

# Long term complications of hypospadias repair: A ten-year experience from Northern Zone of Tanzania.

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## Research article

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# Abstract

Background Hypospadias is one of the commonest congenital penile abnormalities in new born 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 patient who develop long term complications after hypospadias repair and its associated risk factors.

Materials and Methods This was a hospital based analytical cross-sectional study, conducted at KCMC Urology Institute from January 2009 to December 2018. The structural data sheet was used to collect information from patient file. 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, majority were aged more than two years (71.83%) with mean age at operation (SD) of  $4.74 \pm 2.99$  years). Distal types were the most common type of hypospadias 125(50%), where by 51(20%) of patients had severe chordee. TIP repair was most common technique in 130(51.59%). The proportion of long-term complications among patients who underwent hypospadias repair was 156(61.60%) and UCF accounted for 40.5%, the surgeon experience, location of hypospadias, surgical technique and associate chordee were significant predictors of long-term complications of hypospadias repair.

Conclusion TIP urethroplasty is a safe and reliable method of hypospadias repair. Proximal hypospadias with severe chordee still remain a challenge.

## Background

Hypospadias is a common congenital abnormality of the anterior part of male urethra and penile development<sup>(1)</sup>. It is characterised by three classical features; an abnormal location of external urethral meatus, abnormal ventral curvature of the penis and dorsal hooded prepuce<sup>(2)</sup>.

The condition is diagnosed clinically and treated surgical with several aims including; psychological, to allow voiding in a standing position and to allow insemination of sperms in the proper place. Although there are various surgical techniques available for hypospadias repair, treatment is still a challenge because of associated complications. As a result, the long-term complication of hypospadias repair account for 30% globally<sup>3</sup>.

There are many risk factors for long term complication 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 <sup>(9)</sup>. At our Centre we perform one to two hypospadias surgery per month, 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 record. 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 one-year post-operative were extracted from their books.

The ethical clearance and permission to conduct this study was obtained from retrospective review was obtained from KCMUCo Research and Ethical committee and institute of urology at KCMC respectively. All patients' information was kept confidential: no direct patient's identifies were used in this study.

### **Outcomes and Explanatory variables**

The main study outcomes included was long term complication of hypospadias repair (UCF, Meatal stenosis, Urethral stricture, Relapse Chordee formation, Meatal stenosis and UCF)

Explanatory variables included in the study were, Age at operation, Types Hypospadias Surgical experience (<5 cases operated, >5 cases operated), Surgical technique, Suture material, Suture technique, Type of dressing, Presence of chordee

### **Statistical analysis**

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

Where by the power of the study was obtained using Kirkwood and Sterne formula 2003.

## **Results**

There were 254 patients who underwent hypospadias repair between 2009 to 2018. Where by 2 patients had missing information in record book and were excluded from analysis and therefore 252 were included in the analysis. These patients were followed up for 12 months post operatively.

Majority of patients were aged 2 years and above 181 (71.83%) (mean age (SD) of  $4.74 \pm 2.99$  years). The distal type was the most common type of hypospadias 125(50%). Majority of patients underwent 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%). Half of the study subjects 126(50%) were operated by experienced surgeons (**table 1**). UCF was the most common complications encounter (40.5%), followed by meatal stenosis (11.1%). Combined UCF and meatal stenosis accounted for 5.2%. There was few case of urethral stricture and relapse of chordee 3.2% and 2% respectively (**figure 1**).

**Table 2:** Indicates the proportion of long term complication and its associated factors.

Majority of patients 156(61.60%) developed at least one long term complications. Where by surgeon experience, location of hypospadias, surgical technique and presence of chordee were statistical significant with development of at least one long term complication of hypospadias repair. ( $p < 0.001$ ).

**Table 3.** In Adjusted, 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 case experience was 40% lower compared to those children who were operated on by a surgeon with less five cases experience (CR=0.6;95% CI: 0.43 -0.84;  $p=0.003$ ).

However, those children who underwent Snodgrass technique had prevalence of 46% lower compared with other surgical technique (CR=0.54;95% CI: 0.31 -0.93;  $p=0.028$ ) after adjusting 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 to those children who had 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;  $p=0.26$ )

## Discussion

### Proportion of long term complication

The proportion of study participants who developed at least one long-term complication was 156(61.60%) out of 252. Proportion of long term complication was 156 (61.6%) with UCF being the most common complication accounting for 40.5% followed by meatal stenosis 11.1%. This finding is similar to the study done in Nigeria where by the proportion of long-term complication was 50%, UCF being most common which occurred by 38% and meatal stenosis 12.5%.

However, the finding is different from the study done in France where by the prevalence was 36.2% and UCF accounted for 12.9%, meatal stenosis 8.2% and relapse of chordee was 4.5%<sup>(9)</sup>. Our figures in the current study are higher probably because we do not use magnifying glasses in these delicate surgeries and therefore predisposes to higher complication rates.

Age below two years had 26% and that of more than two years had 41% long- term complication, this is due to easibility of post-operative management and lower psychological impacts with better healing process in children below two years <sup>(9)</sup>.

### **Risk factors and long-term complications**

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

The prevalence of having long-term complication was 44% lower among children who were operated by experienced surgeon compare with less experienced surgeon. This study is consistent with the study done in Egypt which show significant impact on success with reduction of long-term complication from 35% to 9% by experienced surgeon. The less complications observed in 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 <sup>(21)</sup>.

The proximal type of hypospadias has been shown to have 29% higher chance of developing long term complication compare with middle and distal types. UCF was observed in 66.0% of proximal,51% in middle and 20% in distal especially if it is associated with severe chordee.

There is much variation with the study done in Canada which showed that 15%- 56% long-term complication in proximal type associated with severe chordee and that of Korea 48.9% long-term complication in proximal, 33.8% middle and 10.3% distal and this was due to few number of patients who had proximal types of hypospadias and most of them they had moderate chordee so they underwent Snodgrass technique <sup>(22)</sup> <sup>(24)</sup>. This could be explained by in our study proximal type of hypospadias was 31.7% and 65% of patients with severe underwent staged hypospadias repair.

Regarding surgical technique, that the prevalence of developing long-term complication in Snodgrass was 50% lower compared with Duckett, MAGPI, Mathew, Onlay/Inlay and Staged urethroplasty where by UCF was around 20%, meatal stenosis 13%, and urethral stricture 1.6% in Snodgrass and higher in

Ducket, 59% UCF, 12% meatal stenosis, 3% urethral stricture and staged urethroplasty 62% UCF, 4.3% meatal stenosis, 5.8% urethral stricture. Snodgrass was the common surgical technique and seems to have better outcome especially in distal type.

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 study done in Pakistan and Ghana where by snodgrass was the most common surgical technique done 54% and 73% respectively and it associated long-term complication was 16% and 30% respectively lower compare with other technique, where UCF was 26% and 20% respectively and highest complication rate was seen in island staged urethroplasty for proximal hypospadias with severe chordee of about 60%. This was due to most of patients with severe chordee underwent staged urethroplasty <sup>(31)</sup> <sup>(37)</sup>.

Study done in Pennsylvania show different where by one staged hypospadias repair done in proximal form and it was associated with high prevalence of long-term complication between 62% and 49%<sup>(25)</sup>.

## Conclusion

The distal hypospadias is the most common type. TIP and surgical hand experience is protective factors of long term complications.

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

## Abbreviations

<b>DHT</b>	Dihydrotestosterone
<b>DFP</b>	Dorsal Preputial Flap
<b>HCG</b>	Human chorionic gonadotropin
<b>KCMUCo</b>	Kilimanjaro Christian Medical University College
<b>KCMC</b>	Kilimanjaro Christian Medical Centre
<b>LUTS</b>	Lower Urinary Tract Symptoms
<b>MAGPI</b>	Meatal Advancement and Glanuloplasty Incorporated
<b>PHS</b>	Preoperative hormonal stimulation
<b>PDS</b>	Polydioxanone
<b>TIP</b>	Tubularized incised plate
<b>T</b>	Testosterone

## Declarations

### Ethical approval

Research ethical clearance was received from the KCMUCO Research and Ethical committee (certificate no 2351) and permission was obtained from the head of 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 BMC Urology.

### Availability of data

Data that support the finding of this study is available in additional file of the manuscript.

### Competing interests

None declared.

### Contributors

The IPH (Andrew Mganga) and Urology Institute conceptualised and designed the study, conducted the statistical analysis, drafted the initial manuscript and approved the final manuscript as submitted.

1.Mbarouk Mohammed-corresponding author

1<sup>ST</sup> authors- involved in writing of the paper

2<sup>nd</sup> authors-external supervisor

3<sup>rd</sup> authors-analyse the data

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Al-Rahma hospital, Zanzibar, Tanzania.

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## Tables

**Table 1: Distribution of characteristic from the study population.**

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

Table 2: Relationship between characteristics and long-term outcomes.

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

**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)
<b>Surgeon experience</b>				
<5 cases operated	1		1	
>5 cases operated	0.56	0.001(0.4 - 0.78)	0.6	0.003(0.43 -0.84)
<b>Location of hypospadiasis</b>				
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)
<b>Surgical technique</b>				
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 hypospadiasis 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)
<b>Chordee</b>				
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)

**Adjusted for** surgeon experience, location of hypospadias, surgical technique and chordee significant p-value

## Figures

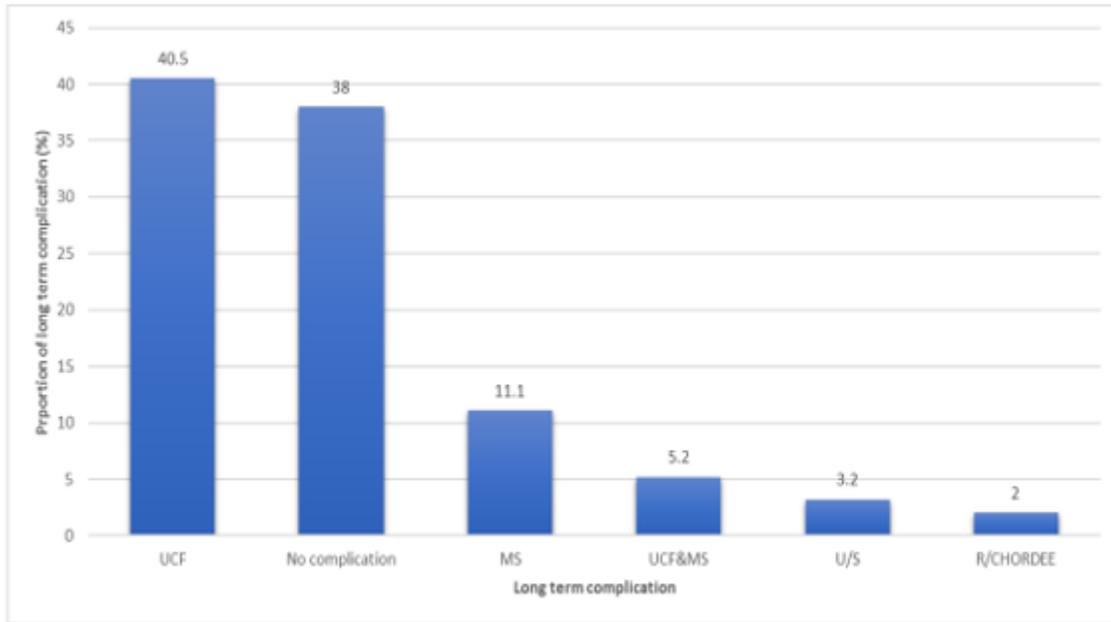


Figure 1: Distribution of long term complications among children underwent hypospadias repair from 2009-2018

## Figure 1

[See figure]

## Supplementary Files

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