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Snodgraft technique's drawbacks and success in treating distal hypospadias

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ABSTRACT:
OBJECTIVE: In the case of hypospadias, the urethral meatus (opening) is found on the base of the penis rather than the tip. It is a relatively common condition affecting about 1 in 250 male infants. The goal is to choose the procedure that would provide the best results while posing the fewest treatment obstacles while taking into account the many treatment options for this aberration and serious issues such as fistula and meatal/neourethral stenosis. The purpose of this research was to assess the efficacy, aesthetics, and complications of the snodgraft technique for treating distal or midshaft hypospadias.
METHODS: The 60 boys who had Snodgraft procedures at Mayo Hospital in Lahore, Pakistan, and had distal hypospadias were included in this research, which was done from December 2022 to December 2023. After surgery, all patients were monitored and checked for postoperative problems at intervals of 1 week, 2 weeks, monthly to 6 months, and finally once a year.
RESULTS: The patients were 30.1±11.3 months old on average. Both surgical diverticulitis and meatal stenosis were not present after surgery. Four patients had urethrocutaneous fistulas at the time of the first follow-up; one of these four patients showed a spontaneous improvement after six months. All patients had normal urinary status. There was no evidence of bleeding, hematoma, or meatus stenosis in the patients. In all instances, the meatus had a very attractive look that was equivalent to that of normal individuals.
CONCLUSIONS: The Snodgrass procedure is a surgical technique used to repair hypospadias. It is known for having good outcomes in terms of the appearance of the glans and meatus, with low rates of

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complications such as fistula formation and stenosis. However, as with any surgical procedure, there is always a risk of complications and individual results may vary. It is important for patients and their families to discuss the potential benefits and risks of the Snodgrass procedure with their surgeons to make an informed decision. Prospective studies with a bigger patient sample size are required to corroborate our results.

KEYWORDS: snodgraft, hypospadias, surgery

INTRODUCTION: The Greek words hypo, which means beneath, and span, which means rent or fissure, were combined to create the medical term hypospadias. One of the most common congenital abnormalities of the male external genitalia, hypospadias is brought on by three anomalies of the penis: chordee, dorsal prepuce hood and ventral prepuce deficit, and a ventrally positioned meatus anywhere between the perineum and the glans. (1,2)

According to reports, 1/300 male births result in hypospadias. (3,4) Anterior (50%) hypospadias, comprising glandular, coronal, and sub-coronal areas 20% of instances are of the posterior type, which comprises penoscrotal, scrotal, and perineal, and 30% are of the middle type, which covers the distal, mid-shaft, and proximal penile areas. (5, 6) For at least 20 years, tabularized incised plate urethroplasty (TIP) has been the main technique for treating distal and midshaft hypospadias. (7) When the urethral plate is shallow or narrow, the outcomes of this method may not be as desirable in terms of function or appearance. (8) There have been several documented problems with the TIP technique, with meatal/neourethral stenosis being the most often reported. (9) In addition, the most frequent side effect of treating hypospadias, with a frequency of between 4 and 25%, is the development of urethrocutaneous fistulas. (10) The Snodgrass procedure (dorsal inlay graft urethroplasty) involves the use of a free graft (usually made from the foreskin or buccal mucosa) on the posterior aspect of the urethra. This technique has been shown to be effective in reducing the incidence of meatal stenosis and neourethral stenosis, compared to older techniques. The use of the free graft helps to provide a smooth, non-strictured urethral plate and reduces the risk of complications. However, as with any surgical procedure, there is still a risk of complications and individual results may vary. It is important for patients and their families to discuss the potential benefits and risks of the Snodgrass procedure with their surgeon to make an informed decision. (11)

Few research has been conducted on this approach since its launch, and further studies are required to prove its usefulness and safety. (12, 13, 14) Therefore, we sought to assess the efficacy, cosmetics, and complications of the snodgraft approach for treating distal or midshaft hypospadias.

METHODS: In this research, 60 children with distal hypoplasia who were sent to Mayo Hospital, Lahore between December 2020 and December 2022 and had Snodgraft surgery were included. Children who had circumcised penis, severe chordee, micropenis, or proximal hypospadias were disqualified from participating.

Meatallocation proximally to the mid-penile shaft was referred to as distal hypospadias. When required, the penis was degloved before performing an intraoperative artificial erection to check for chordee. The stretched penile length that was less than 2.5 SD below the age-appropriate mean was referred to as micropenis.

All operations performed for this investigation used optical magnification. the following was the surgical process: To stop bleeding, diluted adrenaline was injected into the glans after the penis was degloved and a circumferential incision was made. The urethral plate was divided bilaterally, and the glans wings were prepared. Midline longitudinal cutting of the urethral plate. According to each patient's measurements of the breadth and length of the incised urethral plate, an inner prepuce with dimensions of approximately 0.5–0.8 cm in width and 0.5–1.5 cm in length was obtained as a free graft from the dorsal perianal hood. The extra fat was taken off. In the diamond-shaped defect, this was placed as a free graft and its margins were stitched shut. To keep this graft in place inside the neourethral groove, a quilting stitch was further inserted in its middle. Finally, an 8-Fr feeding tube is tabularized around the urethral plate. This is done using a continuous, double-layered subcuticular absorbable suture. The graft is then covered with a vascularized tunica vaginalis flap, which helps to provide blood flow and nutrition to the graft. The closure of the glans wings and application of the skin cover complete the procedure. A week was spent keeping the bandage and catheter. The snodgraft technique for treating hypospadias is shown in Figure 1 in its several phases.

Following release from the hospital, patients were checked every day, then once a month for the first six months, then once a year (for 18 months). Based on the patient's medical history and physical examination, many visits were made to check the patient's glans, penis cover, chordee, and urine flow deviation. The presence of meatal stenosis or neourethral stenosis was assessed by inserting a feeding tube that is approximately the same size as the intraoperative catheter used during the surgical procedure and measuring the caliber of the neourethral lumen. If the caliber is smaller than expected, this can indicate the presence of stenosis and may require further evaluation and treatment. This measurement can help to monitor the outcome of hypospadias repair surgery and ensure that the repair is successful and that the patient is able to void normally. Age, meatal stenosis, hematoma, wound infection, postoperative bleeding, urethral stricture, fistula, and wound edge separation were only a few of the patient's characteristics that were collected in a questionnaire every day up to hospitalization. The research did not include any patients whose records were missing important information.

All patient's parents or legal guardians provided signed informed permission. The hospital’s ethical committee granted their consent.

Figure 1: Snodgraft procedure for treating hypospadias

Utilizing SPSS software v.26, data were examined. The Kolmogorov-Smirnov test was used to establish the normality of the distribution of empirical data. Frequency (%) and mean, standard deviation (SD) were employed to display descriptive statistics for qualitative and quantitative data, respectively.

RESULTS: To treat distal hypospadias, 60 patients who had been referred to the Mayo Clinic were evaluated. The patients' average age was 30.1±11.3 months. Two of the patients were under the age of ten months, while the children with the greatest frequency (13 patients) were between the ages of 35 and 40 months. 18.30% of the patients had birth weights under 2500 grams. 25.30% of patients had gestational ages at delivery that were fewer than 37 weeks. 10% of patients had a positive family history of hypospadias. Coronal distal hypospadias made up about 30% of all cases. In the analyzed samples, the average length of stay in the hospital was 3.95±1.86 days. Three days were spent in the hospital, and it was the longest stay (29 people). Regarding the length of the procedure, the samples' average operation time was 103.90±25.54, ranging from 60 to 140 minutes. The medical and demographic features of the people under investigation are shown in Table 1. Following surgery, all patients were checked at intervals of 1 week, 2 weeks, monthly through 6 months, and finally yearly (18 months in total). After surgery, no diverticulitis nor meatal stenosis was seen in this research. Furthermore, none of the patients had hematomas or bleeding.

Table 1: Patient demographics and clinical information

		Results	
		n	**%**
Age (Mean±SD)		30.2 ±11.3 (Months)	
Birth weight (Gram)	>2500	49	71.70%
	<2500	11	18.30%
Gestational age (week)	≥37	45	75.00%

	<37	15	25.00%
Family history	No	54	90%
	Yes	6	10%
Distal hypospadias types	Subcoronal	26	43.33%
	Coronal	18	30%
	Glanular	5	8.33%
	Mid penile	11	18.34%
Duration of hospitalization (Mean±SD)		3.95±1.86 (Days)	
Operation time (Mean±SD)		103.90±25.54 (Minutes)	

Table 2: Snodgraft complications after operation in hypospadias repair

Complications	**Frequency (%)**	**Group**	**Visit**
Hematoma	0 (0%)	Subcoronal	The 1st & 2nd week
Bleeding	0 (0%)	-	-
Glans rupture & wound infection	1 (1.66%)	-	-
Meatal stenosis	0 (0%)	Mid penile	The 1st & 2nd-week follow-up for six months
Fistula	4 (6.66%)	-	-

There was one instance of wound infection (1.66%) as a result of the parents applying ashes to the wound in accordance with the conventional belief in wound cleansing; this was followed by a thorough opening of the surgical site. In the initial follow-up, 4 patients (6.66%) had urethrocutaneous fistulas found, and after 6 months, 1 of these 4 patients spontaneously improved. Three patients underwent reconstructive surgery which was successful in all cases and no meatal stenosis was observed in the calibrated neourethra. All of the patients had highly acceptable and human-like Mateus appearances. The Mateus had a longitudinal, slit form. All patients' urine functions were normal, and no urinary retention was ever noted. Table 2 lists the frequency of problems after the snodgraft operation. Figure 2 depicts the two patients' follow-ups at six months.

Figure 2: Examination of two individuals 6 months afterward

DISCUSSIONS: A prevalent condition with unclear origins in terms of variation and severity is hypospadias. Normalizing function and appearance is the goal of hypospadias repair. The best time for surgery is still up for debate and depends on several factors, including anesthetic risks, tissue maturation rates, postoperative problems, and the influence of psychological and social factors. Long-term functional and visual results are typically satisfactory but still less favorable than in males without hypoplasia. (15, 16)

This study assessed the effectiveness and safety of the snodgraft procedure in 60 patients who were treated for distal or hypospadias at Mayo Hospital. There hasn't been any consensus yet on the best method for fixing hypospadias. Due to its groundbreaking nature, the Snodgrass approach for treating distal hypospadias quickly rose to the top of the list. It has various advantages, including a flatter phallus and a meatus at the tip of the penis that is more attractive. (17) Conversely, urethral stricture, meatus stenosis, and fistula are some of the often occurring side effects of Snodgrass urethroplasty. Inlay grafts back cut modifications, and vertical hole layout is only a few of the adjustments that have been mentioned as reducing these issues. (18) The most frequent causes of Snodgrass problems were thought to be narrow urethral plates and even plate incisions. Snodgraft was an effective addition to the hypospadiologist's toolkit and fulfilled the requirements for conventional hypospadias repair. (19)

Studies on the use of the snodgraft method for distal hypospadias surgery showed that after an average follow-up of 2.4 years, there was no occurrence of meatal stenosis or diverticulum at the graft site. (20) The results of the study found that 9.8% (10 patients) had urinary fistulas and none of them showed a slit-like meatus. Neither meatal nor neourethral stenosis was found in patients who underwent Snodgraft

surgery. However, 4 patients (6.66%) developed a fistula. All of the patients' urinary conditions were normal, and no one had obstructive urine flow. A different investigation's patient follow-up revealed no obstructive urine flow pattern, which is consistent with our findings. (21)

In another study of the snodgraft procedure in patients with distal hypospadias, none of the 14 patients showed meatal stenosis after an average follow-up of 18 months, which was consistent with the findings in the current study. One patient in the previous study had a fistula, while in the current analysis, 4 patients (6.66%) developed a fistula. (22)

In the thin plate of a healthy urethra, the research found that the snodgraft technique was not better than the Snodgrass procedure. (23) Additionally, there were no changes between the two groups in another study's results for fistula, meatal stenosis, and dehiscence. (24) The snodgraft technique is extremely ideal for constructing a deep and broad urethral plate, even though the Snodgrass approach is a popular procedure with outstanding outcomes and few difficulties. Snodgraft has also significantly decreased the two-step operation required as a result of the tiny penis or shallow depth of the urethra. Furthermore, the stenosis and fistula drawbacks of previous techniques were somewhat mitigated by the snodgraft procedure. (25) The small sample size is one of the study's drawbacks.

CONCLUSIONS: The snodgraft procedure for treating hypospadias is considered a straightforward and effective method with good short-term functional and aesthetic outcomes. However, it is important to note that longer-term follow-up is necessary to fully evaluate the permanency of these outcomes. Further research, including a larger multicenter study with a larger sample size, is recommended to assess the long-term outcomes of this procedure, including cosmetic appearance, sexual function and satisfaction, and sexual life after puberty. It is important to monitor both immediate complications and long-term outcomes to fully understand the effectiveness of the snodgraft procedure for treating hypospadias.

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