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ORIGINAL RESEARCH

Outcomes of hypospadias repair in a university hospital in Dakar, Senegal

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Background: Hypospadias is a congenital abnormality due to hypoplasia of the ventral penile tissues. Hypospadias surgery has benefited from a better understanding of penile anatomy and improved instrumentation. In sub-Saharan Africa, particularly in Senegal, hypospadias surgery remains a challenge due to limited equipment. Our study aimed to evaluate the results of hypospadias surgery at a referral centre in a resource-limited country.

Patients and methods: This was a retrospective descriptive study of 126 patients treated at our centre over six years. The most used surgical techniques were Duplay, Snodgrass, Mathieu, and Duckett.

Results: The postoperative complication rate was 39.7%. Urethrocutaneous fistula was the most common complication (24%). Other complications included suture release (8.7%), meat stenosis (4%), residual curvature with an unsatisfactory aesthetic appearance (3%). After a follow-up of 3–24 months, outcomes were good in 54% of cases, intermediate in 9.5%, and failed in 36.5%. Results for anterior forms were better compared with those for midshaft and posterior forms ($p = 0.002$). The good results were predominant in patients aged 0–6 years. There was no statistical difference in urine drainage type.

Conclusion: Hypospadias surgery is challenging in developing countries, with high rates of complications. To improve results, it is necessary to improve equipment and postoperative care.

Keywords: surgery, hypospadias, developing countries

Introduction

Hypospadias is a congenital abnormality due to hypoplasia of the ventral penile tissues. It can be associated with ectopic urethral meatus, penile curvature, and dorsal hood.[1] Its incidence differs among countries. In France, it is 1/300 male births, and 0.26/1 000 in Mexico.[1] In Senegal, the prevalence of this malformation is unknown.

Recently, hypospadias surgery has benefited from improved understanding of penile anatomy and advances in equipment (sutures, magnification, urethral catheters). In sub-Saharan Africa, particularly in Senegal, hypospadias surgery remains a challenge because adequate equipment, including microsurgical and magnification instruments, is unavailable. Moreover, there are few studies on this congenital abnormality. This preliminary study aimed to evaluate the results of hypospadias surgery at a referral centre in a resource-limited country.

Patients and methods

This descriptive retrospective study spanned six years and included 126 patients managed for hypospadias at our centre. The Duckett classification of hypospadias, described by John Duckett in 1966, was used to distinguish anterior (glandular, subcoronal, and penile distal), midshaft, and posterior forms (penile proximal, scrotal, and perineal). Karyotype was performed in the posterior forms to eliminate disorders of sexual differentiation. Classification was made for those with penile curvature after correction. Penile curvature correction was performed by fibrous tissue release only, combined with urethral plate resection, or by Nesbit dorsal corporoplasty.

Surgical procedures were performed by different surgeons using different surgical techniques. The most used surgical techniques were Duplay, Snodgrass, Mathieu, and Duckett. Duplay's technique consists of tubularisation of the urethral plate distal to the urethral orifice. Snodgrass makes an incision of the plate before tubularisation. Mathieu's procedure is a meatal-based flap technique. Duckett's technique uses a transverse preputial island flap that is tubularised to complete the missing urethral segment. The Snodgrass and Mathieu techniques were used for the anterior forms. Duplay's procedure was performed for anterior and posterior forms. Duckett's technique was used for posterior forms, or those with penile curvature solved by urethral plate excision.

A urethral stent was used in most cases for urethral calibration and urinary drainage. In severe forms, a suprapubic catheter was used in combination with other urinary drainage methods. For urethral stenting, 7–16 Fr aspiration catheters were used, depending on the patient's age and urethral plate size.

Results were considered good, intermediate, or failed. Results were good when there were no complications with an apical meatus, or intermediate in case of complications (meatus not located at the glans tip/apex of the glans, presence of urethrocutaneous fistulae, or meatus or urethra stenosis). Failed results were those with complete suture release and/or persistence of penile curvature more than 30°.

Patients were clinically assessed at three, six, 12, and 24 months postoperatively. Data were recorded and analysed using EpiData version 3.1. A chi-square test was used to compare results. The difference was considered significant at a p-value < 0.05.

Table I: Distribution of patients by surgical technique and hypospadias form

Surgical technique	Hypospadias form, *n* (%)							
	Anterior (*n* = 78)			Midshaft (*n* = 23)	Posterior (*n* = 25)			
	Glandular	Coronal	Distal		Scrotal	Penoscrotal	Perineal	Total
Duplay	-	8 (6.3)	12 (9.5)	7 (5.6)	9 (7.1)	4 (3.2)	2 (1.6)	**42 (33.3)**
Duckett	-	5 (4)	9 (7.1)	9 (7.1)	5 (4)	5 (4)	-	**33 (26.2)**
Koff	2 (1.6)	5 (4)	-	-	-	-	-	**7 (5.6)**
Mathieu	2 (1.6)	12 (9.5)	9 (7.1)	5 (4)	-	-	-	**28 (22.2)**
Mathieu + Snodgrass	-	-	1 (0.8)	-	-	-	-	**1 (0.8)**
Mustardé	1 (0.8)	-	2 (1.6)	-	-	-	-	**3 (2.4)**
Snodgrass	-	7 (5.6)	3 (2.4)	2 (1.6)	-	-	-	**12 (9.5)**
Total	**5 (4)**	**37 (29.4)**	**36 (28.5)**	**23 (18.3)**	**14 (11.1)**	**9 (7.1)**	**2 (1.6)**	**126 (100)**

Results

The mean age of the patients was 9.74 ± 8.36 years (range 1–40). Patients had prior urethroplasty in 18% of cases. Anterior hypospadias was the most common form (62%) (Table I). Duplay urethroplasty was the most used procedure (33.3%). Mathieu's procedure was most used for anterior hypospadias (29.5%), while Duckett's and Duplay's techniques were most used for midshaft and posterior hypospadias, respectively (Table I). Penile curvature occurred in 71% of the cases. Curvature correction was performed by releasing fibrous tissue only, by urethral plate resection, or by Nesbit dorsal corporoplasty.

Postoperative urinary drainage was performed with a urethral catheter (72%), a suprapubic catheter alone (4%), or in combination with a urethral stent (24%). The postoperative complication rate was 39.7%. The main complications were fistulae (24%), suture release (8.7%), meatal stenosis (4%), and residual curvature with an unsatisfactory aesthetic appearance (3%). The mean time for disruption of the wound was 12.6 ± 6.2 days (range 4–17), mostly due to wound infection. The complication rates, as assessed by the surgical techniques, were 27.6% for Duplay and 22.4% for Mathieu (Table II).

After 3–26 months of patient follow-up, results were good in 54% of cases, intermediate in 9.5%, and failed in 36.5%. Results were good for anterior (39.7%), midshaft (9.5%), and posterior forms (4.7%) (p = 0.002). Results were better in the 0–6 year age group, with 64.3% good results (Figure 1). Overall results by surgical procedure are shown in Figure 2. Duplay's technique offered better results,

Table II: Distribution of patients according to surgical technique and complication rate

Surgical technique	Complications	%
	Number of complications/total cases	
Duplay	16/42	27.6
Duckett	18/33	31
Koff	4/7	6.9
Mathieu	13/28	22.4
Mathieu + Snodgrass	1/1	1.7
Mustardé	2/3	3.5
Snodgrass	4/12	6.9
Total	**58**	100

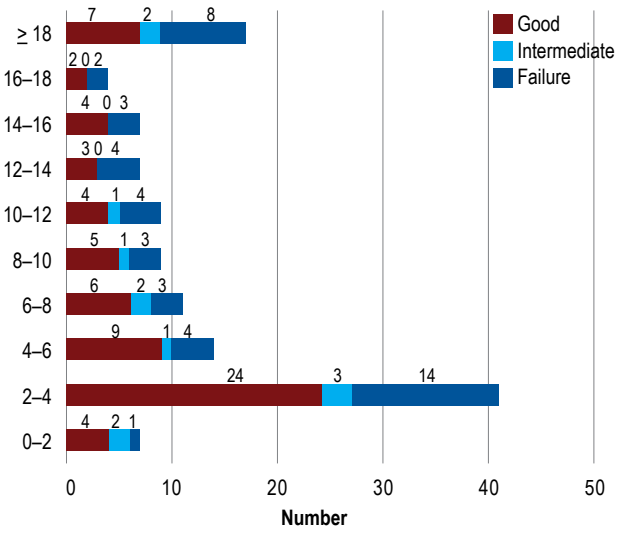

Figure 1: Distribution of patients according to results by age group

Table III: Therapeutic results according to technique and hypospadias form

Surgical technique	Anterior hypospadias		Midshaft hypospadias		Posterior hypospadias			
	Good	Intermediate and failed	Good	Intermediate and failed	Good	Intermediate and failed	Total	*p*-value
Duplay	12	8	5	2	9	6	42	0.85
Duckett	6	8	4	5	5	5	33	0.93
Mathieu	12	11	3	2	-	-	28	1
Snodgrass	7	3	1	1	-	-	12	1
Mustardé	1	2	-	-	-	-	3	-
Koff	3	4	-	-	-	-	7	-
Mathieu + Snodgrass	-	1	-	-	-	-	1	-
Total	**41**	**37**	**13**	**10**	**14**	**11**	**126**	

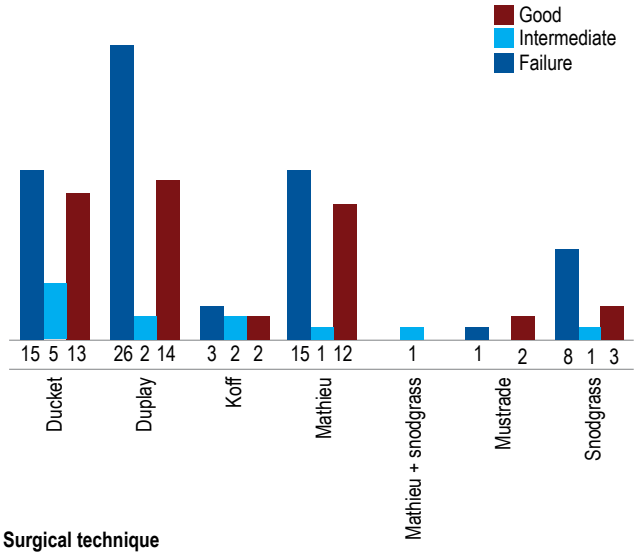

Figure 2: Number of patients distributed according to results and surgical technique

with good results in anterior (28.5%), midshaft (11.9%), and posterior forms (21.4%) ($p = 0.85$).

Outcomes according to hypospadias forms are reported in Table III. No significant difference was observed between techniques across hypospadias forms. Also, no difference in urinary drainage type was observed after urethroplasty. Results for urethral catheter were 38.9% good and 28.6% failed, and 2.7% good and 7.1% failed for a suprapubic catheter with a urethral stent ($p = 0.96$).

Discussion

Hypospadias repair is a challenging surgery. The numerous techniques described demonstrate the complexity of this surgery. There are currently more than 400 surgical procedures with variants. The existing difficulty is heightened by inadequate equipment in developing countries. This reduces the rate of good results, which are lower than those reported by other authors.[2-5] The steps of hypospadias surgery include penile orthoplasty, urethroplasty, spongioplasty, and glanduloplasty.[6]

In developed countries, hypospadias is diagnosed at birth and treated early. This promotes good therapeutic results and reduces psychological consequences. According to Demède et al.,[1] the best age for surgery is between 12 and 24 months. However, in West Africa, the age at surgery is between seven and nine years, as reported in our study and by Diallo et al.[7] in Guinea-Conakry and Diao et al.[8] in Senegal. These delays in diagnosis and treatment are related to the lack of awareness about the disease, as well as taboos and myths associated with genital diseases in our societies.

Hypospadias surgery in older children and adults is linked to a higher complication rate.[9,10] In this study, failures were significant for age groups 12–14 and 16–18 years. Yildiz et al.[10] report a higher rate of fistulae in children aged > 10 years (13.6%; $p < 0.05$). Long urethral catheterisation, the existence of fibrotic tissue, and postoperative penile erections are factors that explain these findings.[4,9,10] Hypospadias repair success depends on selecting the appropriate surgical technique. The choice of surgical technique depends on the type of hypospadias, the surgeon's experience, any associated penile anomalies, and whether the patient had prior hypospadias repair.

Anterior forms of hypospadias are the most common. Their prevalence is estimated at 65–70% of cases.[5] In a series of 500 cases, Sahran et al.[11] reported 74.2% anterior forms. Their surgical treatment can be performed in a single step with satisfactory therapeutic results. Duplay's technique is good for anterior hypospadias and can be used for midshaft forms according to Bouhafs et al.[5] He reports a low complication rate (11%) in a study of 585 hypospadias treated with Duplay's technique.

The tubularised incised plate (TIP) technique, popularised by Snodgrass, can also be used in the anterior and midshaft forms of hypospadias. Compared with Mathieu's technique, it has very few complications with good cosmetic results.[4] Osifo et al.[3] used the Snodgrass and Mathieu technique in 36.2% and 26% of patients, respectively. No complications were observed with the Snodgrass technique, while three cases of urethral stenosis were observed with the Mathieu technique.

A recent literature review by Snodgrass et al.[12] compared the Mathieu and Snodgrass urethral plate incision techniques in anterior hypospadias. They identified 23 papers on TIP and Mathieu's procedure published since 1990. There was no difference in fistula occurrence, meatal stenosis, or urethral stenosis. Similarly, a study comparing the Q_{max} in children treated by these two techniques found no difference after a median follow-up of 20 months.[13] This finding was similar, if flowmetry is performed at variable postoperative times, from < 6 months to > 10 years.[14] However, the TIP offered a better aesthetic appearance than Mathieu's procedure. Snodgrass's technique for repairing anterior hypospadias is preferable to Mathieu's flap, given its contribution to cosmetic outcomes, even though both techniques are viable.[12]

Posterior hypospadias forms are less frequent, may be extremely severe, and are sometimes associated with cryptorchidism, micropenis, or part of a sexual differentiation disorder. In these cases, endocrine, genetic and morphological assessments are necessary.[15] Posterior forms carry a higher risk of complications.[16,17] Bankole et al.[17] report a 31% complication rate, of which 20% are urethrocutaneous fistulae. In our study, the results were good in 4.7% of cases for posterior forms. Two-stage surgery is the most common technique used in these forms.[16,18] It allows correcting the curvature and offers better results with low complication rates. In Bankole et al.'s[17] study, complication rates were 26% for two-stage surgery and 37% for one-stage surgery.

Anaesthetic risk and additional financial costs associated with two-stage surgery are not inconsequential in our countries.[18] Bracka's technique is the most successful if this approach is indicated.[18] Posterior forms are mostly associated with ventral penile curvature. Orthoplasty is the first operative step in these cases. It is carried out by degloving the penis with excision of the fibrous tissues. To avoid excision of the urethral plate, several authors suggest dorsal corporoplasty when the penis is not straight after degloving.[19]

Others perform a ventral incision of the corpus cavernosum after urethral plate dissection.[18]

Snodgrass et al.[12] estimated the residual penile curvature after degloving. For posterior hypospadias with residual curvature < 30°, they suggest repair with TIP or the onlay island flap, as the overall results do not show significant differences between the two techniques. However, when the residual curvature is > 30°, they perform urethral plate resection with either a single ventral incision and grafting or several ventral incisions to complete the orthoplasty. Urethroplasty is performed using a two-stage flap or a two-stage grafting technique.

Penile fistula is the most common complication of hypospadias surgery, occurring in 7.4% of all surgical techniques.[5] Its frequency is higher in our study (24%). Bouhafs et al.[5] reported a 7.5% fistula rate with the Duplay procedure for anterior hypospadias. The Snodgrass technique is a safe technique for distal and midshaft hypospadias with a low fistula rate.[9] Mathieu's technique has a higher fistula rate, which relates to the quality of the skin flap dissection. In severe posterior forms using the Koyanagi method, De Mattos et al.[20] reported a 61.5% complication rate, including fistula, meatal stenosis, suture release, and diverticulitis.

More recently, Kang et al.[21] published a series of 24 patients with severe hypospadias treated with a modified Koyanagi technique, and reported five cases of complications, including four fistulae and one case of suture release. Moreover, postoperative infection is a significant cause of fistulae due to suture release. Using appropriate instruments with microsurgical loupes, fine sutures, suitable urethral catheters, and postoperative care techniques all contribute to reducing the complication rate.

Similarly, increased skill in hypospadias surgery with experience is beneficial, and prospective data assessment may improve results in our practice. Hypospadias repair evaluation includes assessing the patient's view of the results. This provides precious information for evaluation, aids decision-making, and improves efficiency and care quality.[22] Several tools to evaluate patient satisfaction have been described in the literature. These include the Hypospadias Objective Penile Evaluation score, the Paediatric Penile Perception Score, and genital perception. However, most of these scores evaluate postoperative cosmetic aspects and not sexual function or psychosocial repercussions.[22]

Conclusion

Hypospadias repair remains a challenging surgery in developing countries, with high failure and complication rates. Surgical success is associated with the chosen surgical technique, good instrumentation, qualified surgeons, and good postoperative care. Duplay's technique offers better results. Posterior forms of hypospadias usually need flaps and two-stage graft repair.

Conflict of interest

The authors declare no conflict of interest.

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