

Clinical Profile and Surgical Outcomes of Snodgrass Urethroplasty in Distal Hypospadias

Tawseef Altaf Mir¹, Syed Nadeem Rafiq¹, Malik Nasir¹, Zaffar Saleem Khanday², Mufti Mahmood Ahmed³, Syed Javaid Qadri⁴, Asim Laharwal⁴

¹Registrar, Department of Surgery, Government Medical College, Srinagar, Jammu and Kashmir, India, ²Associate Professor, Department of Surgery, Government Medical College, Srinagar, Jammu and Kashmir, India, ³Professor and Head, Department of Surgery, Government Medical College, Srinagar, Jammu and Kashmir, India, ⁴Lecturer, Department of Surgery, Government Medical College, Srinagar, Jammu and Kashmir, India

Abstract

Background: Hypospadias is complex disorder affected by both genes and the environment. Chordee and penile torsion is frequent, particularly in more advanced forms of hypospadias. Several classification systems have been suggested for hypospadias. Many methods for the surgical repair of hypospadias have been described throughout history. To minimize the risk of fistula formation a fascial layer (Buck's or Darto's) can be interposed between the suture lines.

Objectives: The objectives of the study were to assess the clinical profile in children with Distal Hypospadias and surgical outcomes after Snodgrass Urethroplasty.

Methods: It was a prospective observational study on patients of distal Hypospadias admitted in Department of Surgery presented with abnormal meatus location, glans configuration, skin coverage, and mild degree of chordee <30°. A detailed local examination was done in every patient. In addition to type of hypospadias each patient was looked for meatus stenosis and chordee, shape of glans, and size of penis. Special attention was given to prepuce whether intact, circumcised or utilized in the previous operation. Surgical procedure done was Snodgrass Urethroplasty; patients were followed up to 2 years.

Results: Patients were distributed as per type of hypospadias and it was observed that subcoronal hypospadias, distal penile, and coronal hypospadias were found in 25 (50%), 17 (34%) and 8 (16%) patients, respectively. Shape of meatus was slit shaped in 24 (48%) patients, stenotic in 21 (42%) patients and circular in 5 (10%) patients in our study. Out of 50 patients studied, midline raphe was found in 32 (64%) patients while as deviated from midline raphe was seen in 18 (36%). Only 10 (20%) patients had associated chordee in our study. After 24 months of follow-up, acceptable cosmetic results were observed in 47 (94%) patients. Small meatus was seen in 2 (4%) patients while as bulky tissue was present in 1 (2%) patient.

Conclusion: The conclusion of our study was that most of the patients in our study presented late because of unawareness among people about the disease. The surgical procedure done was Snodgrass Urethroplasty for distal hypospadias and was associated with good surgical outcomes and fewer complications.

Key words: Hypospadias, Chordee, Snodgrass urethroplasty, Prepuce, Midline skin raphe

INTRODUCTION

Hypospadias is a common congenital malformation in boys. Hypospadias is complex disorder affected by both genes and the environment. It is an isolated malformation

in the majority of cases, although it can also occur in association with other abnormalities, most frequently undescended testes or micropenis.^[1] During a time window in gestational weeks 8 and 9, the Müllerian ducts regress in a cranio-caudal direction under the influence of AMH.^[2] By week 10, the Müllerian ducts become insensitive to AMH.^[2] The continued differentiation of the Wolffian ducts into the epididymis, vas deferens, and seminal vesicles requires such high testosterone concentrations that it can only occur in the immediate vicinity of the Leydig cells of the testes. During this time, the labioscrotal swellings develop as additional swellings lateral to the urethral folds.^[3]

Access this article online



www.ijss-sn.com

Month of Submission : 08-2022
Month of Peer Review : 09-2022
Month of Acceptance : 10-2022
Month of Publishing : 10-2022

Corresponding Author: Dr. Malik Nasir, Postgraduate Scholar, Department of Surgery, Government Medical College, Srinagar, Jammu and Kashmir, India.

At nine weeks, virilization of the external genitalia by DHT and testosterone begins with the lengthening of the anogenital distance.^[2] The walls of the cloacal membrane in the genital tubercle then come together in a distal-to-proximal direction, resulting in the formation of a solid plate of endodermal epithelium, the urethral plate.^[4] This replaces the urogenital membrane and extends to the tip of the phallus.^[5]

Elucidation of the development process for the normal male genitalia and urethra has indicated that hypospadias results from a disruption of the normal closure of the edges of the urethral groove that inhibits formation of the urethral tube.^[6,7] Chordee and penile torsion is frequent, particularly in more advanced forms of hypospadias.^[8,9] Congenital ventral curvature can also occur in association with a normal urethral meatus, which is commonly called chordee without hypospadias or crypto-hypospadias. In these cases, the glanular urethra is often normal while the spongio-penile urethra is deficient.^[10] Rarely, the curvature can exist in association with a completely normal urethra.^[11] The cause of ventral curvature is debated,^[10] as is the use of the term chordee to describe the ventral curvature.^[12] Ventral curvature can occasionally be surgically released after degloving of the penile skin, although this is not the case for most patients,^[13] who will require a orthoplasty with excision of chordee tissues. Penile torsion usually presents with the penile shaft rotated to the left and the raphe deviating to the right.^[9] Torsion can occur in the absence of hypospadias or chordee, but it is most commonly found in association with these anomalies.^[14] The cause of the torsion is unknown,^[15] though an association with asymmetric ventral tissues is reported.^[16,17]

Several classification systems have been suggested for hypospadias,^[18] mainly based up on the position of the meatus.^[19] However, a comprehensive classification of the phenotype must also account for the position of the meatus after correction of the ventral curvature (excision of the chordee).^[18]

Many methods for the surgical repair of hypospadias have been described throughout history.^[8] Improvements in equipment and materials, such as magnification glasses and sutures, as well as refinements to surgical technique, have made it possible for many patients to have defects repaired in one session, minimizing complications, rather than in two sessions followed by possible secondary repairs due to complications. Ultimately, the phenotype or the degree of the malformation will determine the choice of surgical technique and the risk for complications.^[8,20] Local tissues in the immediate vicinity of the urethral plate can be used for construction of the neo-urethra in some cases, but preputial flaps or transplants are often required to allow

for adequate length of the neo-urethra in more advanced cases.^[8,21] In patients with ventral curvature, the repair must begin with excision of the chordee.^[8] The most frequently used local flap is from the prepuce. Use of scrotal flaps has also been described.^[21] However, when skin from the proximal penile shaft or the scrotum is used, the surgeon must account for the (future) presence of hair, as a neo-urethra with internal hairs can cause both cosmetic and obstructive problems.^[22] When local tissues are absent or inadequate, grafts, most frequently oral mucosa, must be used.^[21,23] In general, the more advanced reconstructions are performed in two steps. The first for excision of the chordee with repair of the ventral defect with a flap or graft which leaves a surplus of tissue on the ventral side that is used in the second session for the urethral repair.^[23] The two sessions should be separated in time to allow for adequate tissue healing and neovascularization.^[24] The challenges of constructing a long neo-urethra in patients with proximal hypospadias are considerably greater than in the more distal cases. The neo-urethra also lacks the native propulsive qualities of the native, spongiosum-covered urethra, and the longer the reconstruction, the greater the risk of abnormal micturition and ejaculation. Furthermore, the risk of vascular scarcity in long reconstructions is always greater as the base of the flap has to be thinned in order to reach the required distance.^[15,25] But, as there is, yet, no reconstructed urethra that possesses the same biological and urodynamic properties as the native urethra, functional outcomes can be affected even in uncomplicated cases.^[26] To minimize the risk of fistula formation a fascial layer (Buck's or Darto's) can be interposed between the suture lines.^[27]

Ventral curvature with chordee is common in hypospadias, although the true nature of the chordee, in terms of its role in the pathology of the ventral curvature and the importance of its excision, remain unclear.^[12,28-30] Recent literature has recommended three ways to manage chordee with respect to the urethral plate: (1) Division and excision of the urethral plate followed by extensive ventral dissection along the corporal bodies; (2) extensive mobilization, without division, of the urethral plate, followed by further dissection at the ventral corporal bodies; and (3) preservation of the urethral plate as a template for an onlay island flap combined with dorsal plication for residual penile curvature.^[28]

Hypospadias surgery is beset with difficulty and complications. The most common complications include recurrent curvature, preputial dehiscence, glans dehiscence, urethral fistula, meatus or urethral stenosis, urethral stricture, urethral diverticulum, hairy urethra, penile skin deficiency, and abnormal penile skin configuration.^[20] Although complications can be isolated, they are often

clustered.^[31,32] The term hypospadias cripple describes those patients who are affected by the greatest incidence of multiple complications and failed repairs, in whom the penis may be scarred, hypovascular, and shortened.^[20]

Aims and Objectives

The objectives are as follows:

- To assess the clinical profile in children with distal hypospadias
- To assess the surgical outcome in children with distal hypospadias after Snodgrass Urethroplasty.

MATERIALS AND METHODS

The study was conducted in the Postgraduate Department of General Surgery at Government Medical College Srinagar from November 2018 to November 2020. It was a prospective observational study on patients of hypospadias admitted in department of surgery over a period of 24 months and was conducted after taking consent from parents of patients and getting clearance from intuitional ethical committee. A detailed history and examination of patients was recorded.

Inclusion Criteria

All cases of distal hypospadias presenting with abnormal meatus location, glans configuration, skin coverage, and mild degree of chordee $<30^\circ$ were included in the study.

Exclusion Criteria

- All patients with proximal hypospadias (proximal penile, penoscrotal, and perineal)
- Patients having severe degree of chordee more than 30°
- Patients having congenital ventral curvature with normal meatus
- All patients having contraindications to general anesthesia.

In addition to general physical and systemic examination, a detailed local examination was done in every patient. In addition to type of hypospadias each patient was looked for meatus stenosis and chordee, shape of glans and size of penis. Special attention was given to prepuce whether intact, circumcised or utilized in previous operation. Local examination also included shape of scrotum, midline raphe, nature of urinary stream, any cryptorchidism, or ambiguous genitalia. Patients operated previously will be examined for any scarring, fistula, and stricture. Pre-operative antibiotic prophylaxis was given one hour before intubation. Meticulous part preparation was done with 10% Povidone-Iodine. All the procedures will be done as elective surgeries under general anesthesia. To obtain a bloodless field, a tourniquet (released every 30–45 min) used. Hemostasis

is ensured using bipolar diathermy. Urethroplasty was performed around a 7/8 feeding tube catheter to avoid subsequent stenosis. A compressing dressing was applied post-operatively for 48 h for hemostasis, and feeding tubes removed on 10th post-operative day.

All patients had mild degree of Chordee $<30^\circ$. Surgical procedure done for Distal Hypospadias was Snodgrass Urethroplasty for Glanular, Coronal, Subcoronal and Distal Penile Hypospadias. The tubularized incised plate urethroplasty combines modifications of techniques of urethral plate incision and tubularization. The concept of a urethral plate “relaxing incision” as an adjunct to hypospadias repair is to allow tension-free neourethral tubularization. Urethral calibration was routinely done intraoperatively with a urethral sound to exclude any distal stenosis, thereafter presence, location, number of fistulas was assessed, probing every pit in the skin with the probe to avoid missing smaller fistulae under loupe magnification. In doubtful cases methylene blue was injected under pressure from the terminal portion of neourethra while a tourniquet was applied at the base of the penis to occlude the proximal urethra. Patients were regularly followed up for 2 years for outcome and complication of hypospadias. The follow up was done on outpatient department (OPD) basis at an interval of 2 weeks for 1 month then 6 monthly for 2 years.

Statistical Method

The recorded data were compiled and entered in spreadsheet (Microsoft Excel) and the exported to data editor of SPSS version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as mean SD and categorical values were summarized as frequencies and percentages. Graphically, the data were presented by bar and pie diagrams.

RESULTS

Our study patients age ranged between 5 months and 12 years with maximum patients, that is, 19 (38%) falling in their 6th decade of life followed by 12 (24%) patients aged between 5 and 6 years with a mean age of 5.4 ± 1.89 years. Majority of patients i.e. 35 (70%) came with abnormal urinary stream followed by cosmetic deformity of penis in 15 (30%) patients. 38 (76%) were diagnosed at birth while as 12 (24%) patients were diagnosed at circumcision. No family history of hypospadias was seen in all the 50 patients. 46 of the 50 patients (92%) had no associated congenital abnormalities. Only 4 patients were found to have associated congenital abnormality including 2 (4%) patients with undescended testes and 2 (4%) patients with inguinal hernia. Only 8 (16%) of the 50 patients were circumcised. Patients were distributed as per type of hypospadias and

it was observed that subcoronal hypospadias, distal penile and coronal hypospadias were found in 25 (50%), 17 (34%), and 8 (16%) patients, respectively. Shape of meatus was slit shaped in 24 (48%) patients, stenotic in 21 (42%) patients, and circular in 5 (10%) patients in our study.

Out of 50 patients studied, midline raphe was found in 32 (64%) patients while as deviated from midline raphe was seen in 18 (36%). Only 10 (20%) patients had associated chordee in our study. Catheter was removed on 10th post-operative day in 45 (90%) patients, catheter was removed on 11th POD and >13th POD in 2 (4%) patients while as catheter was removed on 12th POD in 1 (2%) patient. 12 (24%) patients had postoperative complications comprising of urethrocutaneous fistula in 8 (16%) patients, meatus stenosis in 3 (6%) patients and 1 (2%) infection. At 24 months acceptable cosmetic results were observed in 47 (94%) patients. Small meatus was seen in 2 (4%) patients while as bulky tissue was present in 1 (2%) patient [Tables 1 and 2].

DISCUSSION

In our study, we had total number of 50 patients. Mean age of presentation is 50 months minimum age is 5 months and maximum age is 12 years. Age of presentation is early as compared to study of clinical profile of hypospadias in Medical College South Gujarat^[33] where mean age of presentation was 7.5 years. In our study age of presentation is still late, that is, 15 months, ideally patient should be operated between 6 and 18 months of age.^[34] Parents of the patients are still unaware about the disease and present late. 35 cases that are 70% presented abnormal urinary stream while 30% presented with cosmetic deformity of penis.

In our study, 38 (76%) were diagnosed at birth and 12 (24%) were diagnosed at the time of circumcision. In our study, no patients had associated family history of hypospadias. In our study, 11 cases that are 22% had already circumcised penis while 39 cases that is 78% had uncircumcised penis. Still there needs a lot of awareness in our society about delaying of circumcision in hypospadias as lot of patients about 22% are already circumcised, but in our patients most of the circumcised patients have distal hypospadias and it did not overall affected the surgical outcome but circumcision should be avoided in hypospadias encountered especially in proximal hypospadias where prepuce may be needed for surgical reconstruction. In our study, associated external genital anomalies were undescended testes and inguinal hernia. 2 (4%) patients had associated undescended testes and 2 (4%) had inguinal hernia. There were no other anomalies associated. During antenatal period 1 case that is 2% cases had history small for gestational age. Type of hypospadias

was assessed on clinical examination. 25 cases that is 50% had subcoronal type of hypospadias, 8 cases that is 16% had coronal and 17 cases that is 34% had distal penile. Shape of meatus was also assessed on clinical examination 24 cases that are 48% had slit shaped meatus 21 cases that is 42% had stenotic and 5 that is 10% cases had circular type of meatus. In our study, skin raphe was midline in 32 cases that is 64% while 18 that is 36% patients had deviated raphe. 10 (20%) patients of cases had associated mild degree of meaning chordee <30°. Mean age at the time of surgery was 50 months that is 4.166 years.

We operated patients immediately after diagnosing them on OPD basis. Catheter was removed on post-op 10th day in 90% of cases while 10% cases needed catheterization for more than 10 days because they failed to pass urine after giving trial and developed retention and were catheterized again. Surgical procedure done was Snodgrass urethroplasty. This procedure was associated with good surgical outcomes and less complication and was procedure of choice in distal hypospadias our study was consistent with the Hamid *et al.*^[34] comparative study of Mathieu and Snodgrass Repair of hypospadias which favored Snodgrass repair as procedure of choice in distal hypospadias with good surgical outcomes and fewer complications. Our study results are consistent with the current study done at Alribat University Hospital, Department of Paediatric Surgery by Yassir *et al.*,^[35] for patients who underwent distal hypospadias repair in the period August 2012–September using patient's record. 31 children (aged between 2 years and 13 years) with distal hypospadias have been treated from August 2012 to September 2013. The average age at operation was 5.8 years. They underwent primary repair using different type of operations, and they had no history of previous hypospadias repair. The pre-operative meatus sites were glanular in seven patients, coronal in eight patients, and sub coronal in 16 patients. Data collected using predesigned questionnaire including information such as age, family history, type of hypospadias, type of surgery, and complications. Results were that all Patients enrolled in this study have no family history of hypospadias most of the patients were diagnosed at birth (87.1%), and only 12, 9% diagnosed at circumcision. The most common presentation of patients is abnormal shape of penis and abnormal stream of urine (71% and 25.8%, respectively). According to the site of meatus sub coronal hypospadias is the commonest 51.6% of patient. Associated chordee is present in 19.4% of patients (6 patients). Associated external genitalia anomalies are inguinal hernia and undescended and they are equals 3.2% for each. Only one patient had been circumcised before surgery representing about 3.2%. Mean age at time of surgery was 5.8 and 74.2% of patients underwent surgery after 3 year of age postoperatively 35% of our patients had been catheterized

Table 1: Age, symptoms at presentation, associated congenital abnormality, history of circumcision, type of hypospadias

Patient characteristics	Number of patients (%)
Age (years)	
<3	7 (14)
3–4	4 (8)
4–5	8 (16)
5–6	12 (24)
≥6	19 (38)
Total	50 (100)
Mean±SD (range)	5.4±1.89 (5 months–12 years)
Symptoms	
Abnormal urinary stream	35 (70)
Cosmetic deformity of penis	15 (30)
Associated congenital abnormality	
Undescended testes	2 (4)
Inguinal hernia	2 (4)
No congenital abnormality	46 (92)
History of circumcision	
Yes	8 (16)
No	42 (84)
Type of hypospadias	
Subcoronal	25 (50)
Coronal	8 (16)
Distal penile	17 (34)

SD: Standard deviation

Table 2: Distribution of study patients as per shape of meatus, midline skin raphe, associated chordee, post-operative complications, and cosmetic results

Patient characteristics	Number of patients (%)
Shape of meatus	
Slit shaped	24 (48)
Stenotic	21 (42)
Circular	5 (10)
Midline skin raphe	
Midline	32 (64)
Deviated from midline	18 (36)
Associated chordee	
Yes	10 (20)
No	40 (80)
Postoperative complications	
Urethrocutaneous fistula	8 (16)
Meatal stenosis	3 (6)
Infection	1 (2)
Cosmetic results	
Small meatus	2 (4)
Bulky tissue	1 (2)
Acceptable cosmetic results	47 (94)

more than 7 days. All these results of study are almost matching to our study. Chordee associated in our patients was also supported by another study by Gohil *et al.*^[32] which found association of chordee in 19% of patients. Assessment of surgical outcome in hypospadias was done by assessing complications Cosmetic appearance of penis. In our study, most common complication during follow-up was urethrocutaneous fistula in about 16%

of patients followed by meatus stenosis in about 3% of patients and 2% developed post-operative infection as our study is consistent with study of Appeadu-Mensah *et al.*^[36] on Complications of hypospadias surgery: Experience in a tertiary hospital of a developing country in which 18% patients developed urethrocutaneous fistula and 3% developed meatus stenosis during follow-up period. Cosmetic results were assessed during follow-up of 24 months 2 cases that is 4% of patients had small meatus, 1 case that is 2% had bulky tissue. Rest cases had acceptable cosmetic results. Complications and cosmetic outcome during follow-up in our study was consistent with study done by Aslam *et al.*^[37] a retrospective case note review was undertaken of all patients undergoing a primary, single stage, tabularized, incised plate (TIP) hypospadias repair between April 2000 and January 2003, mean age of 3.5 years with a mean follow-up of 56 months. Data were recorded regarding complications such as re-operation, fistula, meatus stenosis, and urethral stricture. Indications of cosmesis and long-term function were also recorded. The complication rates for the two groups and the overall complication rate were assessed. This study had similar complications and cosmetic outcome to our study.

CONCLUSION

The conclusion of our study was that most of the patients in our study presented late because of unawareness among people about the disease. Good amount of patients had already circumcised penis. Patients usually presented with abnormal urinary stream more than concerning about cosmetic deformity. The surgical procedure done was Snodgrass Urethroplasty for distal hypospadias and was associated with good surgical outcomes and fewer complications.

REFERENCES

- Bouty A, Ayers KL, Pask A, Heloury Y, Sinclair AH. The genetic and environmental factors underlying hypospadias. *Sex Dev* 2015;9:239-59.
- Rey RA, Grinspon RP. Normal male sexual differentiation and aetiology of disorders of sex development. *Best Pract Res Clin Endocrinol Metab* 2011;25:221-38.
- Larsen WJ. *Human Embryology*. London, United Kingdom: Churchill Livingstone Inc.; 1993.
- Hynes PJ, Fraher JP. The development of the male genitourinary system: II. The origin and formation of the urethral plate. *Br J Plast Surg* 2004;57:112-21.
- Kurzrock EA, Baskin LS, Cunha GR. Ontogeny of the male urethra: Theory of endodermal differentiation. *Differentiation* 1999;64:115-22.
- Shen J, Overland M, Sinclair A, Cao M, Yue X, Cunha G, *et al.* Complex epithelial remodeling underlie the fusion event in early fetal development of the human penile urethra. *Differentiation* 2016;92:169-82.
- Baskin LS, Erol AL, Li YW, Cunha GR. Anatomical studies of hypospadias. *J Urol* 1998;160:1108-15.
- Baskin LS, Ebberts MB. Hypospadias: Anatomy, etiology, and technique. *J Pediatr Surg* 2006;41:463-72.
- Avellan L. Morphology of hypospadias. *Scand J Plast Reconstr Surg*

- 1980;14:239-47.
10. Baskin LS, Duckett JW, Lue TF. Penile curvature. *Urology* 1996;48:347-56.
 11. Yachia D, Beyar M, Aridogan IA, Dascalu S. The incidence of congenital penile curvature. *J Urol* 1993;150:1478-9.
 12. Snodgrass W. A farewell to chordee. *J Urol* 2007;178:753-4.
 13. Kaplan GW, Brock WA. The etiology of chordee. *Urol Clin North Am* 1981;8:383-7.
 14. Montag S, Palmer LS. Abnormalities of penile curvature: Chordee and penile torsion. *ScientificWorldJournal* 2011;11:1470-8.
 15. Shih EM, Graham JM Jr. Review of genetic and environmental factors leading to hypospadias. *Eur J Med Genet* 2014;57:453-63.
 16. Van der Putte SC. Hypospadias and associated penile anomalies: A histopathological study and a reconstruction of the pathogenesis. *J Plast Reconstr Aesthet Surg* 2007;60:48-60.
 17. Avellán L, Knutsson F. Microscopic studies of curvature-causing structures in hypospadias. *Scand J Plast Reconstr Surg* 1980;14:249-58.
 18. Hadidi AT. Classification of hypospadias. In: Azmy AF, editor. *Hypospadias Surgery. An Illustrated Guide*. Berlin: Springer Verlag; 2004. p. 79-82.
 19. Springer A, Tekgul S, Subramaniam R. An update of current practice in hypospadias surgery. *Eur Urol Suppl* 2017;16:8-15.
 20. Cimador M, Vallasciani S, Manzoni G, Rigamonti W, De Grazia E, Castagnetti M. Failed hypospadias in paediatric patients. *Nat Rev Urol* 2013;10:657666.
 21. Hadidi AT. Men behind principles and principles behind techniques. In: Azmy AF, editor. *Hypospadias Surgery. An Illustrated Guide*. Berlin: Springer Verlag; 2004.
 22. Kampantais S, Dimitriadis C, Laskaridis L, Perdakis I, Kirtsis P, Toutziaris C. Urethral hairballs as a long-term complication of hypospadias repair: Two case reports. *Case Rep Urol* 2012;2012:769706.
 23. Bracka A. The role of two-stage repair in modern hypospadiology. *Indian J Urol* 2008;24:210-8.
 24. Jayanthi VR, McLorie GA, Khoury AE, Churchill BM. Can previously relocated penile skin be successfully used for salvage hypospadias repair? *J Urol* 1994;152:740-3.
 25. Rynja SP, De Jong TP, Bosch JL, De Kort LM. Functional, cosmetic and psychosexual results in adult men who underwent hypospadias correction in childhood. *J Pediatr Urol* 2011;7:504-15.
 26. Cimador M, Pensabene M, Sergio M, Catalano P, De Grazia E. Coverage of urethroplasty in pediatric hypospadias: Randomized comparison between different flaps. *Int J Urol* 2013;20:1000-5.
 27. Erol A, Baskin LS, Li YW, Liu WH. Anatomical studies of the urethral plate: Why preservation of the urethral plate is important in hypospadias repair. *BJU Int* 2000;85:728-34.
 28. Hayashi Y, Mizuno K, Kojima Y, Moritoki Y, Nishio H, Kato T, *et al.* Characterization of the urethral plate and the underlying tissue defined by expression of collagen subtypes and microarchitecture in hypospadias. *Int J Urol* 2011;18:317-22.
 29. Kaplan GW, Lamm DL. Embryogenesis of chordee. *J Urol* 1975;114:769-72.
 30. Barbagli G, De Angelis M, Palminteri E, Lazzeri M. Failed hypospadias repair presenting in adults. *Eur Urol* 2006;49:887-94.
 31. Barbagli G, Perovic S, Djinovic R, Sansalone S, Lazzeri M. Retrospective descriptive analysis of 1,176 patients with failed hypospadias repair. *J Urol* 2010;183:207-11.
 32. Gohil A, Nema A. A study of clinical profile of hypospadias cases at a medical college hospital of South Gujarat, India. *Int Surg J* 2018;5:2127-30.
 33. Kaas E, Kogan SJ. Timing of elective surgery on the genitalia of male children with particular reference to the. *Pediatrics* 1996;97:590.
 34. Hamid R, Baba AA, Shera AH. Comparative study of snodgrass and Mathieu's procedure for primary hypospadias repair. *ISRN Urol* 2014;2014:249765.
 35. Ismail YH, Khair OA, Bagadi A. Outcome of distal hypospadias repair in pediatric surgery department at Alribat teaching hospital. *Glob J Med Res Surg Cardiovasc Syst* 2013;13:1-5.
 36. Appeadu-Mensah W, Hesse AA, Glover-Addy H, Osei-Nketiah S, Etwire V, Sarpong PA. Complications of hypospadias surgery: Experience in a tertiary hospital of a developing country. *Afr J Paediatr Surg* 2015;12:211-6.
 37. Aslam R, Campbell K, Wharton S, Bracka A. Medium to long term results following single stage Snodgrass hypospadias repair. *J Plast Reconstr Aesthet Surg* 2013;66:1591-5.

How to cite this article: Mir TA, Rafiq SN, Nasir M, Khanday ZS, Ahmed MM, Qadri SJ, Laharwal A. Clinical Profile and Surgical Outcomes of Snodgrass Urethroplasty in Distal Hypospadias. *Int J Sci Stud* 2022;10(7):8-13.

Source of Support: Nil, **Conflicts of Interest:** None declared.