal stenosis, urethral stricture, urethral diverticulum, and cosmetic problems.[5-7]

In 1994, Snodgrass introduced a simple and promising tubularized incised plate (TIP) urethroplasty which received worldwide acceptance.[6] The procedure can also address re-do and complex hypospadias.[8] This study presents our experience with the TIP urethroplasty to manage various types of hypospadias.

METHODS

A total of 80 boys with different types of virgin hypospadias were enrolled in the study. The Snodgrass urethroplasty technique was used in all cases. The age ranged from 1 to 9 years with a median age of 3.5 years (Table 1). The patients with previous failed surgery, mild glanular hypospadias which required only meatoplasty or meatal advancement, or the cases that had iatrogenic fistula as a complication of circumcision, were excluded from the study.

Table-1 Age distribution

Age	No. of cases	%age
1-2	02	2.50
2-3	23	28.75
3-4	26	32.50
4-5	20	25.00
5-6	05	6.25
6-7	02	2.50
7-8	01	1.25
8-9	01	1.25
Total	80	100

Informed written consent was taken by the parents. The study was reviewed and approved by the hospital ethical committee.

All the patients were seen in the outpatient department where a detailed history and physical examination were carried out and documented. Patients were admitted after routine work up one day before surgery after pre-anesthesia check-up. All patients underwent surgery under general anesthesia and caudal block for postoperative pain. Single-stage repair was performed in all cases, except penoscrotal and scrotal hypospadias, which required staged repair. All operations were performed by the same surgeon. The period of follow-up lasted for 24 months.

Surgical technique

Under possible aseptic technique, 4/0 Prolene stay suture was applied as traction, well away from the proposed site of the meatus. The traction is very important to stabilize the penis, easy handling, and is also helpful to identify and highlight any abnormal curvature. A silicon Foley catheter 6 or 8 Fr (depending on phallus size), was passed into the urinary bladder for postoperative urinary drainage.

A circumferential incision was made, 5 to 7 mm proximal to the coronal sulcus, preserving the urethral plate. Penile degloving was performed down to the penoscrotal junction and in the majority of cases, the associated chordee was corrected by degloving only. Before TIP repair started, the tourniquet was applied for a maximum of 45 minutes. We did not use epinephrine for local infiltration.

Next, a deep U-shaped incision was made with its lateral limbs parallel to the urethral plate border and ventrally incorporating with the previous subcoronal incision, thus creating glanular wings. To get subsequent tension-free glanuloplasty, wings were further mobilized. The urethral plate midline was defined by retracting the lateral edges of the plate, using fine forceps. The plate was made wider by making a deep midline relaxing incision with blade 11, just short of lateral incisions, and incorporating with the hypospadias opening. The urethral plate was tubularized in continuous subcuticular fashion with PDS 6/0 suture over adequate size Silicone Foley catheter. In cases of sub-coronal, middle, and posterior hypospadias, the repair was reinforced by a second layer consisting of periurethral tissue. We did not use dartos fascia to cover the repair.

In the next step glanular wings, mucosal cuff, and penile shaft skin were approximated in the midline starting from proximal to distal, using interrupted 6/0 PDS suture. The meatus was stitched to the glans at 5 and 7 O'clock positions to prevent meatal regression, meatal stenosis and also to improve cosmetic appearance. In all cases except posterior hypospadias, repairs were accomplished by circumcision using catgut 5/0. A mild compressive dressing consisting of sofra tulle and crepe bandage was applied. On the 7th postoperative day, the dressing was removed, followed by daily local application of iodine. After two weeks of surgery, the Foley catheter was removed and on the same day the patient was discharged, when the normal urinary flow was observed from the new urethra. Very initially the repairs were assessed after removal of the dressing and after removal of the catheter by seeing urinary stream.

The patients were kept under follow-up for further evaluation, at one month, 6 months, 12 months, and 24 months. During follow up the patients were evaluated for the urinary stream, meatal site, size, shape, urethra-cutaneous fistula, repair disruption, any residual chordee, or any other complication. The patients with acceptable cosmetic and functional results were discharged.

RESULTS

The most common category was anterior hypospadias populated by 64 boys (80%) followed by mid-penile, in 13 cases (16.25%). The posterior hypospadias was the least common category consisting of 3 patients (3.75%). (Table 2). We had 13 (16.25%) simple complications, consisting of catheter block, penile edema, bleeding, hematoma, and infection, which were treated conservatively. Catheter block was observed in 3 (3.75%) patients that were managed by flushing with 2-3 cc normal saline and in one patient flushing was not successful and the catheter was removed and another Foley catheter of smaller size was inserted, during early postoperative days.

Considerable penile edema was noticed in 4 (5%) patients, which resolved spontaneously. Postoperative bleeding occurred in 3 (3.75%) patients. These patients were successfully managed by redressing. Two (2.5%) patients developed hematoma who did not need evacuation and showed satisfactory response to conservative measures. Penile infection which is a very rare occurrence was observed in one (1.25%) patient, who responded well to I/V cefuroxime and the local application of gentamicin.

Table-2 classification and specific types

Class	Specific type	Total no. (%age)	Total %age
Anterior (n=64)	Glanular Coronal	30 (37.50)	80
	Sub-coronal	15 (18.75) 19 (23.75)	
Middle (n=13)	Mid-penile	11 (13.75)	16.25
	Proximal penile	02 (2.50)	
Posterior (n=3)	Peno-scrotal	02 (2.50)	3.75
	Scrotal	01 (1.25)	
Total	7	80	100

Overall 16 patients (20%) developed different complications (Table 3) who needed re-intervention. Out of 80 cases, 7 patients (8.75%) developed urethrocutaneous fistula, being the most frequent complication, followed by meatal stenosis, which developed in 4 (5%) cases. The glanular dehiscence, urethral stricture, and total repair disruption occurred in 2 (2.50%), 2 (2.50%), and 1 (1.25%) patients respectively. In a few cases, mild residual chordee was observed which was acceptable and needed no further correction.

Table-3. Complications that required re-intervention

Complications	No. of cases	%age
Urethrocutaneous fistula	7	8.75
Metal stenosis	4	5.00
Glans dehiscence	2	2.50
Urethral stricture	2	2.50
Total disruption	1	1.25
Residual chordee	0	0
Flap necrosis	0	0
Penile rotation	0	0
Total	16	20.00

All patients with UCF underwent fistula closure surgery after 6-12 months and all fistulae closed successfully except one patient who showed dribbling of urine from a pinhole fistula after removal of catheter on the day of discharge. The patient was re-catheterized for another two weeks and the fistula closed spontaneously.

Meatotomy was performed in all established meatal stenosis cases. Similarly, one urethral stricture which was almost complete obliteration after sub-coronal urethroplasty underwent successful redo-surgery, while the other post-penoscrotal urethroplasty stricture responded well to serial calibration. The second surgery for glanuloplasty dehiscence and total repair dehiscence was successful in all patients. Table 4 depicts the complications by type and by category.

Table-4 Complications by the type of hypospadias

Type of hypospadias	complications	No. of cases	%age by type	%age by total no.
Glanular (n = 30)	Meatal stenosis	2	10	3.75
	Fistula	1		
Coronal (n = 15)	Meatal stenosis	1	26.66	5
	Glanular dehiscence	1		
	Fistula	2		
Sub-coronal (n = 19)	Meatal stenosis	1	26.31	6.25
	Fistula	2		
	Stricture	1		
	Total wound dehiscence	1		
Mid-penile (n=11)	Glans dehiscence	1	27.27	3.75
	Fistula	2		
Proximal (n= 2)	Nil	0	0	0
Peno-scrotal (n=2)	Stricture	1	50.00	1.25
Scrotal (n = 1)	0	0	00	0
Total (n= 80)		16		20.00

DISCUSSION

Hypospadias can be defined as a congenital defect of the penis which is featured by an abnormally sited urethral opening, on the ventral surface of the penis or till to the perineum. In the first and second centuries AD, Celsius and Galen were the first to describe hypospadias surgery. Since that time, surgery has been undergoing continuous evolution. [8] In 1994, Snodgrass introduced a new technique which is a widely accepted procedure for distal and even for proximal hypospadias. The rationale of the procedure rests on, constructing a new urethra, utilizing the native urethral plate by incising it in the midline to make it wider for tension-free urethroplasty. Moreover, the defect between the incised edges heals by re-epithelialization rather than fibrosis which leads to scar formation.[1] Therefore urethral plate is an ideal tissue for repairing hypospadias, because of its extensive vascular network and muscular support. This procedure has an additional advantage of its simplicity and versatility to correct different variants of hypospadias.[1]

Despite advanced surgical techniques, the emergence of different modifications and refinements, the rate of

complication after urethroplasty remains high, especially UCF which is the chief complication in most of the studies.[6,8,9,10]

In our study, the overall complication rate was 20%, which is quite comparable with other studies from Pakistan (22%) [11] and Turkey (23%).[12] A meta-analysis study of large series has revealed a 33% complication rate,[13] while another study has shown a lower, 7.76% complication rate.[14] The UCF has been shown the most frequent complication of hypospadias repair, in almost all studies. In our study, the overall UCF incidence was noticed in 7 cases (8.7%). There is wide variation in the UCF frequency in different studies, mentioning its overall rate as 12.5%,[10] 17.24%,[6] 12.6%,[13] 26%[15] and 4.14%.[4]

We believe that in our study fistula rate is in line with other studies that have lower rates. Similarly, in the present study fistula rate in anterior, middle, and posterior hypospadias is noted as 7.8%, 5.8%, and 0% respectively. Hypospadias surgery for the posterior category carrying 0% fistula rate is most likely due to a very small number (only 3) of cases.

Many studies have advocated vascularized dartos flap coverage to repair, to decrease the incidence of UCF. [9,10,14] This is an additional procedure that requires skill to dissect the fascia away from the skin, which may subject the skin to necrosis. The chances of vascularity compromise may become more when the dorsal skin is transported ventrally as Byar flaps to resurface the ventral skin deficient area in certain cases and later on accompanied by compressive dressing leading to skin loss and dehiscence, making subsequent surgery more difficult. Penile skin flap necrosis has been reported 6% in one series.[6] Penile torsion has also been documented when dartos flap is transported ventrally around the side of the penis or when flap length is inadequate.[16] We have not used a dartos flap, instead, a periurethral tissue cover was created to blanket the repair in sub-coronal, middle, and posterior hypospadias.

Meatal stenosis stood second in the list of complications, which occurred in 4 (5%) cases and this is comparable

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with other reported incidences of 9.7%,[4] 2.1%[6], and 3%.[17] All the patients were advised on discharge, to apply gentamicin locally and calibrate the meatus with the nozzle of the tube. Although uroflowmetry is ideal to assess the obstructive flow objectively, we relied on the subjective assessment, including forward-directed single good full urinary stream, an inspection of the meatus, and passage of adequate size N/G tube as needed, during follow up visits. The established cases of meatal stenosis underwent meatotomy. Two patients (2.5%) met glans dehiscence and both underwent successful redo TIP repair. Other studies have reported the incidence of the glans dehiscence to be 3.45%, [6] 4.2%[13], and 5% in patients undergoing TIP repair.[18] We encountered two (2.5%) urethral strictures. One stricture that occurred after penoscrotal hypospadias repair, responded satisfactorily to dilatation while the other stricture necessitated redo TIP repair and recovery was successful. In our study, there was no case of flap necrosis, urethral diverticulum, or residual chordee which required correction.

CONCLUSION

This study describes our experience with the Snodgrass technique to repair different types of hypospadias. It is the procedure of choice in anterior hypospadias and also quite suitable for middle hypospadias providing satisfactory functional and cosmetic results. We have limited experience of procedure in posterior hypospadias due to small numbers of cases but still, the results were acceptable

Conflict of Interest: Nil

Source of Support: Nil

Consent to Publication: No clinical figure is being used in this manuscript.

Authors Contribution: Author(s) declared to fulfill authorship criteria as devised by ICMJE and approved the final version. Authorship declaration form, submitted by the author(s), is available with the editorial office.

Acknowledgements: None

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