

# Efficacy of Snodgrass Urethroplasty Using De-epithelialised Flap

**Puneet Kumar, \*Sudhir Kumar, \*\*Naveen Sirohi**

Department of Surgery, \*Department of Burns and Plastic Surgery, \*\*Department of Ophthalmology, Maharani Laxmi Bai Medical College, Jhansi (Uttar Pradesh) India

(Received: May, 2017)

(Accepted: June, 2017)

## ABSTRACT

This research included 30 cases of hypospadias admitted in Maharani Laxmi Bai Medical college, Jhansi between January 2014 to June 2015 to study the effects of water proofing in hypospadias repair by Snodgrass urethroplasty using de-epithelialised flap. The patients underwent Snodgrass urethroplasty using inner preputial de-epithelialized flap and were followed up for 3 months. This study comprises of 30 male patients with mean age (range 1-20 years) of  $7.13 \pm 5.42$ . The commonest age at presentation was in the age group of 1-4 years (13 cases, 43.3%). The resultant neo-meatus was vertically oriented and slit like. Glans was conical with the penile raphe in the midline. None of the patients had residual chordee, significant penile torsion, or glans dehiscence. Excellent cosmetic results were observed in all cases. The complication rate in our series were as: 4 cases (13.3%) developed meatal stenosis and 3 cases (10%) developed fistula which healed spontaneously. No case developed skin necrosis and urethral stricture. One case had partial wound dehiscence that resolved on conservative treatment with no sequelae. The present study showed that the de-epithelialized flap from a prepuce provides an extra waterproofing to the neourethra after Snodgrass urethroplasty. It gives us uncrossed suture lines apart from providing maximum vascularity and efficient waterproofing. De-epithelialised flap being a part of dermis holds sutures better.

**KEY WORDS:** dartos flap, hypospadias, snodgrass urethroplasty

## INTRODUCTION:

Hypospadias is a congenital disorder of the urethra where the urinary opening is not at the usual location on the head of the male genitalia (Figure 1). It is the second-most common birth abnormality of the male reproductive system, affecting about one of every 250 males at birth.<sup>[1]</sup> In roughly 90% of cases, the opening (meatus) is on or near the glans, referred to as distal hypospadias, while the remainder have proximal hypospadias with a meatus near or within the scrotum. Shiny tissue seen extending from the meatus to the tip of the glans, which would have made the urinary channel, is referred to as the urethral plate. In most cases, the foreskin is also underdeveloped and does not wrap completely around the genitalia, leaving the

underside of the glans uncovered. Also, a downward bending of the genitalia, commonly referred to as chordee, may occur.<sup>[2]</sup> This is found in 10% of distal hypospadias<sup>[3]</sup> and 50% of proximal hypospadias<sup>[4]</sup> at the time of surgery. The scrotum may be higher than usual to either side of the genitalia, called penoscrotal transposition, adding to the abnormal overall appearance. Hypospadias is thought to result from failure of the urinary channel to completely tubularize to the end of the genitalia. Most often, it is the only abnormal finding, although in about 10% of cases, hypospadias may be part of a syndrome with multiple abnormalities.<sup>[4]</sup> The most common associated defect is an undescended testicle, which has been reported in around 3% of infants with distal hypospadias and 10% of those having proximal hypospadias.<sup>[5]</sup>

Hypospadias is amenable to various tissue repairs based only on the dual blood supply of genitalia<sup>[6]</sup>. The blood supply to the skin of genitalia is by the left and right superficial external pudendal vessels that arise from the first portion of the femoral artery. Entire skin of genitalia along with dartos can be

### Corresponding Author:

**Dr Puneet Kumar**

MS, Senior Resident,

Department of Surgery,

Maharani Laxmi Bai Medical College,

Jhansi - 284001 (Uttar Pradesh) India

Phone No.: +91 7236059392

E-mail: bharadwaj.puneet@gmail.com



raised based on these vessels. The blood supply to the deep structures of the genitalia is from the common penile artery, which is a continuation of the internal pudendal artery after it gives a perineal branch. This dual blood supply of the penis makes it amenable to a lot of tissue repairs.

The main object of therapy is to construct a: (a). straight genitalia; (b). meatus as close to the normal site as possible and (c). to allow a forwardly directed stream

There are around 200 original methods of reconstruction reported today and they continue as modifications of modification. Mastering hypospadiology requires an in depth study of contributions of our predecessors as well as thorough knowledge of the methods and maneuvers of current experts. Due to the emphasis put on cosmesis and better function, hypospadiology will continue to offer a challenge, which will innovate new methods as well as cause further refinement of old ones.

The commonest complication of hypospadias surgery is fistula formation which usually requires re-operation. Several techniques of providing vascularized soft tissue cover to the neourethra have been described. They include de-epithelialized skin, corpus spongiosum, dartos fascia, and tunica vaginalis. Both dartos fascia and de-epithelialised skin flap provide robust cover to the urethra and act as a barrier between the suture lines. Dartos fascia, harvested from the dorsal penile skin, is more frequently used. Harvesting dartos fascia may be difficult for beginners as it requires precise and skilful dissection to raise the dartos flap without damaging the intrinsic blood supply to the outer skin. This outer skin when transposed ventrally to provide skin cover may consequently devitalize leading to skin necrosis. Whereas in second choice the de-epithelialised flap first described by Durham Smith<sup>[7]</sup> in 1973, is raised from the preputial wings which is then transposed over the neourethra. It leads to a greater tissue adhesion over a wide area rather than edge-to-edge healing of the earlier counterparts with no suture lines superimposing each other. The choice between the two depends more on surgeon's choice and experience rather than scientific evidence. Durham Smith<sup>[7]</sup> described a new technique using de-epithelialized inner preputial skin flap for water proofing in a two staged procedure. It leads to a greater tissue adhesion over a wide area rather than edge-to-edge healing of the earlier counterparts. It prevents direct super imposition of suture lines. Snodgrass<sup>[8,9]</sup> described distal penile hypospadias repair by tubularising the

urethral plate after it has been incised to make it wide (Figure 2a). This had the advantage of using the inherent urethral plate instead of other substitutes, thus more anatomical. In his repair, he used vascularized subcutaneous tissue dissected from the dorsal prepuce to cover the new tubularised urethra. In our study we have used de-epithelialized flap (Figure 2b) from the inner prepuce to cover the suture line of neo-urethra for waterproofing and making it cosmetically acceptable.

The objective of this research was to study the types and varieties of hypospadias and their occurrence in our patient population and to study the result and complications encountered in the Snodgrass urethroplasty using de-epithelialized flap.

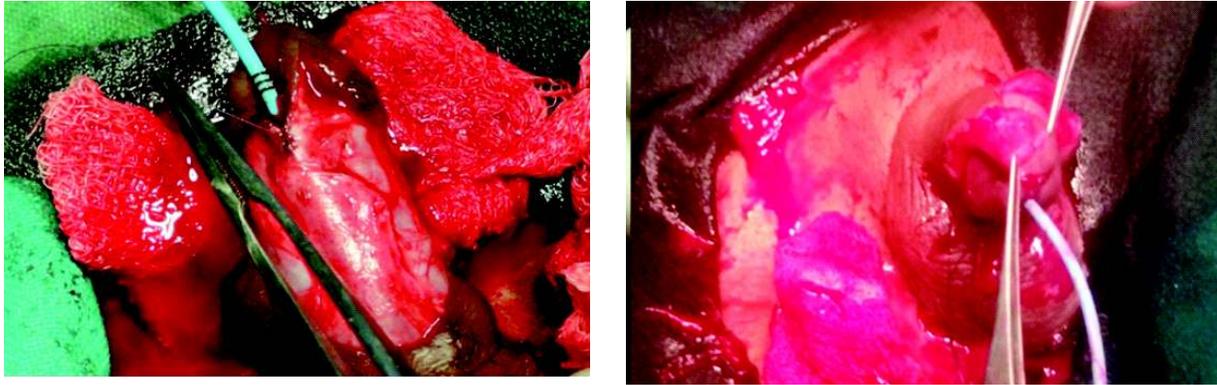


**Figure 1:** Clinical photograph showing mid penile hypospadias in a 4 years old patient.

## MATERIALS AND METHODS:

This prospective study included 30 cases of hypospadias admitted in Maharani Laxmi Bai Medical college, Jhansi between January 2014 to June 2015, who underwent Snodgrass urethroplasty using inner preputial de-epithelialized flap and were followed up for 3 months. The study was conducted as per the Declaration of Helsinki and after approval from Ethical committee of M.L.B. Medical College, Jhansi. Written informed consent was obtained from each participant. The clinical details of the patients were recorded according to the Proforma and questionnaire form were prepared before the commencement of the study.

To study the effects of water proofing in hypospadias repair using Snodgrass urethroplasty using de-epithelialised flap, patients with good preputial hood, mild chordee and well formed urethral



**Figure 2:** Operative pictures of a 4 years old patient (3a. tubularisation of incised urethral plate, 3b. raised harvested de-epithelialised flap).

mm as narrow plate were included. (5 mm labelled as well formed, 4). The patients with urethral plate of inadequate width, severe hypospadias requiring more complex repair and intersex cases were not included in this series.

Assessments of history of present complaints, systemic and surgical examination of all cases was made. Snodgrass repair<sup>[8,9]</sup> was done by incising the urethral re based on extensive data set of our detailed study. plate and tubularising it over 8 or 10 Fr plain Nelaton catheter. The length of the skin required to cover the ventral skin defect was assessed. The excess skin which otherwise would have been discarded, was marked for a flap of appropriate size. The marked flap was held with stay sutures with silk 3-0 and then it was de-epithelialized using no. 15 blade. The island of de-epithelialized inner prepuceal layer was raised on dartos and then sutured over the neourethra with 6-0 vicryl. Skin cover was done by Byar's method and suture line was kept in ventral median plane (to simulate penile raphe). The operating time was 1hr-1.5 hr in 24 patients and 1.5 hr-2 hr in 6 cases. The patients were called for follow-up every week for two weeks, every month upto three months after surgery.

The patient's details were recorded in data collection form. Quantitative data were expressed as mean±SD (standard deviation) and qualitative variables were expressed using percentages. All statistical analyses were made with the help of data analysis tool of Microsoft Excel 2007. The data shown in the tables herein are based on extensive data set of our detailed study.

## RESULTS:

This study comprised of 30 male patients with mean age (range 1-20 years) of 7.13±5.42. The

commonest age at presentation was in the age group of 1-4 years (13 cases, 43.3%) (Table 1). Preoperatively the meatal site was sub coronal in 16 patients (53.3%), distal penile in 9 patients (30%), midpenile in 5 patients (16.7%) (Table 2). Acceptable cosmetic results were observed in all cases. The resultant neomeatus was vertically oriented, slit like and glans was looking normal which was cosmetically well accepted. The penile raphe was in the midline. Meatal stenosis was noted as a common complication (Table 3). The incidence noted was 13.3% (4 out of 30 cases). Waterproofing with well vascularized pedicled flap prevents from meatal stenosis. Meatal stenosis itself increases resistance in urinary flow and predispose to fistula formation (3 cases, 10%) which is a dreaded complication of hypospadias surgery. In 2 cases it was associated with urethral cutaneous fistula. In rest one case, it was improved by dilatation with feeding tube 8 Fr. In all the patients with mid penile hypospadias, a small coronal fistula was noticed on first follow-up. At the time of discharge they did not have a fistula. Meatal stenosis was observed with two of them, when the fistula was noticed. With regular dilatation of the meatus for a period of 2 months, the fistula closed spontaneously. In all patients the chordee was released completely and the raphe was in the midline. The appearance of the glans was normal in all patients. The patient with circumcision also had good cosmetic and functional results. Four cases had torsion of less than 30 degrees which did not require correction.

## DISCUSSION:

Although numerous techniques have become available for the correction of hypospadias to improve further cosmetic appearance and yield perfection, new methods are still described. Numerous waterproofing methods can be applied to strengthen the neo-urethra like dorsal dartos, spongioplasty and tunica vaginalis

**Table 1:** Demography of patients (n=30)

Age (years)	No. of patients	Percentage
1-4	13	43.33%
5-8	7	23.33%
9-12	4	13.33%
13-16	3	10%
17-20	3	10%

**Table 2:** Preoperative profile of patients (n=30).

Position of meatus	No. of patients	Percentage
Subcoronal	16	53.33%
Distal penile	9	30%
Mid penile	5	16.67%

**Table 3:** Complications in patients during follow up (n=30)

The complications were as follows	
Meatal stenosis	4 (13.3%)
Fistula requiring closure	None
Fistula healed spontaneously	3 (10%)
Chordee	None
Torsion(<30degrees)	2 (6.67%)
Glans dehiscence (partial)	1 (3.3%)

flap but all have some shortcomings. Dorsal dartos provides local flap cover but overzealous dissection leads to skin necrosis and fistula formation whereas spongioplasty provides very less tissue cover. Tunica vaginalis flap though gives abundant tissue cover but a virgin area of testes has to be denuded and exposed. The complication rate in our series were as: 4 cases (13.3%) developed meatal stenosis and 3 patients (10%) developed fistula which healed spontaneously. No case developed skin necrosis and urethral stricture. None of the patients had residual chordee, significant penile torsion, or glans dehiscence. Excellent cosmetic results were observed in all cases. Duckett<sup>[7]</sup> reported incidence of site of meatus as; anterior 50%, middle 30% and posterior 20%. We had 50% anterior (glanular hypospadias excluded), 50% middle hypospadias. However this is a very small series of selected cases to comment on the percentage of the meatal location. On meatal calibration with bougie a boule no. 8 bougie could not be passed in 16 patients,

which was suggestive of meatal stenosis, whereas in rest of the cases meatus could be calibrated with no. 10 bougie a boule. Dividing urethral plate in the midline was helpful in increasing the caliber of the meatus, which then could admit no. 10 bougie a boule easily. The more distal locations, in particular, are often associated with stenotic meatus. The occurrence of meatal stenosis after Snodgrass repair is due to adherence of both raw sides of incised plates during healing. Jordon and Schlossberg<sup>[8]</sup> explained in detail, the healing process of urethral wounds, if the epithelia are apposed wound healing occurs by primary intention resulting in stenosis. When epithelial apposition is prevented by separating both sides of the wound, healing occurs by secondary intention and the epithelium progress slowly from the edges of the wound to cover the raw area.

Durham Smith<sup>[9]</sup> described de-epithelialized overlap flap in 1973. He used this technique as a two-stage procedure and reported only one fistula in 51 patients (2%). Other features of his repair included a urethral tube of uniform lumen, an orifice on tip of the glans and a cosmetic appearance of a normal circumcised male. With experience, it became apparent that de-epithelialized flap is also helpful in the successful closure of urethrocutaneous fistula. In this study 3 cases(10%) of fistula developed but all were self resolving.

Snodgrass' technique<sup>[10,11]</sup> of tubularized incised plate urethroplasty makes a narrow urethral plate wide enough for easy tubularization and provides vertically oriented and a cosmetically normal neomeatus. The key step in the procedure is to divide the urethral plate by deep sagittal incision in the midline, dividing all transverse webs, and exposing the underlying corporal bodies. This allows for its subsequent tubularization. Initially Snodgrass reported tubularized incised plate urethroplasty for distal hypospadias where no fistula was reported. Later on, he reported multicentric experience of tubularized incised urethroplasty (148 patients)<sup>[9]</sup> Complications were reported in 10 patients (7%)<sup>[12]</sup>.

Snow et al<sup>[13]</sup> in 1995 reported first time the use of tunica vaginalis to interpose between reconstructed urethra and dartos and skin. The fistula rate reported was 9%. Similar results has also been reported by Shanker et al<sup>[14]</sup> and Handoo<sup>[15]</sup>. It has a dependable blood supply from the cremasteric vessels and its pedicle length can safely be increased up to the external inguinal ring. Djordjevic ML<sup>[16]</sup> et al in 2005 showed a dorsal well-vascularized dartos flap, buttonholed ventrally, to be a good choice for

preventing fistula. Redundancy of the flap and its excellent vascularization depends on the harvesting technique. Gupta Ak, et al<sup>[7]</sup> in 2008 conducted a similar procedure on 25 patients and concluded that de-epithelialised flap is a better waterproofing method. His complication rate was 8%. Two patients developed fistula. Excellent cosmetic results were noted in all cases. Oswald J, et al<sup>[8]</sup> reported 30 patient's comparative series of Mathieu's and Snodgrass repair in distal hypospadias. Three patients who underwent Mathieu's repair had complication (two fistula and one meatal stenosis), compared with only one complication in Snodgrass group. We agree with Oswald J, the resultant meatus in our patients was cosmetically looking normal. We had one patient in whom circumcision was already done. We saw additional advantage of this procedure that it can be done in circumcised patients, as construction of neourethra doesn't require any skin flap. At this point we would like to emphasize that this is a repair in which the urethra is entirely formed by urethral plate. One of the causes of urethral fistula after hypospadias repair is known to be devascularization of the distal urethra. Reduction in the incidence of urethral fistula can be achieved by de-epithelialized flap as it creates a layer between two suture lines and by probably increasing vascularity to the neomeatus.

### CONCLUSION:

Snodgrass urethroplasty is a simple and versatile technique which is applicable to all varieties of hypospadias. The neourethra is formed entirely by urethral plate. It gives an excellent cosmetic appearance to the glans with a vertically oriented slit like neomeatus. De-epithelialised flap is a simple method to provide additional cover to the constructed neo-urethra after Snodgrass urethroplasty. It achieves the goal of non-crossing suture lines, maximizing vascularity and minimizing fistula rate. Our study showed that the de-epithelialized flap from a prepuce provides an extra waterproofing to the neourethra after Snodgrass urethroplasty. De-epithelialised flap being a part of dermis holds sutures better.

### LIMITATION OF THE STUDY:

This study has small sample size and needs further large scale study to detect various complication rates in patients undergoing Snodgrass repair.

### REFERENCES:

1. Snodgrass, Warren. Chapter 130: Hypospadias. In Wein, Allan. Campbell-Walsh Urology , Tenth Edition. Elsevier. 2012.pp. 3503–3536.
2. King, Sebastian & Beasley, Spencer. Chapter 9.1: Surgical Conditions in Older Children. In South, Mike. Practical Paediatrics, Seventh Edition. Churchill Livingstone, Elsevier. 2012.pp. 266–267. ISBN 978-0-702-04292-8.
3. Wein, Allan. Chapter 130: Hypospadias. Campbell-Walsh Urology , Tenth Edition. Elsevier. 2012. pp. 3503–3536.
4. Stoll C, Alembik Y, Roth MP, Dott B. Genetic and environmental factors in hypospadias. J Medi Gene. 1990;27 (9):559-63.
5. Wu Hongfei, Wei Zhang MGU. Hypospadias and enlarged prostatic utricle. Chinese Journal of Urology. 2002;12: 51–3.
6. Quartey JKM. The anatomy of the blood supply of penile skin and its relevance to reconstructive surgery of the lower urinary and genital tracts. [ChM Thesis] University of Edinburgh (1992).
7. J W Duckett Hypospadias-History of surgical procedures. Campbell's Urology; 7<sup>th</sup> Edn.; Vol 2; 1992. pg.2097.
8. Devine CJ Jr., Horton CE. A one-stage hypospadias repair. J Urol. 1961; 85;166-172.
9. Durham S. A de-epithelialized overlap flap technique in the repair of hypospadias. Br J Plast Surg 1973;26:106-14.
10. Snodgrass W. Tubularized incised plate urethroplasty in distal hypospadias. J Urol 1994;151:464-5.
11. Snodgrass W, Koyle M, Manjoni G. Tubularized incised plate hypospadias repair: Results of a multicentric experience. J Urol 1996;156:839-41.
12. Snodgrass WT. Assessing outcome of Hypospadias surgery. J Urol 2005;174:816.
13. Snow BW, Cartwright PC, Unger K. Tunica vaginalis blanket wrap to prevent urethra-cutaneous fistulas an eight year experience. J Urol 1995;153:472-3.
14. Shanker KR, Losty PD, Hopper M, Wong L, Rickwood AM. Outcome of hypospadias fistula repair. BJU Int 2002;89:103-5.
15. Handoo YR. Role of tunica vaginalis interposition layer in hypospadias surgery. Indian J Plast Surg 2006;39:152-6.

16. Djordjevic ML, Provic SV, Slakovic Z, Djakovic N. Longitudinal dorsal dartos flap for prevention of fistula after Snodgrass hypospadias procedure. *Eur Urol.* 2006; 50: 53-57.
17. Gupta AK, Sarda D, Kothari PR, Jiwane A, Kulkarni BK. Tubularized incised plate urethroplasty with de-epithelialized flap. *Afr J Paediatr Surg* 2008;5(1):8-10.
18. Oswald J. Comparison of Mathieu's and Snodgrass repair in primary distal hypospadias. *Br J Urol Int* 2000; 85; 725-727.

Cite this article as: Kumar P, Kumar S, Sirohi N: Efficacy of Snodgrass Urethroplasty Using De-epithelialised Flap. *PJSR* ;2017;10(2):53-58.  
**Source of Support** : Nil, **Conflict of Interest**: None declared.