

An overview of traditional surgical techniques for hypospadias and outcomes: a monocentric experience

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Abstract

Background

This study examines the incidence patterns of hypospadias in this region and investigates the management strategies employed for its repair. The aim is to gain insight into the factors influencing surgical decision-making, potential complications, and the reasons behind these complications.

Materials and methods

This research was conducted at our centre from January 2019 to July 2024, involving all male patients of any age who came in with hypospadias. Data was collected from the hospital's database and analysed using SPSS (Statistical Package for Social Sciences).

Results

214 patients with a mean age of 8.13 (SD = 5.03 years) were included in the study. The most common type of hypospadias found was mid-penile. Chordee was found in 75.5% of the boys, an abnormal opening of the urethra in 9.7%, undescended testes in 2.7%, and an inguinal hernia in 2.2%. Repairs were performed using the TIP (tubularized incised urethral plate) method in 20.9% of the cases, while a notable 75.5% chose to undergo two-stage (Bracka) repairs along with various other techniques. The most common complications identified were oedema and urethrocutaneous fistula. Surgeries performed by specialists had fewer complications compared to those done by residents, with a significant difference (p -value = 0.0087). Single-stage repairs resulted in fewer complications than two-stage repairs, with a p -value of 0.0001.

Conclusion

Hypospadias repair is a complex procedure that requires considerable practice, patience, and surgical expertise, particularly when utilising magnification techniques. However, single-stage repairs are encouraged due to fewer post-operative complications.

Introduction

Hypospadias is a condition prevalent among newborn boys, occurring in every 1 in 150 to 200 births. The incidence is rising, possibly due to increasing environmental pollution, which is considered a contributing factor [1].

The BDMP (Birth Defects Monitoring Program) reports a rise in the incidence of hypospadias and is now twice what it was in the 1970s [2]. This is associated with various developmental issues, including problems with the ventral prepuce, urethral spongiosum, and penile chordee [3]. The classification of hypospadias depends on the location of the meatus. It can be found in three main areas: anterior (which includes glandular and subcoronal), midpenile (covering distal penile, midshaft, and proximal penile), or posterior (which consists of penoscrotal, scrotal, and perineal), with these categories accounting for approximately 50%, 30%, and 20% of cases, respectively [3].

The objective of this study is to investigate the demographics associated with hypospadias, the factors that influence decision-making during surgical procedures, the potential complications that may occur post-surgery, and the factors that contribute to these complications. Several factors influence the decision on the timing of surgery, such as the risks of anaesthesia, the size of the penis, and the infant's psychosocial development.

Materials and Methods

Once approval from the ethics committee was obtained, all male patients treated at the institution for hypospadias between January 2019 and July 2024 were enrolled. Patients with co-morbidities such as diabetes, clotting disorders, or conditions related to sex development, as well as those who were lost to follow-up, were excluded.

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Demographic data, clinical presentations, laboratory results, surgical treatments, complications, and the perspectives of both patients and their parents on the hypospadias repair process were analysed. Data was collected retrospectively from the department's record sheets. The operating surgeons were divided into two groups: specialists and trainees. The residents performed surgeries with either direct or indirect supervision from the specialists.

The quantitative variables were reported as means $\pm$ SD, while the qualitative variables were shown as frequencies and percentages. The key variables analysed were: age, severity, and type of hypospadias, the duration of surgery, the surgical technique used, and the surgeon's experience. Comparison of the quantitative variables were done using the Fisher's exact test with a 95% confidence interval.

Results

A total of 214 male patients were examined, with 96.4% classified as primary cases and 3.6% as secondary. The ages ranged from 1 year to 42 years, with a mean age of approximately 8.16 years (SD = ± 5.05 years). Nineteen of these patients (8.7%) had a family history of hypospadias.

There was a notable increase in the number of patients seeking surgery for hypospadias during the study period, peaking in 2019 with 53 patients, which made up 24.76% of the total. In the younger age groups, only 1.86% of patients aged 1-2 years and 34.24% of those aged 3-5 years underwent surgery, while the majority were older than 6 years. Mid-penile hypospadias, which encompasses distal penile, midshaft, and proximal penile types, is the most prevalent form, making up 49.0% of the cases ($n = 105$). Anterior hypospadias, which includes glandular and subcoronal types, accounted for 34.24% ($n = 73$) of the cases. This pattern was consistent across all regions included in the study (Figure 1).

All patients, 75.70% ($n = 162$) had some level of chordee associated with their hypospadias. The mildest form of chordee, measuring less than 20° , was the most frequently observed abnormality (51.55 %; $n = 110$), while severe chordee was noted in 7.45% of the cases.

All instances of penoscrotal and perineal hypospadias exhibited chordee, whereas glandular hypospadias had the lowest incidence, at approximately 54.70% (Figure 2).

Meatal abnormalities were identified in 9.7% ($n = 21$), with meatal stenosis being the most common, affecting 9.2% ($n = 20$) of individuals, and mega-meatus appearing

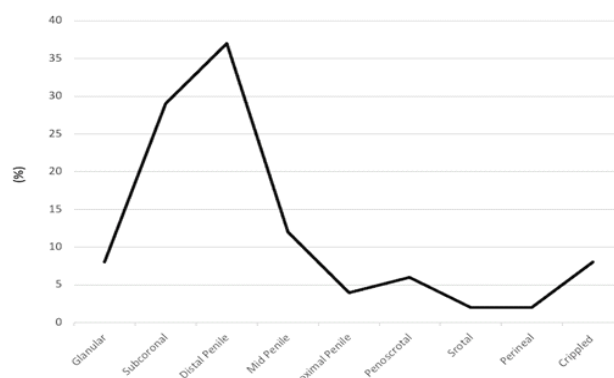


Figure 1: Hypospadias classification within the study group

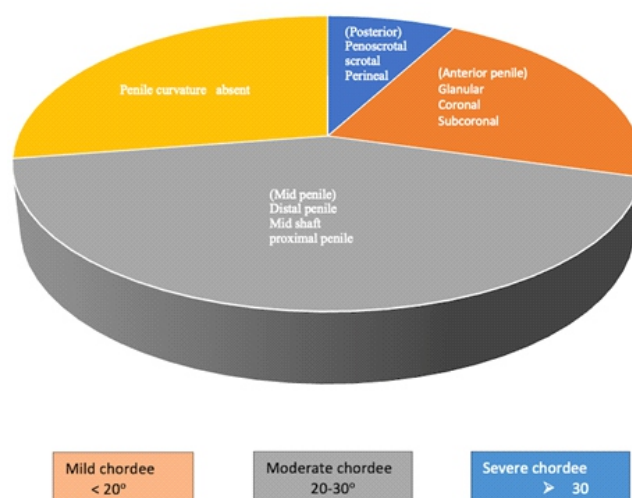


Figure 2 : Types of hypospadias and the levels of chordee

in 0.4% ($n = 1$) of cases.

Glandular (16.4%) and perineal (16.2%) variants of hypospadias were most commonly associated with meatal stenosis. Additionally, inguinal hernias were noted in 2.2 % ($n = 5$).

Of the total 214 cases, 75.5% ($n = 163$) of patients underwent two-stage Bracka's repair for their hypospadias, while 20.9% ($n = 45$) underwent a TIP repair. The two-stage hypospadias repair emerged as the most commonly used surgical technique for all types of proximal hypospadias. In 55 cases without chordee, 53.6% (29 cases) of hypospadias were treated using single-stage repair techniques, with the TIP procedure being the most common, performed in 26 cases (49.1%). For the remaining 46.4% (26 cases) of the 55 hypospadias without chordee, a two-stage (Bracka) repair was utilised, particularly for those with a narrow urethral plate and an incomplete glans cleft.

Of the total, 66.1% (142 surgeries) were performed by specialist surgeons, while the remaining 33.9% (72 surgeries) were conducted by residents. The specialists performed two-stage (Bracka) repairs in 67.50% of the cases and single-stage repairs (such as TIP, MAGPI, and Mathieu's) in 32.50% of the cases. Amongst the residents, two-stage (Bracka) repairs were performed in 93.80% cases, while TIP repairs accounted for the remaining 6.20%.

Out of the total procedures, 50.7% (n = 112) involved surgical procedures that took longer than 60 minutes. For specialists, 58.70% of the surgeries were completed within 60 minutes or less, while for residents, 68.70% exceeded the 60-minute mark. In 90% of the cases (n = 193), patients had a hospital stay of 3 days.

The most common early postoperative complications included oedema (28.40%), bleeding (4.5%), surgical site infections (4.3%), wound dehiscence (4.20%), and partial graft loss (1.42%), all of which were effectively managed with conservative treatment (Table 1).

The most common chronic complication was urethro cutaneous fistula, which appeared in 38.8% (n = 83) of cases. Out of these, 50.6% (n = 42) were treated with a single procedure, while 15.10 % required multiple surgical interventions. 31.33% of these fistulas closed spontaneously within 1 to 3 months after surgery, bringing the adjusted rate of fistulas down to 26.66%. The second most common complication was meatal stenosis, which occurred in 5.62% of the patients. The occurrence of urethrocuteaneous fistulas was highest in cases of scrotal, penoscrotal, and perineal hypospadias (Table 2).

The complication rates reported by specialists were significantly lower than the residents (56.92% vs 70.33%; P<0.01) (Table 3).

Table 2: Association of post operative urethra-cutaneous fistulae with variations of Hypospadias

Hypospadias types	Urethrocuteaneous fistula		Total
	Nil	Yes	
Glanular	12 (80.62%)	3 (19.38%)	15
Sub coronal	47 (74.39%)	16 (25.61%)	63
Distal penile	58 (75.79%)	19 (24.21%)	75
Midshaft	16 (70.20%)	8 (29.80%)	24
Proximal penile	3 (66.76%)	2 (33.24%)	5
Scrotal	1 (33.30%)	2 (66.70%)	2
Penoscrotal	5 (52.63%)	4 (47.37%)	9
Perineal	2 (66.70%)	1 (33.30%)	3
Crippled	13 (72.20%)	5 (27.80%)	18
Total	157 (73.4%)	57 (26.6%)	214

Table 3: Comparison of complication rates amongst procedures conducted by specialists and residents

Expertise	Complications		Total
	Yes	No	
Specialists group	80 (56.92%)	61 (43.08%)	141
Residents group	51 (70.33%)	22 (29.67%)	73
Total number of patients	132	82	214

(P <0.01)

Procedures conducted by specialists reported a significantly lower rate of postoperative urethro cutaneous fistulae requiring repair (23.32% vs 33.10%; P<0.05).

Table 1: Complications associated with different techniques for Hypospadias repair.

Procedure	Complications				Total
	Nil	Acute complications	Chronic complications	Acute and chronic	
Two-stage	54 (33.10%)	36 (22.10%)	41 (25.10%)	32 (19.60%)	163
TIPS	25(56.20%)	6 (13.50%)	9 (21.30%)	4 (8.90%)	44
Mathieu	1 (50%)	0 (0%)	1 (50%)	0 (0%)	1
MAGPAI	3 (54.55%)	0 (0%)	3 (45.45%)	0 (0%)	6
Total	83	42	53	36	214

Table 4: Comparison of postoperative urethrocutaneous fistulae rates requiring surgical correction rates amongst procedures conducted by specialists and residents

Expertise	Fistula		Total
	Nil	Yes	
Specialists group	108 (76.78%)	33 (23.32%)	141
Residents group	49 (66.90%)	24 (33.10%)	73
Total number of patients	157 (73.40%)	57 (26.60%)	214

In proximal hypospadias repair, the single staged techniques had a significant;y lower complication rate (44.10% vs 66.9; $P<0.01$) (Table 5, Figure 3).

Table 5: Postoperative complication rates in single and two-stage procedures.

Surgical procedure	Complications		Total
	Yes	No	
Two-stage	109 (66.90%)	54 (33.10%)	163
Single-stage	23 (44.10%)	28 (55.90%)	51
Total	82 (38.60%)	132 (61.40%)	214

($P<0.01$)

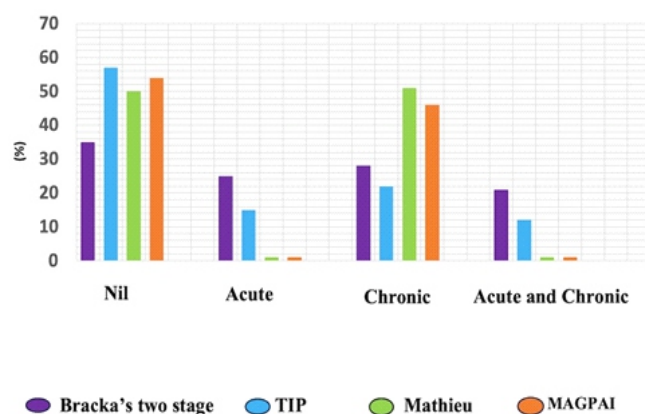


Figure 3: Postoperative complication patterns associated with different techniques of hypospadias repair.

There is a nonsignificant higher rate of postoperative urethrocutaneous fistula formation in two-stage procedures (19.6% vs 28.8%; $P>0.05$) (Table 6).

Table 6: Occurrence of urethrouaneous fistula in single and two-stage procedures

Surgical procedure	Fistula		Total
	Yes	No	
Two-stage	47 (28.85%)	116 (71.25%)	163
Single-stage	10 (19.64%)	41 (80.40%)	51
Total	57 (26.66%)	157 (73.44%)	214

$P=0.7$

Discussion

This analysis provides valuable insights into patient demographics, surgical procedures, complications, and the various factors that can impact the success of hypospadias repair. In this study, we found that only 35.6% of patients were operated on within the 3–5-year age range, and only 1.87% in the 1 to 2-year window. The majority of patients presented at the age of 6 years or older. Gohil et al. reported the average age at which patients present with hypospadias to be around 7.55 years [3]. These findings do not comply with the recommended timing for hypospadias repair, which is between 6 and 18 months of age [4]. The reason for a higher average age at correction at this centre is its' preference of carrying out hypospadias surgeries during the preschool years, typically around 3 to 4 years of age. The higher number of patients coming in at age 6 or older can be linked to a lack of public awareness about the condition and financial constraints. 8.7% of the total patients had a positive family history of hypospadias. This finding aligns with the results of Ollivier et al, who reported a 12% association with a family history of [5]. Akin et al. found an even more striking rate of 26.5% in their study conducted [6]. The lower rate of familial preponderance in this study may be due to underreporting associated with the social stigma associated with this condition. In this study, mid penile hypospadias is the most prevalent type, with anterior hypospadias closely following. However, the predominant pattern of hypospadias varies in the literature. According to Suresh et al, distal hypospadias has the highest incidence, followed by midshaft and proximal hypospadias [7]. Ollivier M et al. reported anterior hypospadias as the predominant type in their research [5]. However, Patra et al. reported that distal hypospadias (61.45%) was present in 65.7% of their study population [8]. Chordee was present in 75.70% of the hypospadias cases in this group, with mild chordee being the most frequently seen type. Ollivier M and colleagues found similar results, observing positive chordee in 88% of the cases they studied [5].

Additionally, abnormalities of the meatus were associated with 9.7% of the hypospadias cases in this study, while Patra et.al. had observed meatal stenosis in 22.7% of patients [8]. Cryptorchidism, in contrast, was associated with 2.9% patients with hypospadias in this study while Wood et al. found a similar association in 7.3% cases [9]. Ollivier M et al. noted a positive relationship between hypospadias and cryptorchidism in 20% of cases [5]. Akin et al. found that 14.7% of patients with hypospadias in their population to have cryptorchidism [6].

In this study, inguinal hernias were present in 2.2% of the patients, which aligns closely with the findings of Ollivier M et al. who reported a rate of 2% in their study population, [5], while in contrast to Wood et al., who reported inguinal hernia in 12.4% of hypospadias patients [9].

In the current study, the two-stage Bracka's repair emerged as the most frequently performed procedure, accounting for 75.5% of procedures. This approach was particularly utilised for patients with a narrow urethral plate and incomplete glans cleft, accounting for 46.5% of cases without chordee. The second most common procedure was the Snodgrass (TIP) technique, which was carried out in 20.9% of cases. Wood and his team opted for a single-stage procedure for most of their study participants, whereas Duckett and his colleagues mainly relied on the MAGPAI technique for their cases [9],[10].

The majority of operators involved were the residents handling two-stage repairs (Bracka's). The popularity of the two-stage repairs amongst residents may be attributed to the technically demanding nature of the one-stage procedure and the relatively steep learning curve associated with two-stage repairs.

The most common complication seen after surgery was oedema, affecting 28.40% of patients. This higher incidence of postoperative oedema could be related to the extended use of the tourniquet and the accidental application of bipolar cautery. In this study, urethrocutaneous fistula was observed in 26.6% of cases. Zulli A and colleagues found that UCF was the most prevalent complication, followed closely by oedema, in their research [11]. Similar rates of fistulae were reported by Duarsa et al. in their population [12]. In contrast, Zaidi et al. found a lower frequency of 14.6% for UCF in their study [13]. Bush et al. noted 11.5% in their study of TIP repairs [14] while O'Connor and colleagues found that the postoperative fistula rates were 33% for patients who had a TIP with a single-layer closure using chromic catgut, and

those with a two-layer closure using polyglactin had a rate of 10%. [15]. In this study population, the relatively high frequency of UCF may be attributed to the infrequent use of magnification and microvascular instruments.

The higher rate of urethrocutaneous fistula amongst the procedures performed by the residents highlights the technically demanding nature of the repair procedures. Salzhauer and Horowitz also noted findings that support these observations regarding this learning curve [16]. In this study, urethrocutaneous fistulas were more frequently seen in cases of proximal hypospadias, such as penoscrotal, scrotal, and perineal types, compared to distal hypospadias. This finding is consistent with the results reported by Chung et al. [17].

To improve the outcomes of hypospadias treatment, revising the existing institutional guidelines is advised. This would comprise carrying out hypospadias repairs between 6 and 18 months of age, ensuring that magnification is used during surgery, and tightening the criteria for two-stage Bracka's repair. This implies that it must be considered for more severe cases, such as those with significant chordee, that still have residual chordee after initial treatment, and those with fibrosed, narrow urethral plates that can't be fixed with Snodgrass repair.

Conclusion

Hypospadias surgery is a highly specialised area that comes with its own set of challenges. It demands not just a great deal of patience and surgical expertise, but also a deep understanding of magnification techniques and the intricacies of surgical anatomy. By adhering to strict guidelines, the chances of postoperative complications can be significantly lowered. It's essential to operate within the recommended therapeutic windows, utilise microsurgical instruments, and ensure that residents receive direct supervision during their surgeries. To manage hypospadias effectively, it's important to treat hypospadias as a distinct speciality. This field of surgery comes with a significant learning curve, so it's crucial to recognise its unique challenges. It is recommended that surgeons possess the right temperament and have a solid grasp of the six key techniques, handling at least 40 to 50 cases each year to achieve better outcomes in hypospadias surgery.

Moreover, focus must be given to improving skills for single-stage repairs in cases of hypospadias linked to mild to moderate chordee, as well as tackling more complex situations to help ease psychological distress and minimise postoperative issues. Regular audits are also crucial for

continually improving the outcomes of hypospadias repairs.

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