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Original Article

Snodgrass Procedure (TIP), game changing procedure: A single Surgeon's Experience

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Abstract

Background: Hypospadias is the most common congenital anomaly of male urogenital tract. Different aspects of hypospadias such as its etiology, classification and treatment have been a place of discussion. More than 300 methods have been tried for correction of hypospadias. No single technique has been accepted as gold standard because of diversity of results of different methods and different outcome. The of surgical technique depends on the surgeon's personal experience and training.

Aim: The aim of our study is to see the outcome of Snodgrass procedure in distal hypospadias as well of proximal hypospadias where the urethral plate is adequate and having minimal chordee.

Methods: This is a retrospective study conducted in a single unit of Dept. of Pediatric Surgery DMCH and a private hypospadias center by a single surgeon where total 96 patients out of 152 were operated by Snodgrass (TIP) procedure from July 2022 to September 2023. Data were analyzed and results were compared with other recently published studies.

Results: Out of 96 patients, 7 patients developed single UC fistula among which 3 healed spontaneously and 3 needed repair after 6 months.

5 patients developed meatal stenosis who required regular dilation with the help of the tip of a feeding tube lubricated with 2% jesocaine jelly and low potential steroid ointment.

2 patients developed partial glans disruption and 4 patients lost epidermal layer of skin, all of which healed spontaneously without residual scar.

Conclusion: The TIP or Snodgrass technique is the most popular option for distal hypospadias and proximal hypospadias without severe chordee and having good outcomes.

Keywords: Snodgrass, hypospadias, single surgeon.

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Introduction

Hypospadias is the most common congenital defect of male urogenital system. The incidence is about 1 in 250-300 male live births.[3]

For the last 100 years continuous innovation and understanding of the developmental background of hypospadias has brought so many concepts of urethroplasty in the field of hypospadias surgery.

More than 300 methods have been tried for correction of hypospadias defects. But none of them fulfill the expectation. For the long while Thiers Duplay urethroplasty technique have been practiced.[8] In 1932 after invention of peri meatal base flap procedure known as Mathieu technique became popular and widely practiced all over the world till the introduction of Tabularized incised plate (TIPU) technique in 1994 by W. Snodgrass.[7.9]

Since then, this new concept was hugely accepted and mostly practiced in majority of the center for correction of distal hypospadias. It is easy to apply in

most cases of distal hypospadias with minimum chordee and many of the cases of proximal variety also in some selective cases of redo urethroplasty having intact urethral plate.

No single technique has been accepted as gold standard because of diversity of results of different methods and different outcome.

Which fails to show the conclusive evidence of absolute superiority on one technique over other.

Snodgrass procedure simplifies decision making algorithm where neourethra is formed only by urethral plate with a good functional and cosmetic result.[10]

Comparing with distal hypospadias, proximal hypospadias has a gross anatomical and functional difference with a much higher rate of complication.

Snodgrass procedure can be applied in many cases of proximal hypospadias where the urethral plate is adequate and having minimal chordee.

It has been shown that in many recent literatures there is a great variation of complications (0%-30%).[6]

The aim of our study is to see the outcome, determine the incidence of complications along with the evaluation of the causative factors related to complications.

Materials and Methods:

This is a descriptive retrospective case series, conducted in a single unit of Dept. of Pediatric Surgery DMCH and a private hypospadias center by a single surgeon.

All the hypospadias patients with minimal or no chordee, urethral plate >8mm & glans width >14 mm who underwent urethroplasty by Snodgrass procedure were included in the study.

Per-operative findings suggesting other suitable procedures and lost cases during follow up were excluded in the study.

Total 96 patients out of 152 were operated by Snodgrass (TIP) procedure from July 2022 to September 2023.

These surgical data were evaluated, analyzed and results were compared with other recently published studies.

Operation Technique:

After proper pre-operative evaluation and preparation patients were selected for first case (in OT list). Size of urethral plate before and after giving incision, glans width and penile length- all were measured by slide calipers.

A stay suture was placed on the dorsal aspect of the glans for traction and fixation of stent, other two were placed on lateral wings of preputial skin and another two-stay suture were placed on glans wings for facilitating proper glans apposition and hemostasis.

6Fr-8Fr Romson feeding tube was used as urethral stent.

Hemostasis was maintained by application of torniquet (in many cases), epinephrine-soaked gauze (in all cases) and minimal use of low voltage diathermy.

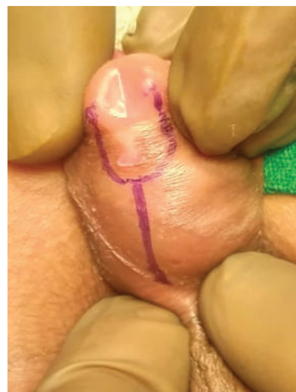
1 ml of lignocaine mixed with adrenalin was infiltrated into the ventral glans for hemostasis and maintaining the spongio-corporal space during glans wings formation.

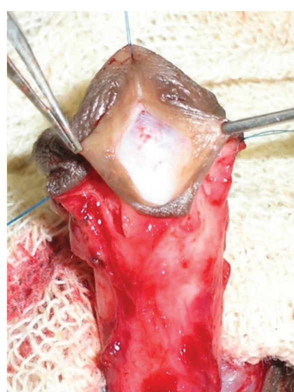
Two longitudinal parallel deep incisions were made along the junction of penile skin and urethral plate and a circumferential sub-coronal incision was made keeping about 1 cm of inner preputial skin collar. Then degloving done by strictly maintaining the subdartos plane.

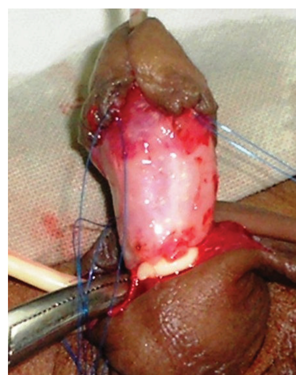
Regarding the assessment of chordae, the patients who has apparently no chordae, we did not do artificial erection test.

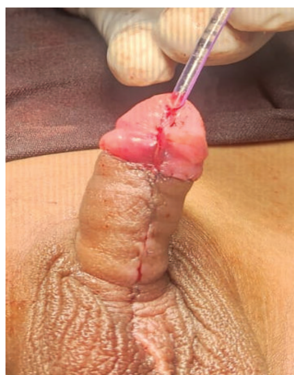
But those clinically having mild to moderate chordee, we routinely performed erection test before and after degloving of penile skin & patients having >20^0 chordee after degloving were corrected by dorsal plication.

A longitudinal relaxing incision was given on the urethral plate which was strictly maintained in the midline, deep enough down to corpora cavernosa with tenotomy scissor/BP blade, started 2-3 mm proximal to the tip of the glans and ends at 3-5 mm beyond the meatus which widens the urethral plate at least two times, which facilitated tension free neourethra formation without the need for additional skin.


Marking for incision


Midline incision on UP


Glans apposition


Final appearance

Tube was made in two layers; first layer was made mostly with 7/0 vicryl and in some cases with 6/0 vicryl in interrupted subcuticular stitches. The second layer was made with the same suture material with continuous suture to bury the first suture line.

In many cases a dartos pedicle flap was applied for 2nd protective layer harvesting from proximal ventral penile shaft or dorsal preputial skin.

Glanular apposition was done in two layers –

Inner spongy layer was opposed with a master stitch by 6/0 vicryl, which was given just above the coronal sulcus at about 2-3 mm depth to the surface epithelium, taking equal amount of spongious tissue from both the wings, which made a conical shaped glans in almost all cases.

Outer epithelial layer was opposed by 7/0 vicryl in continuous or interrupted fashion.

The glans apposition should be done so snugly that it allowed the tip of the mosquito forceps easily.

During Glanuloplasty most distal point should never exceed the midpoint of glans and the glans fusion length should be within 2.5 to 6.5 mm (mean 4.5 mm).

Finally, phalloplasty was done with excision of all redundant preputial skin and dartos tissue in subcuticular suturing with 7/0 or 6/0 vicryl. We made penopubic angle for pronouncing the penile length.

Dressing done with two layers of surgin pad (inner 50mm, outer 60mm size) or with tegaderm.

Urethral stent was connected to a Foley's catheter (size 14Fr/16Fr). Patient was kept in hospital with parenteral antibiotics (ceftriaxone, kacin ± Fluclox) and with adequate pain killer and stool softener.

Patient was discharged on 3rd POD with oral antibiotic, analgesics, purgatives and bladder sedative.

Check dressing done on 5th POD if it was soaked. Otherwise in all patient dressing was removed on 7th POD along with the urethral stent.

Average time of surgery was 110 minutes.

Follow-up schedule:

Total follow-up period was 6 months and scheduled on 2nd week, 6th week and 6 months.

Clinical findings on follow-up were recorded as per pre-designed data sheet.

Normal looking circumcised penis with vertical slit like meatus considered as good cosmesis. Penis with skin blob or skin tethering considered as cosmetically unacceptable.

Results:

Age of the patients:

Age (years)	Number	Percentage (%)
<2	24	25
2-6	44	45.83
6-12	28	29.16

Types of hypospadias (according to the site of meatus):

Type	Number
Coronal/Subcoronal	68
Distal to mid penile	18
Proximal	06
Redo	04

Penile length ranges from 3.5cm to 10.5cm (mean 7cm).

Width of urethral plate ranges from 7 mm to 12 mm and 14mm to 20mm before and after midline incision on urethral plate respectively.

Degree of Chordae:

Total 32 patients having mild to moderate chordae. Only 8 patients needed dorsal plication.

Complications:

In our study total 7 patients developed single UC fistula among which 3 healed spontaneously and 3 needed repair after 6 months.

5 patients developed meatal stenosis who required regular dilation with the help of the tip of a feeding tube lubricated with 2% jesocaine jelly and low potential steroid ointment.

2 patients developed partial glans disruption.

4 patients lost epidermal layer of skin, all of which healed spontaneously without residual scar.

Complication	Number	Percentage	Total
UC fistula	7	9	
M. Stenosis	5	5	16(16.6%)
Glans disruption	2	2	
Loss of Epidermis	4	4	

Discussion:

The aim of hypospadias repair is to make a functionally & cosmetically normal penis that will be able to be straight during erection with adequate single stream during micturition. More than 300 surgical techniques with many modifications have been tried to get optimum results. Still surgical correction remains uncertain and unclear in many aspects.[11]

In our center majority of the cases were distal hypospadias and a few were proximal variety who had minimal chordae with wide urethral plate (UP) were being treated by Snodgrass technique or TIPU.

According to the European society of Urology the ideal time of hypospadias repair is 6 months to 18 months.[26]

In our study the mean age of operation was 5 years. In our country there is a social fear in general population regarding operation that surgery in younger children is associated with higher rate of morbidity and mortality. Thats why most of the guardians are reluctant to come within the mentioned age groups.

The mean age of other studies in this sub-continent like S. Asad et al was around 3 years and that of O. Sarhan et al was 6 years.[1,27]

The mean operation time was 110 minutes a bit higher than other studies[2] because we gave more time for proper phalloplasty. The penile length of our study cases ranges from 3.5 cm to 10.5cm. It is our observation that in smaller penis surgical repair is a bit challenging which is facilitated by the use of magnification but the result is encouraging. We always measure the width of the UP before and after making midline incision on UP. The measurement before incision was ranging from 7mm to 12 mm and after incision it was ranging from 14mm to 20mm. Most of the time by making the incision deep enough up to the corporal tissue the width of UP increased near to double- which facilitated to make neourethra tension free.

In most of the cases neourethra were constructed with 7/0 vicryl cutting body needle in subcuticular inverting interrupted stitches with a 2nd layer burying the stitch line of the first layer with 7/0 or 6/0 vicryl in continuous fashion. There are many studies on single layer vs double layers neourethra formation along with interrupted vs continuous stitching- but overall result is same.

We follow this strategy in cases of relatively thin UP, we usually use continuous suture and in thick UP with more supporting tissue we use interrupted stitching. Theoretically interrupted inverting subcutaneous stitching should have good result and having more surgeon satisfaction.[28]

We use the dartos flap as a water seal protective layer from dorsal preputial dartos or from proximal dartos layer according to its availability and feasibility. But whenever the neourethra construction was satisfactory with good apposition by 2nd stitch layer, we usually did not use the dartos flap and it was observed that there was no increased evidence of fistula formation.

In our study total 7 patients (7.5%) developed UC fistula among which 3 healed spontaneously and remaining 4 needed subsequent surgical corrections.

The overall complication rate of UC fistula in different study group was 7.88%, ranging from 0-14%.[13,15,18,22,23]

Superficial skin infection, perimeatal thin skin, and narrow UP along with the less amount of supporting spongeous tissue of UP are the contributing factors in the development of UC fistula.

In different institutes of our country, the incidence of UC fistula is a bit higher than the western countries.

MS Mahmud et. Al shows the UC fistula rate was 15.09%.

According to online survey in our country the overall incidence of UC fistula was 24.5%.

Another study in Gujrat, India Archana A. shows UC fistula rate was 16%.

Irfan U Khakllak et Al from Ahmedabad, Pakistan showed the incidence of UC fistula was 17%.

Probable causes of increased incidence of UC fistula were lack of surgical experience (10-30 cases/year done by individual surgeon), 85% surgeons are not habituated with magnification, lack of use of fine suture materials and fine instruments & increased incidence of wound infection.

Second most common complication in our study was meatal stenosis, which was about 5% (5 patients out of 96).

In comparison to other series the reported rates of meatal stenosis was ranging from 2%-12%. A large meta-analysis showed that there is geographical variation of meatal stenosis. It showed 1.8% in North America, 3.4% in Europe and 8.2% in the rest of the world. [24, 25, 26]

In our study population the first stitch was applied at a point 2-3mm proximal to the lower limit of the 'V' marking and the midline incision over the UP did not reach the tip of the glans. We tried to maintain the length of glans fusion ranges from 2.5mm to 6.5mm (mean 4.5mm). Probably these factors had contributed to the less incidence of meatal stenosis.

Out of 96 patients, 2 patients developed glans dehiscence among which 1 was corrected surgically.

4 patients developed epidermal skin loss which was healed spontaneously.

No stricture or complete disruption of neourethra and gross skin necrosis were found in our series.

During the follow up many of our patients did not come at 3 months and 6 months follow up schedule. In these cases we collected the data over telephone and videos of urinary flow via what's app.

Patients who developed UC fistula were advised to urinate occluding the fistula opening with the fingertip along with meatal dilation impregnated with lubricant and low potential steroid ointment which helped to heal the fistula spontaneously.

We used surgin pads as pressure (moderate) dressing in two layers (inner 50 & outer 60) which gave good post operative hemostasis & reduced the edema. This gave a good dressing accepted by the guardians.

Conclusion:

The TIP or Snodgrass technique is a widely used procedure applicable for most of the distal variety hypospadias without severe chordae. Where the width of the urethral plate is more than 7mm, along with deep midline incision increases the width around double and interrupted inverting subcuticular stitching along with the help of magnification during neourethra formation reduce the complication rate. Special attention has been paid for phalloplasty in each patient in order to get a good cosmetic outcome, which included – excision of excess redundant skin ± aggregated dorsal dartos tissue and application of subcuticular continuous stitch with 7/0 vicryl for penile shaft coverage and most importantly formation of Peno-scrotal and peno-pubic angles whenever needed.

Limitations:

Classical method of Snodgrass technique were not applied to all patients. There are some surgeon's modifications in many cases. All the patient did not strictly maintain the follow up schedule. Urinary flow was measured either by direct visual impressions or by indirect video clips and not justified by uroflowmetry.

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