

Long-Term Complications of Hypospadias Repair: A Ten-Year Experience from Northern Zone of Tanzania

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Background: Hypospadias is one of the commonest congenital penile abnormalities in newborn males. The external urethral opening can be located anywhere from the glans penis along the ventral aspect of the shaft of the penis up to the scrotum or the perineum in extreme cases. The condition has a huge impact on the patient's psychological, emotional and sexual well-being.

Aim: To determine the proportion of patients who develop long-term complications after hypospadias repair and its associated risk factors.

Methods: This was a hospital-based analytical cross-sectional study, conducted at KCMC Urology Institute from January 2009 to December 2018 and all children were followed up for 1-year post-operatively. A structural data sheet was used to collect information from patients' files. Study parameters include age, location of hypospadias, surgical technique, surgeon experience, chordee, suture size, materials to assess the association with long-term complications.

Results: A total of 254 patients were included in the study, the majority were aged more than 2 years (71.83%) with mean age at operation (SD) of 4.74 ± 2.99 years. Distal types were the most common type of hypospadias (125 patients; 50%), and 51 patients (20%) had severe chordee. Tubularized incised plate (TIP) repair was the most common technique (130 patients; 51.59%). The number of patients with long-term complications following hypospadias repair was 156 (61.60%) and urethrocutaneous fistula (UCF) accounted for 40.5%. The surgeon's experience, location of hypospadias, surgical technique and associated chordee were significant predictors of long-term complications of hypospadias repair.

Conclusion: Tubularized incised plate urethroplasty is a safe and reliable method of hypospadias repair. Proximal hypospadias with severe chordee still remain a challenge.

Keywords: hypospadias, long-term complication

Background

Hypospadias is a common congenital abnormality of the anterior part of the male urethra and penile development.¹ It is characterized by three classical features; an abnormal location of the external urethral meatus, abnormal ventral curvature of the penis and dorsal hooded prepuce.¹⁻⁴

The condition is diagnosed clinically and treated surgically with several aims, including psychological, to allow voiding in a standing position, and to allow insemination of sperm in the proper place. Although there are various surgical techniques available for hypospadias repair, treatment is still a challenge because of

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associated complications. As a result, long-term complications of hypospadias repair are reported in 30% of these operations globally.⁴⁻⁸

There are many risk factors for long-term complications of hypospadias repair, such as severity of hypospadias, location of hypospadias, surgical repair technique, age at operation, preoperative hormonal therapy, dressing technique and type of suture material.⁷ At our Centre we perform one to two hypospadias operations per month, and some of them develop various complications.

The aim of this study was to determine the frequency of long-term complications and its associated risk.

Methods

Study Design

It was a hospital-based analytical cross-sectional study involving all patients who underwent hypospadias repair from 2009 to 2018.

Study Population and Data Sources

The record books of patients who underwent hypospadias repair from January 2009 to December 2018 at KCMC – Zonal Referral and Teaching Hospital in Tanzania were retrieved from the medical records. A pre-tested structural data collection form was used to extract information from the patient record books. Records of these patients from the time of operation up to 1-year post-operative were extracted from their books.

The ethical clearance and permission to conduct this study from retrospective review was obtained from KCMUCo Research and Ethical committee (2351) and Institute of Urology at KCMC respectively. All patients' information was kept confidential: no direct patient identities were used in this study.

Outcomes and Explanatory Variables

The main study outcome included was long-term complication of hypospadias repair (urethrocutaneous fistula, meatal stenosis, urethral stricture, relapse chordee formation and meatal stenosis)

Explanatory variables included in the study were age at operation, types of hypospadias, surgical experience (<5 cases operated, >5 cases operated), surgical technique, suture material, suture technique, type of dressing, presence of chordee (mild 0–20°, moderate 30–40°, severe >50°).

Statistical Analysis

Multivariable logistic regression was used to model the relationship between exposure and outcomes variables. The magnitude of association was determined using crude prevalence ratio with 95% confidence interval. Statistical significance was set at p value of < 0.05.

Table 1 Distribution of Characteristics from the Study Population

Variables	n(%)
Age (mean (sd))	4.74(2.99)
Age at time of operation	
Less than 2 years	71(28.17)
More than 2 years	181(71.83)
Surgeon experience	
<5 cases operated	126(50)
>5 cases operated	126(50)
Suture size	
3	4(1.59)
4	163(64.68)
5	49(19.44)
6	36(14.29)
Type of suture material	
Monocryl	21(8.33)
Pds	14(5.56)
Vicryl	217(86.11)
Suture technique	
Continuous	5(1.98)
Interrupted	5(1.98)
Subcuticular	242(96.03)
Location of hypospadias	
Distal	125(49.6)
Mild	47(18.65)
Proximal	80(31.75)
Surgical technique	
Ducket	32(12.7)
MAGPI	2(0.79)
Mathias technique	15(5.95)
Snodgrass	130(51.59)
Staged hypospadias repair	69(27.38)
Onlay/inlay	4(1.59)
Chordee	
Mild	36(14.29)
Moderate	20(7.94)
Severe	51(20.24)
No chordee	145(57.54)
Total	252(100.00)

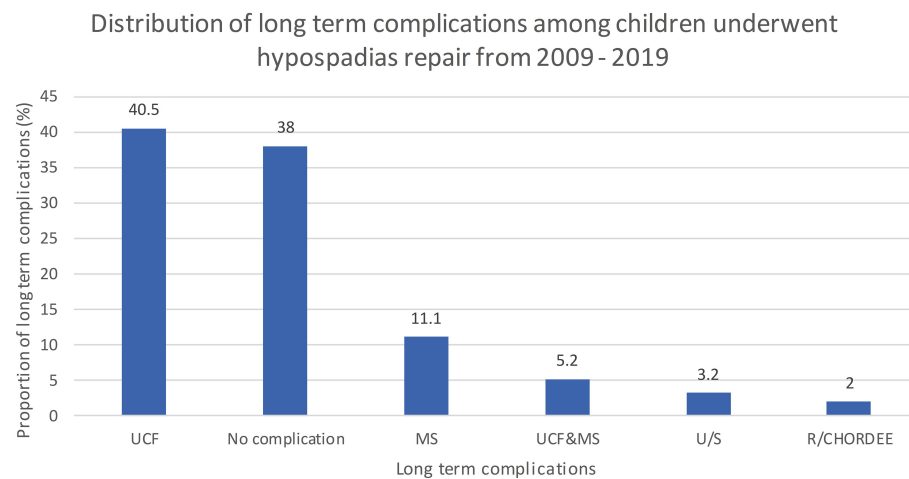


Figure 1 Distribution of long-term complications among children who underwent hypospadias repair.

The power of the study was obtained using Kirkwood and Sterne formula (2003).⁹

Results

There were 254 patients who underwent hypospadias repair between 2009 and 2018. Two patients had missing information in the record book and were excluded and therefore 252 were included in the analysis. These patients were followed up for 12 months post-operatively.

Table 1 shows the general characteristics of the study population; the majority of patients were aged 2 years and above (181; 71.83%) (mean age (SD) 4.74 ± 2.99 years). The distal type was the most common type of hypospadias (125; 50%). The majority of patients underwent the Snodgrass repair technique (130; 51.59%). The severe form of chordee (51; 20%) was the most common among hypospadias patients. The subcuticular suturing technique was most practised during the repair (294; 96.03%) and four zero Vicryl suture material was used in 163 (64.68%). Just over half of the study subjects (126) were operated on by experienced surgeons.

Figure 1 shows the proportion of long-term complications. UCF was the most common complication encountered (40.5%), followed by meatal stenosis (11.1%). Combined UCF and meatal stenosis accounted for 5.2%. There were a few cases of urethral stricture and relapse of chordee (3.2% and 2%, respectively).

Table 2 indicates the proportion of long-term complications and their associated factors. The majority of patients (156; 61.60%) developed at least one long-term complication. Surgeon experience, location of hypospadias, surgical technique and presence of chordee were

statistically significantly associated with development of at least one long-term complication of hypospadias repair ($p < 0.001$).

Table 3 shows crude and multivariable analysis for the association between long-term outcomes and significant predictors.

Adjusted for the effect of location, surgical technique and chordee, the prevalence of having at least one long-term complication among children who were operated on by a surgeon with more than five cases experience was 40% lower compared with those children who were operated on by a surgeon with less than five cases experience (CR=0.6; 95% CI: 0.43–0.84; $p = 0.003$).

However, those children who underwent the Snodgrass technique had a long-term complication prevalence of 46% lower compared with other surgical techniques (CR=0.54; 95% CI: 0.31–0.93; $p = 0.028$) after adjusting for effect of location, surgeon experience and presence of chordee.

Adjusting for the effect of surgeon experience, surgical technique and chordee the prevalence of having at least one long-term complication among children who had distal type of hypospadias was 12% higher compared with those children who had a mild type of hypospadias (CR=1.12; 95% CI: 0.62–2.03, $p = 0.701$).

However, after adjusting for the effect of location, surgeon experience and surgical technique, the prevalence of having at least one long-term complication among children with severe chordee was 55% higher compared with those with no chordee (CR=1.55; 95% CI: 0.74–3.24; $p = 0.26$).

Table 2 Relationship Between Characteristics and Long-Term Outcomes

Variables	Patients with At Least One Long-Term Outcome	
	n(%)	p-value
Age at time of operation		
Less than 2 years	41(57.75)	0.395
More than 2 years	115(63.54)	
Surgeon experience		
<5 cases operated	100(79.37)	<0.001
>5 cases operated	56(44.44)	
Suture size		
3	2(50)	0.109
4	106(65.03)	
5	32(65.31)	
6	16(44.44)	
Type of suture material		
Monocryl	13(61.9)	0.78
Pds	10(71.43)	
Vicryl	133(61.29)	
Suture technique		
Continuous	3(60)	0.879
Interrupted	4(80)	
Subcuticular	149(61.57)	
Location of hypospadias		
Distal	54(43.2)	<0.001
Mild	32(68.09)	
Proximal	70(87.5)	
Surgical technique		
Ducket	25(78.13)	<0.001
Magpi	2(100)	
Mathias technique	13(86.67)	
Snodgrass	51(39.23)	
Staged hypospadias repair	61(88.41)	
Onlay/inlay	4(100)	
Chordee		
Mild	26(72.22)	<0.001
Moderate	19(95)	
Severe	47(92.16)	
No chordee	64(44.14)	
Total	156(61.60)	

Discussion

Proportion of Long-Term Complication

The proportion of study participants who developed at least one long-term complication was 61.60% (156 of 252). UCF was the most common complication accounting for 40.5% followed by meatal stenosis at 11.1%. This

finding is similar to a study done in Nigeria where the proportion of long-term complications was 50%, UCF being most common (38%) followed by meatal stenosis at 12.5%.¹⁰

However, the finding is different from a study done in France where the prevalence was 36.2% and UCF accounted for 12.9%, meatal stenosis 8.2% and relapse of chordee was 4.5%.⁷ Our figures in the current study are probably higher because we do not use magnifying glasses in these delicate surgeries and this predisposes to higher complication rates.

Age below 2 years had 26% and age more than 2 years had 41% long-term complications. This is most likely due to feasibility of post-operative management and lower psychological impacts with better healing process in children below 2 years.^{3,7}

Risk Factors and Long-Term Complications

In our study some risk factors have been picked up which were associated with long-term complications of hypospadias repair. These include surgeon experience, location of hypospadias, surgical technique and associated factors.

The prevalence of having long-term complications was 44% lower among children who were operated on by an experienced surgeon compared with a less experienced surgeon. This study is consistent with a study done in Egypt which showed significant impact on success with reduction of long-term complications from 35% to 9% with experienced surgeons. That fewer complications are observed following operations by experienced surgeons is probably due to better hand skills, improvement on learning curve and proper pre- and intra-operative judgement in choosing the best technique.¹¹

The proximal type of hypospadias has been shown to have 29% higher chance of developing long-term complications compared with middle and distal types. UCF was observed in 66% of proximal, 51% in middle and 20% in distal, especially if it is associated with severe chordee.

There is much variation with a study done in Canada which showed 15–56% long-term complications in proximal type associated with severe chordee and a study in Korea reporting 48.9% long-term complications in proximal, 33.8% middle and 10.3% distal; this was due to the small number of patients who had proximal types of hypospadias and most of them had moderate chordee so they underwent the Snodgrass technique.^{12,13} This could

Table 3 Crude and Multivariable Analysis for the Association Between Long-Term Outcomes and Significant Predictors

Variables	Crude		Multivariable	
	Prevalence Ratio	p-value(95% CI)	Prevalence Ratio	p-value(95% CI)
Surgeon experience				
<5 cases operated	1		1	
>5 cases operated	0.56	0.001(0.4–0.78)	0.6	0.003(0.43 –0.84)
Location of hypospadias				
Mild	1		1	
Distal	0.63	0.041(0.41–0.98)	1.12	0.701(0.62 –2.03)
Proximal	1.29	0.240(0.85–1.95)	1.01	0.977(0.52 –1.95)
Surgical technique				
Ducket	1		1	
MAGPI	1.28	0.737(0.30–5.40)	0.9	0.891(0.21 –3.96)
Mathias technique	1.11	0.762(0.57–2.17)	1.13	0.718(0.58 –2.23)
Snodgrass	0.5	0.005(0.31–0.81)	0.54	0.028(0.31 –0.93)
Staged hypospadias repair	1.13	0.603(0.71–1.80)	0.83	0.570(0.44 –1.58)
Onlay/inlay	1.28	0.647(0.45–3.68)	1.12	0.840(0.38 –3.31)
Chordee				
No chordee	1		1	
Moderate	1.64	0.034(1.04–2.58)	1.31	0.349(0.74 –2.32)
Severe	2.15	0.003(1.29–3.59)	1.55	0.246(0.74 –3.24)
Mild	2.09	<0.001(1.43–3.04)	1.57	0.237(0.74 –3.34)

be explained in our study by the proximal type of hypospadias being 31.7% and 65% of patients with severe chordee underwent staged hypospadias repair.

Regarding surgical technique, the prevalence of developing long-term complications following the Snodgrass technique was 50% lower compared with Duckett, MAGPI, Mathew, Onlay/Inlay and staged urethroplasty. UCF was ~20%, meatal stenosis 13% and urethral stricture 1.6% with the Snodgrass technique; complications were higher following Duckett, with 59% UCF, 12% meatal stenosis, 3% urethral stricture or following staged urethroplasty, with 62% UCF, 4.3% meatal stenosis, 5.8% urethral stricture. Snodgrass was the common surgical technique and seems to have better outcomes especially in distal type.¹⁴

Staged urethroplasty was the most common procedure in proximal types of hypospadias especially if it is associated with chordee (65%). This finding is consistent with studies done in Pakistan and Ghana in which Snodgrass was the most common surgical technique (54% and 73%, respectively) and its level of associated long-term complications was 16% and 30% lower, respectively compared with other techniques, where UCF was 26% and 20%, respectively and the highest complication rate was seen in island flap staged urethroplasty for proximal

hypospadias with severe chordee of about 60%. This was due to most of the patients with severe chordee undergoing staged urethroplasty.^{15,16}

A study done in Pennsylvania shows different results, where single staged hypospadias repair done in proximal form was associated with a high prevalence of long-term complications at between 62% and 49%.¹⁷

Conclusion

Distal hypospadias is the most common type. TIP and surgical experience are protective factors against long-term complications.

Proximal hypospadias with a severe form of chordee >30° still remain a challenge according to our study.

Abbreviations

DHT, dihydrotestosterone; DFP, dorsal preputial flap; HCG, human chorionic gonadotropin; KCMUCo, Kilimanjaro Christian Medical University College; KCMC, Kilimanjaro Christian Medical Centre; LUTS, lower urinary tract symptoms; MAGPI, Meatal Advancement and Glanuloplasty; PHS, preoperative hormonal stimulation; PDS, polydioxanone; TIP, tubularized incised plate; T, testosterone; UCF, urethrocutaneous fistula.

Ethical Approval

Research ethical clearance was received from the KCMUCO Research and Ethical committee (certificate no 2351), patient informed consent was not required due to the anonymized patient data. It was conducted in accordance with the Declaration of Helsinki and permission was obtained from the head of the Urology Institute.

Consent for Publication

I Dr. Mbarouk Mohammed hereby declare, I participated in the study and development of manuscript entitled “Long-term complications of hypospadias repair: A ten-year experience from Northern Zone of Tanzania” I have read the final version and give consent to be published in Dovepress Urology.

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Author Contributions

The IPH (Andrew Mganga), external Examiner (Prof. Sidney Yongolo) and Urology Institute conceptualised and designed the study, conducted the statistical analysis, drafted the initial manuscript and approved the final manuscript as submitted. Mbarouk Mohammed – corresponding author

1st authors - (Frank Bright, Alfred Kein Mteta, Jasper Said Mbwambo, Nicolaus Bartholomew Ngowi, Orgeness Mbwambo – KCMC Department of Urology.)

2nd authors – Sidney Yongolo – Muhimbili university of health and allied science – external supervisor. 3rd authors – Andrew Mganga – (KCMC Institute of Public Health – Department of Biostatistics).

Note: All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal

to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest for this work.

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