URETHROGRAPHIC PATTERNS OF URETHRAL STRICTURES AMONG PATIENTS WITH MICTURITION ABNORMALITIES AT MUHIMBILI NATIONAL HOSPITAL

Gilbert Masuma

MMed (Radiology) Dissertation
Muhimbili University of Health and Allied Sciences
October, 2017

URETHROGRAPHIC PATTERNS OF URETHRAL STRICTURES AMONG PATIENTS WITH MICTURITION ABNORMALITIES AT MUHIMBILI NATIONAL HOSPITAL

By

Gilbert Masuma

A Dissertation Submitted in (Partial) Fulfillment of the Requirement for the Degree of Master of Medicine (Radiology) of the Muhimbili University of Health and Allied Sciences

Muhimbili University of Health and Allied Sciences
October, 2017

CERTIFICATION

The undersigned certifies that he has read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled ***"Urethrographic Patterns of Urethral strictures among Patients with Micturition abnormalities at Muhimbili National Hospital"*** in (partial) fulfillment of the requirement for the degree of Master of Medicine (Radiology) of Muhimbili University of Health and Allied Sciences.

_____

Dr. Balowa Mussa

(Supervisor)

_____

Date

DECLARATION AND COPYRIGHT

I, Gilbert S. Masuma, declare that this **dissertation** entitled is my own original work and that it has not been presented and will not be presented to any other university for similar or any other degree award.

Signature……. **Date**……

This dissertation is copyright material protected under Berne Convention, the Copyright Act of 1999 and other international and National enactments, in that behalf, on intellectual property. It may not be reproduced by any means, in full or in part, except for short extracts in fair dealing, for research or private study, critical scholarly review or discourse with an acknowledgement without the written permission of the Directorate of Postgraduate studies on behalf of both, the author and the Muhimbili University of Health and Allied Sciences.

ACKNOWLEDGEMENT

I would like to extend my sincere gratitudes to Almighty God for his blessings that enabled me complete this work.

I also like to thank my supervisor, Dr. Balowa Mussa, for working with me from the beginning to the end, from the development of proposal to the point of coming up with this informative report, without forgetting Dr Kazema Ramadhan whose guidance has not only made this work a success but also taught me to be hardworking, focused and dedicated in my daily activities.

Special thanks to everyone in the department of radiology at MUHAS, MNH and MOI for their participation and tireless support throughout my dissertation report preparation. They are the most supportive group of people I have ever worked with in my cereer so far. Without forgetting the IT department of MUHAS for their technical support.

Last but not least I thank my family for their support as I try to advance through my cereer. They have tolerated me throughout my studies and supported me socially as well as spiritually through their endless prayers. .

DEDICATION

I dedicate this work to my lovely wife Dr. Shani Maboko and my kids Gabriella and Aaron for their love and support.

ABSTRACT

Background

Urethral stricture is a global health problem mainly occurring among males with history of pelvic trauma and urinary tract infections which normally is associated with various voiding problems ranging from urinary incontinence to complete obstruction. Urethrography is the most important imaging modality for urethral stricture and can help in planning of its management.

Broad objective

To determine urethrographic patterns of urethral strictures among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016.

Methodology

This was a descriptive cross sectional study that was conducted at radiology department MOI involving 145 patients with micturition abnormalities who were referred and had consented for urethrogaphy examination during the period of study. Convenience sampling method was used. Structured questionnaires were used for data collection and imaging findings recorded. Data analysis was done using the Statistical Package for Social Sciences (SPSS) version 20. and a p-value of < 0.05 was considered statistically significant. Statistical association between urethral stricture patterns and various associated aetiological factors such as trauma, iatrogenic, congenital and inflammatory causes was done using cross tabulations and CHI-square test was used to compare proportions. Urethral stricture was the dependent variable while the urethral stricture causes such as trauma, inflammatory, congenital and iatrogenic causes were the independent variables.

Results

This study involved 145 patients with micturition abnormalities who were refered to MOI radiology department .All patients were males. The median age was 65 years with age range of 86(1-87) and standard deviation of 24.56 for the mean age of 55.72 years [P=0.0002]. Many patients with Urethral stricture were above 60 years old 63(58.9%).Obstruction was a

major symptom with which most patients presented(63.4%). Urethral catheterization appeared to be the dominant indication with which patients who were reffered for urethrography presented ie 53(36.6%) patients with [P=0.0001] followed by infections 20 (18.7%), trauma 20 (18.7%) and post prostatectomy strictures in 19 (17.8%) patients. The results show that among the anatomic patterns of urethral strictures, bulbous urethra was the most commonly involved anatomic site(54.5%) followed closely by membranous urethra(41.5%) and by far the penile(9.9%) and last was the prostatic urethra(2%). Most of patients found to have urethral strictures had short segment strictures (82%). The results revealed that most of the patients with urethral strictures presented with smooth mucosal pattern(76.6%) rather than irregular pattern(17.8%). Most of patients presented with single stricture(88.1%) rather than multiple(11.9).

The study also showed statistically significant correlation between post urethral catheterization and bulbous urethral strictures(r = 0.340 and p=0.0001**)** that are smooth [r=0.349, p=0.001] and of short segment. [r=0.227,p=0.022]. Trauma is shown to have significant correlation with membranous, [r=0.488, p=0.0001] long segment [r=0.308, p=0.002] as well as mixed type of urethral stricture patterns.[r=0.201, p=0.044]

Conclusion

Urethral stricture disease is a predominantly male disease. Most of patients with urethral stricture are above 60 years of age. Bulbous urethra is the most commonly involved anatomic site. Urethral catheterization is a leading cause of urethral stricture in patients above 60 years. Infections are still a significant cause of urethral stricture in our communities.

Recommendation

1. All patients aged 60 years and above presenting with lower urinary tract symptoms should undergo urethrogram procedure to rule out urethral stricture disease provided prostate enlargement has been ruled out as a cause..
2. More research on assessment of urethral stricture patterns.

TABLE OF CONTENTS

CERTIFICATION ii
DECLARATION AND COPYRIGHT iii
ACKNOWLEDGEMENT iv
DEDICATION v
ABSTRACT vi
Background vi
TABLE OF CONTENTS viii
LIST OF TABLES x
LIST OF FIGURES xi
ABBREVIATIONS xii
CHAPTER ONE 1
1.0 INTRODUCTION AND LITERATURE REVIEW 1
1.1 Introduction 1
1.2 Literature Review 4
1.3 Problem Statement 6
1.4 Conceptual Framework 7
1.5 Rationale 8
1.6 Research Questions 8
1.7 Objectives 9
1.7.1 Broad Objectives 9
1.7.2 Specific Objectives 9
CHAPTER TWO 10
2.0 METHODOLOGY 10
2.1 Type of study 10
2.2 Study duration 10
2.3 Study area 10
2.4 Study population 10
2.5 Inclusion criteria 10

2.6 Exclusion criteria 10
2.8 Sampling method 10
2.9 Sample size 11
2.10 Collection of data 11
2.11 Imaging and Evaluation 12
2.12 Data analysis 13
2.13 Ethical consideration 13
2.14 Ethical clearance 13
2.15 Study limitation and Mitigation 13
CHAPTER THREE 14
3.0 RESULTS 14
CHAPTER FOUR 25
4.0 DISCUSSION 25
CHAPTER FIVE 28
5.0 CONCLUSION AND RECOMMENDATION 28
5.1 Conclusion 28
5.2 Recommendation 28
REFERENCES 29
APPENDICES 32
Appendix I: Questionnaire 32
Appendix II: Informed Consent Form (English version) 35
Appendix III: Informed Consent Form (Kiswahili version) 38

LIST OF TABLES

Table 1a: Age in years……...14

Table 1b: The distribution of age characteristics with urethral stricture status among patients with micturition abnormalities at Muhimbili National Hospital from June 2016 to December 2016.....15

Table 2: The distribution of symptoms associated with urethral stricture among patients with micturition abnormalities at Muhimbili National Hospital from June 2016 to December 2016.....16

Table 3: The distribution of urethrography indications with urethral stricture status among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016.....17

Table 4: The distribution of urethral catheterization with urethral stricture status among patients with micturition abnormalities at Muhimbili National Hospital.....18

Table 5: The distribution of urethral mucosal patterns with urethral stricture among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016 20

Table 6: The relationship between urethrographic patterns of urethral stricture and indications among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016.....23

LIST OF FIGURES

Figure 1: Bulbar and Membranous stricture …….12

Figure 2: The distribution of age group with urethral stricture among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016. 15

Figure 3: The distribution of anatomic pattern with urethral stricture status among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016. 18

Figure 4: The distribution of urethral stricture length among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016. 19

Figure 5: The distribution of urethral mucosal patterns with urethral stricture status among patients with micturition abnormalities at Muhimbili National Hospital from June 2016 to December 2016.....21

Figure 6: Urethral stricture mucosal patterns frequency distribution bar chart.....22

Figure 7: Number of urethral strictures frequency distribution bar chart.....22

ABBREVIATIONS

MNH	Muhimbili National Hospital
MOI	Muhimbili Orthopaedic Institute
RUG	Retrograde Urethrography
MCUG	Micturition cystourethrography
Tshs	Tanzanian shillings
Fig.	Figure
USS	Ultrasonography
CT	Computed Tomography
MRI	Magnetic Resonance Imaging

CHAPTER ONE

1.0 INTRODUCTION AND LITERATURE REVIEW

1.1 Introduction

Urethral stricture is a global health problem mainly occurring among males with history of pelvic trauma and urinary tract infections [1][2][3]. It normally occurs due to fibrosis resulting in various urinary outflow (i.e. voiding) problems ranging from urinary incontinence to complete obstruction [4]. Prevalence of urethral stricture varies in different countries from 0.9% in industrialized countries [5], 0.3% in Europe [6] to 0.3% in Africa[7] and this varies by age depending on the causes from youth to elderly due to infection and trauma respectively[8].

Urethrography is the most important imaging modality for urethral stricture and can help in planning of its management[9] Urethra can be narrowed/ blocked at any part along its course which may result from iatrogenic cause, traumatic or any inflammatory process which leads to fibrotic scarring due to proliferation of fibroblasts and collagen fibers with resultant impairment of the urine outflow. This is referred to as a stricture. It is a predominantly male disease.[1]Though women can also be affected.

Urethral stricture disease is a common problem in men, higher rates have been reported in USA compared to other western countries with an estimated prevalence of 229-627 per 100 000 males.(USA).[10] and occured in 0.6% of men being more common in elderly and in black patients.[2] while in UK it is approximately 10/100 000 men in their youth rising to about 20/100 000 by the age of 55 years then to 40/100 000 by the age of 65 years and to over 100/100 000 thereafter.[8]

Urethral stricture is a common urological condition with high morbidity and lifelong disabilities in African countries given that the prevalence and peak prevalence of urethral stricture in Africa is somehow lower compared to the study done in USA by *steins et al*.[10] This was reported by study done in Nigeria where Urethral stricture disease affects about 300

per 100 000 men.[7] and the peak prevalence is at 40-45years of age and is very rare below 9 years.[3]

In the pre antibiotic era, it was largely attributed to the Neisseria Gonnorhea infection of the urethra but since the discovery of successful treatment regimes for gonoccocal infection,the pattern of its aetiologies has changed.[11] Due to increasing urethral injuries from motor traffic accidents, traumatic strictures as opposed to inflammatory strictures currently are the predominant aetiology .[12] Other urethral injuries /traumas include straddle injuries, iatrogenic instrumentation.[11] and as a result of complication of radiation treatment of the pelvis, it may also be congenital and rarely, tumors of urethra have been mentioned as an etiology.[11]

Symptoms of urethral stricture include acute urine retention, painful urination, poor stream or intermittent urine retention. Most patients with urethral stricture present with acute urine retention and painful micturition.[13] Other Signs and symptoms of urethral stricture include, hematuria, splaying of the urine stream ,nocturia, incomplete, pain with bladder distention and fever due to recurrent urinary tract infection. Urethral stricture can also be asymptomatic and this can occur in the setting of chronic urethritis, minor trauma and post radiation. Urethral stricture can be associated with painful micturition and this can occur in the setting of acute urethritis, trauma and urethral calculi.[14][13]

Diagnosis of urethral strictures is achieved through Urethrography, which includes Retrograde urethrography and Micturition cystourethrography and it is the modality of choice when it comes to imaging of the urethra.[9]While ultrasonography is useful in assessment of the thickness and length of the bulbar urethral strictures, cross sectional imaging modalities such as Computed Tomography and Magnetic Resonance Imaging play an important role in evaluating periurethral strictures.[11]Conventional Urethrography is a readily available and cost effective examination, considered to be the best initial imaging modality for urethral and periurethral pathologies like urethral injuries, urethral strictures and fistulas.[11] [15]

A standard urethrographic procedure that is normally applied in the evaluation of urethral pathologies is the one described by kawashima et al.[11] The examination is a radiographic imaging modality that involves visualisation of the entire urethra under fluoroscopy.With the patient lying in supine position, under sterile conditions, a 16 or 18-F Foley catheter is inserted within the external meatus of the urethra to the level of fossa navicularis, a position at which it is then ballooned by an irrigating syringe and inflated with about 1-1.5mls of normal saline.Then about 20-30ml of 60% iodinated contrast material is injected under fluoroscopic guidance filling the urethral canal.Spot films are then taken. Retrograde urethrography is normally followed by Micturition cystourethrography for visualization of the posterior urethra. [11]

There are different modalities and approaches on management of urethral stricture, among these include urethral dilatation which is the simplest method and highly effective for short segment and uncomplicated strictures. [16] Others are internal urethrotomy, urethral stent placement and open reconstruction (urethroplasty) which can be done in single or multiple stages.[16]

1.2 Literature Review

Urethral stricture disease is the worldwide problem which causes long term morbidity. It Accounts for a significant number of hospitalized patients per year. Several studies have shown that urethral stricture disease is a predominantly male disease although it can also affect females.[1]

Demographic Distribution

A study that was done in Dar-Es-Salaam in the year 2013 showed that the age group that was most affected by urethral stricture was the elderly patients above the age of 60 years followed by those between 45-60 years.The leading cause in this age group was iatrogenic.[1] Ahidjo et al, in a study done in Nigeria, report a peak prevalence of urethral stricture at the age between 40-45 years with the condition being rare below the age of 9 years.[3]

In the United Kingdom(UK) its been shown that urethral stricture prevalence increases with age with the peak prevalence of 1%(1000 per 100,000 men) in elderly patients above the age of 65 years.[8]. Anger J.T et al in a study done in 2011 report a decrease in prevalence of urethral stricture from 1.4% in 1992 to 0.9% in the year 2001.[16] A study which was done in the year 2013 reported a urethral stricture prevalence of 0.9% in industrialised countries.[5] Urethral stricture is said to be a predominantly male disease.[1][2][3]

Aetiological Factors

Urethral stricture can be caused by urethral trauma.[1] which can either be accidental trauma due to motor traffic accidents accompanied with pelvic fractures and falling astride on a metal bar[11] or non accidental which includes catheterisation,instrumentation,prostatectomy and post irradiation due to prostate cancer.[1] Accidental trauma is reported to be the commonest cause among patients below the age of 45 years , while non accidental trauma like catheterisation is commonest among the elderly patients above the age of 45 years.[1][11] [15][17]. Other aetiologies of urethral stricture are sexually transmitted infections like Neisseria gonnorhea.[12] The typical urethrographic finding in gonococcal urethral stricture is an irregular urethral narrowing several centimeters long.[12] An estimated 15% of men with gonococcal urethritis go on to develop stricture, with an interval of 2–30 years between infection and the onset of obstructive

symptoms. A study done in West Africa on the spectrum of urologic diseases in 2002 showed that most of urethral stricture found were of inflammatory etiology(58%) and 40.3% were traumatic.[12] Urethral tumors and congenital strictures have also been mentioned as amongst the etiologies of urethral strictures but they are relatively rare.[11].

In settings of trauma,it has been shown that prevalence of urethral injuries in male patients with pelvic fractures is 10%.[9] Posterior urethral injury with bladder rupture is seen in up to 20% of patients with pelvic fracture.[9]

Urethral Stricture Patterns

Urethral stricture commonly occurs in the bulbous part of urethra which has been shown to be the commonest location. However it has also been found to occur in membranous urethra, penile urethra and in very few cases, prostatic urethra.[1][3][18][19] A study which was done in midwestern Nigeria to assess the changing patterns of urethral stricture showed that bulbar strictures were the commonest location(35.3%) followed by membranous strictures(19.1%) and bulbo-membranous strictures and penile strictures(10.1%).[18] Most patients with urethral strictures were found to have multiple strictures most of which were short segment.[3] However, a study done at KCMC hospital in Tanzania showed that most of patients were found to have single and short segment strictures of 1cm or less.[19]

Posterior urethral strictures can occur in the setting of trauma associated with pelvic fractures. Most common associated mechanism for these injuries is reported to be road traffic accidents and falling from a height. Posterior urethral strictures are commonly associated with urinary bladder laceration.[20][10] while anterior urethra strictures have been associated with straddle injuries due to compression of the urethra against the pubic bone.[20]In the past, anterior urethral stricures were largerly associated with repeated gonococcal urethritis.[18][20] posterior urethral strictures have also been reported to occur post irradiation due to prostate cancer.[5]

Bulbar urethral strictures have been shown to be commonly associated with iatrogenic and idiopathic causes while penile urethral strictures have commonly been associated with iatrogenic as well as inflammatory causes.[8][21][10]

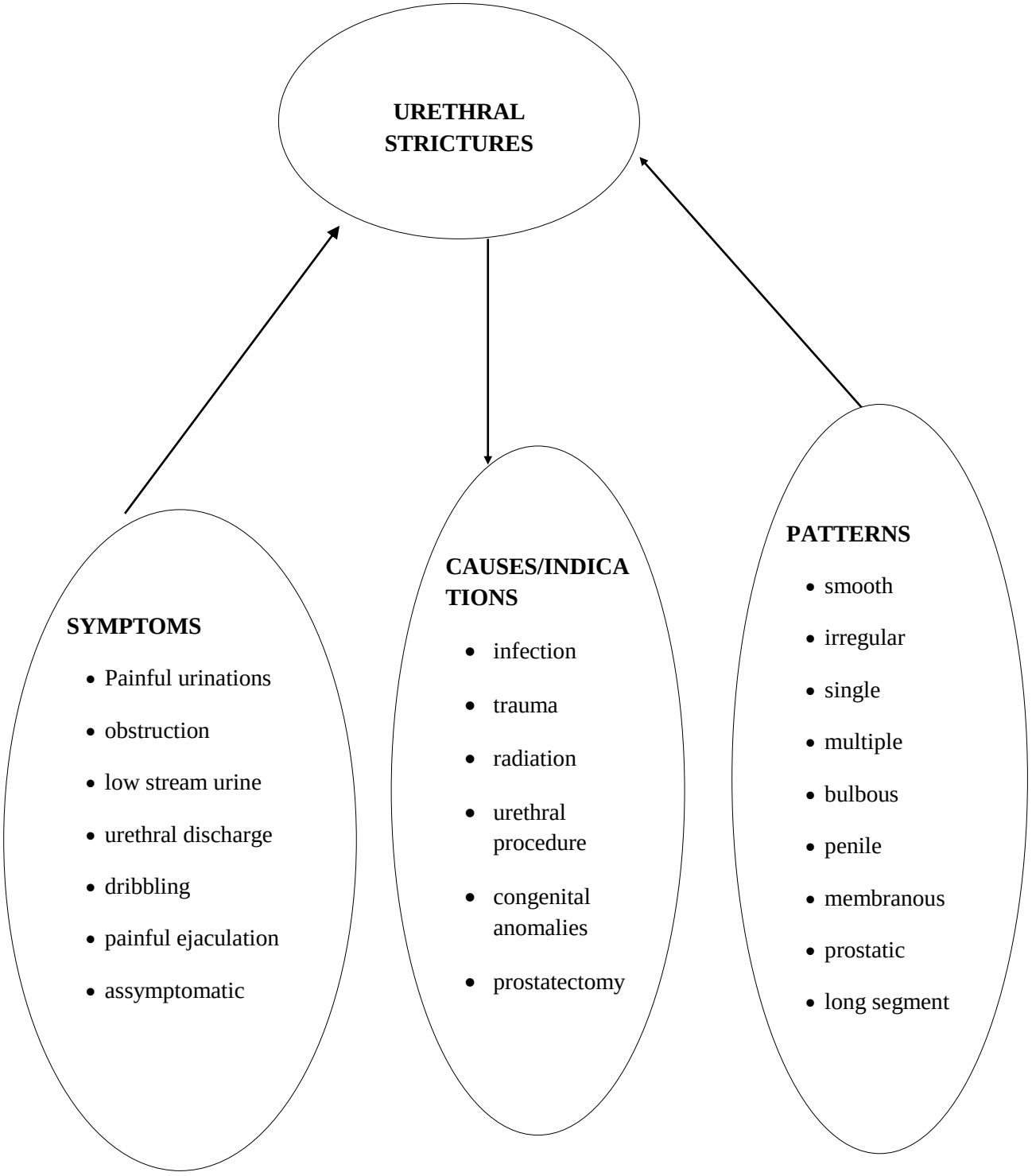
The constellation of urethrographic findings for each corresponding urethral stricture aetiology include the following;

- ✓ Inflammatory stricture: These present as urethritis which is radiologically seen as irregularity of the urethral mucosa and beaded narrowing of the lumen.[11]
- ✓ Urethral calculi: present as rounded opacities within the urethral lumen on preliminary films and as a filling defect on urethrography. Occassionally, urethral calculi may be found embedded within the urethral diverticulum.[11][14][22]
- ✓ Urethral tumors present as filling defects within the urethral lumen filled with contrast.[11]
- ✓ Urethral disruption/rupture presents with contrast material extravasation beyond the urethral lumen and may be associated with urinary bladder rupture.[11]
- ✓ Tuberculous stricture presents with an anterior urethral stricture associated with multiple prostatocutaneous and urethrocutaneous fistulas with a characteristic watering can perineum.[11].

1.3 Problem Statement

Urethral pathologies such as trauma and urethral strictures are a major reason which necessitates the need for urethrography in patients referred to Muhimbili National Hospital. In recent years there have been a change in age patterns in patients affected by urethral stricture disease. Most of the patients are of old age and iatrogenic and traumatic causes have been the major aetiologies.Urethrography has been the primary imaging modality when it comes to diagnosis of various urethral pathologies. In our set up, urethral pathologies like urethral strictures have been one of the major causes of long term morbidity. Although there are few studies that have been done previously looking at some of the urethral pathologies like strictures, little is known on the general urethral imaging findings in patients refered for urethrography in Tanzania.

1.4 Conceptual Framework



1.5 Rationale

Urethral stricture has been a major cause of long term morbidity in patients referred for urethrography. Little is known in our country with regards to radiographic findings in these patients. Therefore the aim of this study was to look at common urethrographic findings in patients with micturition abnormalities referred to MNH for urethrography, various clinical causes and common patterns in patients found with urethral strictures. This study went further into looking at the relationship between these stricture patterns and the clinical causes among patients referred for urethrography at Muhimbili National Hospital. The study is aimed at establishing valuable information that can be used in future research planning in Radiology and Urology units and also help in the establishment of a standard protocol when it comes to reporting of urethrographic findings in radiology department which will be of much help to urologists in improving management outcomes**.** As there have been changes in aetiology of urethral strictures from mainly infective to iatrogenic and trauma causes, there is a need to study the current trend in utilization of urethrography.

1.6 Research Questions

1. What are the urethrographic patterns of urethral stricture in patients with micturition abnormalities that are referred to Muhimbili National Hospital?

2. How are the urethral stricture patterns related to their different aetiological factors.?

1.7 Objectives

1.7.1 Broad Objectives

To determine urethrographic patterns of urethral stricture among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016

1.7.2 Specific Objectives

1. To determine socio-demographic distribution among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016.
2. To determine indications of urethrography among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016
3. To determine urethrographic patterns of urethral stricture among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016.
4. To describe the relationship between urethrographic patterns of urethral stricture and indications among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016.

CHAPTER TWO

2.0 METHODOLOGY

2.1 Type of study

The study was a prospective descriptive cross sectional hospital based study.

2.2 Study duration

The study was conducted from June to December, 2016.

2.3 Study area

The study was conducted at radiology department of Muhimbili Orthopaedic institute(MOI).

2.4 Study population

This study included all patients with micturition abnormalities referred to radiology department for urethrography examination.

2.5 Inclusion criteria

All patients regardless of age or sex, with micturition abnormalities, who were referred for urethrography examination.

2.6 Exclusion criteria

Patients who had consented for the procedure.

2.8 Sampling method

Convenience sampling was used.

2.9 Sample size

The sample size was calculated from Fisher's formula;

$n=Z^2P\ (1-P)/E^2$

Where: n= sample size,

Z = (1.96)

P = prevalence = 10%. (prevalence of urethral injuries in men with pelvic fracture.).[9]

95% confidence interval will be used.

E = margin error 5%

Therefore $n= (1.96)^2 \times 0.1\ (1 - 0.1)/ (0.05)^2 =138$

An extra 5% is included to account for possible non-response

n=138 + 1 (5% of 138) hence n=145

Thus the calculated sample in this study was **145** patients.

2.10 Collection of data

Data collection was done through structured questionare which were filled by principle investigator and radiologist. The data was only recorded after reaching a consensus. Data collected included demographics, clinical causes (history) eg trauma, STI's, post operative or history of catheteterization etc..Stricture patterns included location and site eg anterior or posterior urethra, bulbar, membranous etc, stricture length, and number of strictures .

For assessment of clinical causes the following were enquired from the patient and/or the request form; history of trauma or pelvic injuries, history of recent catheterization, congenital ,history of sexually transmitted infections, history of instrumentation , history of prostatectomy, history of previous pelvic irradiation**.**

2.11 Imaging and Evaluation

Patients in the study underwent standard urethrographic procedure done under high kv technique using a PHILLIPS Xray machine with a fluoroscopic unit, which included both the retrograde urethrography for evaluation of anterior urethra and antegrade urethrography for the posterior urethra.Antegrade images were achieved through a suprapubic catheter. The radiographs were obtained with the patient in the supine oblique position. The radiographs were taken by a radiographer and images were evaluated by the principle investigator and the radiologist. All types of urethral pathologies were evaluated from the spot films taken. Water soluble contrast agent(iopamidol) was used to outline urethral meatus.

Urethral stricture patterns ie location, site, length, and number of strictures, were analysed from the spot films obtained as shown in the images below. Urethral strictures that were <10mm were considered as short strictures, Those between 10mm-40mm were intermediate and those >40mm in length were considered as long strictures.(3)Intermediate and long strictures were grouped as long segment strictures.Final diagnosis was reached after discussion between the principle investigator and a radiologist.

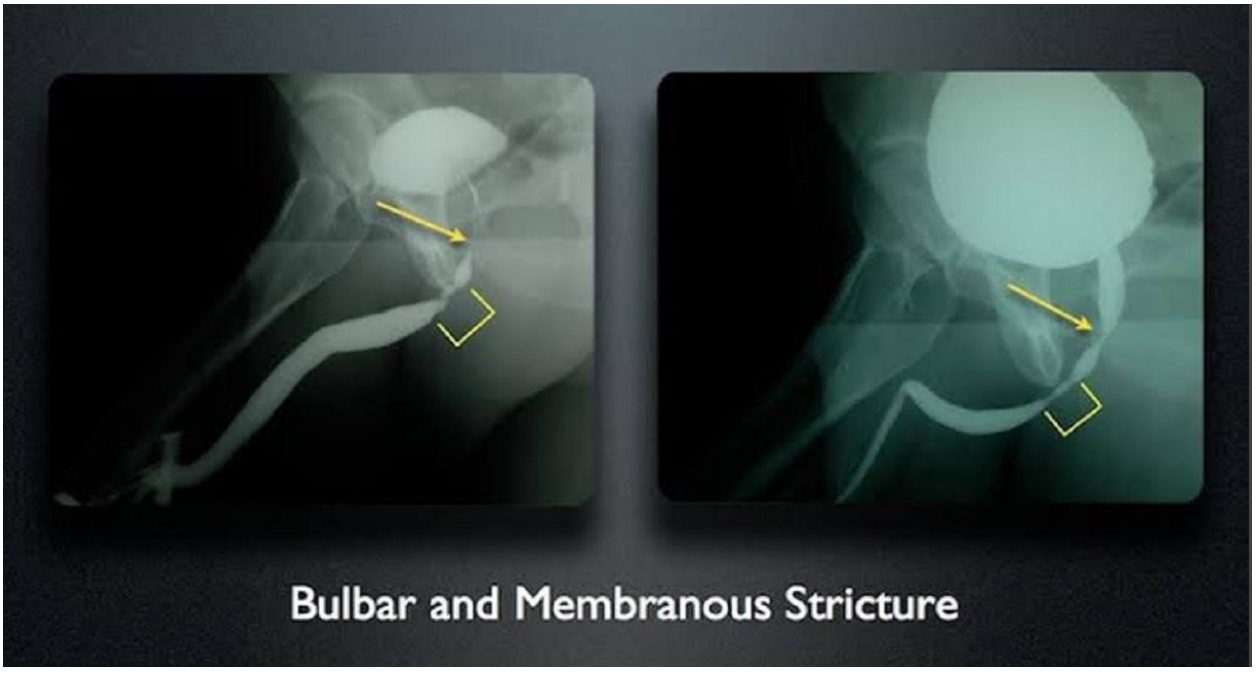


Figure 1: Bulbar and Membranous stricture

2.12 Data analysis

Data analysis was done using the Statistical Package for Social Sciences (SPSS) version 20. Statistical Association between age, sex, clinical causes of strictures and stricture patterns, radiographic findings was done using cross tabulations and Chi-square test was used to compare proportions. P value of < 0.05 was considered statistically significant.

2.13 Ethical consideration

The Researcher introduced himself to the patient or parent/guardian of a child and explained everything concerning the study hence permission to do the study was sought and consent was obtained from patient. The Interview was conducted in a private room. Only the consenting patients were involved in this study. The interpretation of the Images was done by principal investigator and Radiologists. Confidentiality of patients information was adhered to.. Data was handled confidentially and stored in a secured place.

2.14 Ethical clearance

The proposal was presented to the department of Radiology, Muhimbili University of Health and Allied Sciences. Ethical clearance was then obtained from the Research and Publication Committee of the Muhimbili University of Health and Allied Sciences.

2.15 Study limitation and Mitigation

Some patients especially the children were restless during imaging and therefore it was difficult in ensuring that the position is correct for obtaining the proper images. The images were taken with parent or guardian around to minimize errors.

There was modification of the technique as most patients referred for urethrography were on a supra pubic catheter and therefore antegrade urethrography was achieved through the suprapubic catheter rather than MCUG.

CHAPTER THREE

3.0 RESULTS

Age characteristics

Table 1a: Age in years

N	**Total number of patients**	**145**
Mean age		55.72
Median		65
Mode		68
Age range		1-87 yrs
Minimum age		1
Maximum age		87

Total number of patients was 145. All were males. The median age was 65 years with age range of 86(1-87) and standard deviation of 24.56 for the mean age of 55.72 years.

Table 1b: The distribution of age characteristics with urethral stricture status among patients with micturition abnormalities at Muhimbili National Hospital from June 2016 to December 2016. N=107

			Urethral stricture			P value (Pearson's X^2) at 95%CI
			Yes	**No**	**Total**	
Mean age (years)			59.8(8-86)	16.1(1-62)	**55.72 (1-87)**	**0.0002**
Age (years)	groups	<30	9 (9%)	5 (71.4%)	**14 (13.1%)**	
		31-44	17 (17%)	1 (14.3%)	**18 (16.8%)**	
		45-60	11 (11%)	0 (0.0%)	**11 (10.3%)**	**0.0001**
		60+	63 (63%)	1 (14.3%)	**64 (59.8%)**	
		Total	**100 (100%)**	**7 (100%)**	**107 (100.0%)**	

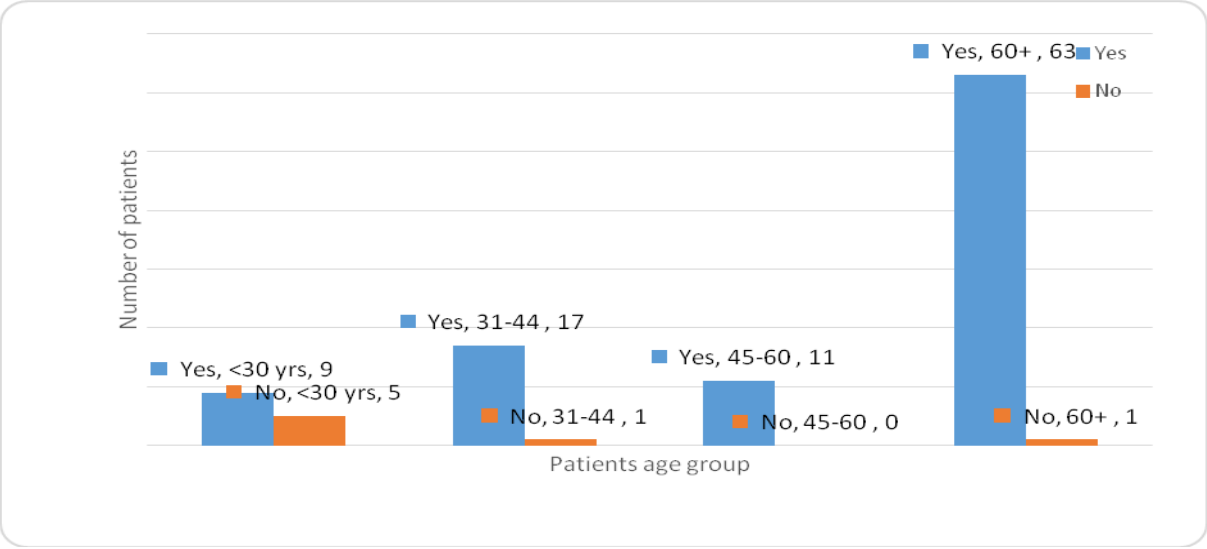


Figure 2: The distribution of age group with urethral stricture among patients undergoing urethrography at Muhimbili National Hospital from June 2016 to December 2016. N=107

Many patients with Urethral stricture were above 60 years old 63(63%) followed by those between 31-44 years 17(17%) and 45-60 years 11(11%).Agegroup of < 30 years had the least number of patients with urethral strictures ie 9(9.0%) as shown in the table 1b and figure 2 above.

Presenting symptoms

Table 2: The distribution of symptoms associated with urethral stricture among patients undergoing urethrography at Muhimbili National Hospital from June 2016 to December 2016. N=107

Symptom	Frequency	Percentage
Assymptomatic	7	4.8%
Painful micturition	25	17.2%
Urethral discharge	15	10.3%
Obstruction	92	63.4%
Low stream urine	61	42.1%
Dribbling	35	24.1%
Painful coitus	1	7%
Painful ejaculation	2	1.4%

The results show that obstruction was a major symptom with which most patients presented (63.4%), followed by low stream urine(42.1%). Few patients presented with dribbling (24.1%),painful micturition (17.2%) and some with urethral discharge as summarised in table 2 above. Some patients reported more than one symptom.

Table 3: The distribution of urethrography indications with urethral stricture status among patients with micturition abnormalities at Muhimbili National Hospital from June 2016 to December 2016. N=107

		Urethral stricture			**P value (Pearson's X^2) at 95%CI**
		No	**Yes**	**Total**	
Infection	No	1 (14.3%)	80 (80%)	**81 (75.7%)**	
	Yes	6 (85.7%)	20 (20%)	**26 (24.3%)**	0.0001
	Total	**7 (100%)**	**100 (100%)**	**107 (100.0%)**	
Trauma	No	7 (7%)	80 (80%)	**87 (81.3%)**	
	Yes	0 (0.0%)	20 (20%)	**20 (18.7%)**	0.189
	Total	**7 (100%)**	**100 (100%)**	**107 (100.0%)**	
Radiation	No	7 (7%)	91 (91%)	**98 (91.6%)**	
	Yes	0 (0.0%)	9 (9%)	**9 (8.4%)**	0.407
	Total	**7 (100%)**	**100 (100%)**	**107 (100.0%)**	
Post urethral procedure	No	1 (14.3%)	32 (32%)	**33 (30.8%)**	
	Yes	6 (85.7%)	68 (68%)	**74 (69.2%)**	0.327
	Total	**7 (100%)**	**100 (100%)**	**107 (100.0%)**	
Post Prostatectomy	No	7 (7%)	81 (81%)	**88 (82.2%)**	
	Yes	0 (0.0%)	19 (19%)	**19 (17.8%)**	0.203
	Total	**7 (100%)**	**100 (100%)**	**107 (100.0%)**	

Urethral procedures were the leading indications 68(68%) ,followed by infections 20 (20%), trauma 20 (20%) and post prostatectomy strictures in 19 (19%) patients as shown in table 3 above.

Table 4: The distribution of urethral catheterization with urethral stricture status among patients with micturition abnormalities at Muhimbili National Hospital. N=107

		Urethral stricture			Pvalue (Pearson's X^2) at 95%CI
		Yes	**No**	**Total**	
(Post urethral procedure) Catheterization	No	0 (0.0%)	91 (62.8%)	91 (62.8%)	**0.0001**
	Yes	53 (36.6%)	1 (0.7%)	54 (37.2%)	
	Total	53 (36.6%)	92 (63.4%)	145 (100.0%)	

Urethral catheterization appeared to be the dominant indication among the urethral procedures ie 53(36.6%) patients with [P=0.0001] as shown in table 4 above. None of the patients reported of urethral stricture due to urethroscopy, cystoscopy, or urethrography.

Urethrographic patterns

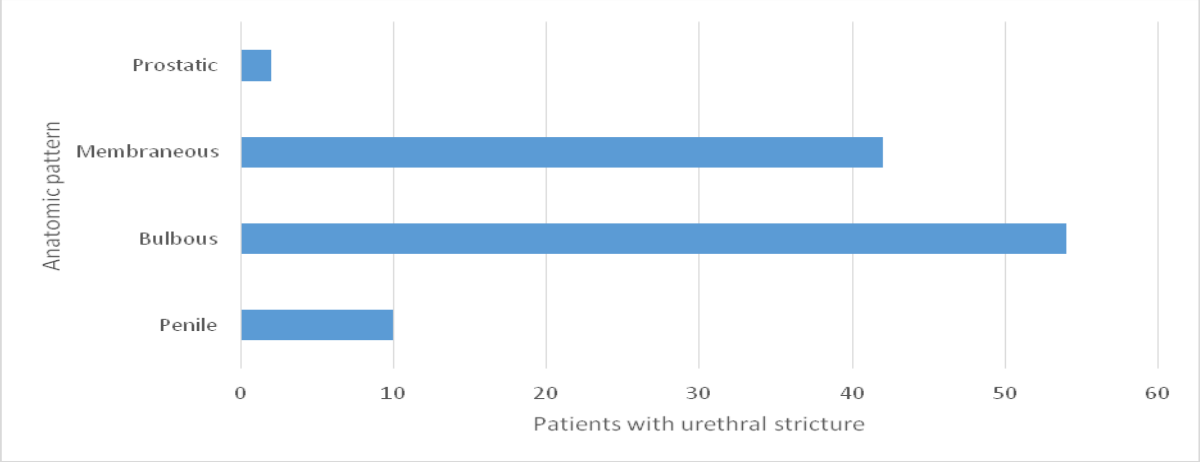


Figure 3: The distribution of anatomic pattern with urethral stricture status among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016. N=107

The results show that among the anatomic patterns of the patients with urethral strictures, the bulbous urethra was the most commonly involved anatomic site(54.5%) followed closely by membranous urethra(41.5%) and by far the penile(9.9%) and last one was prostatic urethra(2%) as shown in the figure 3 above.

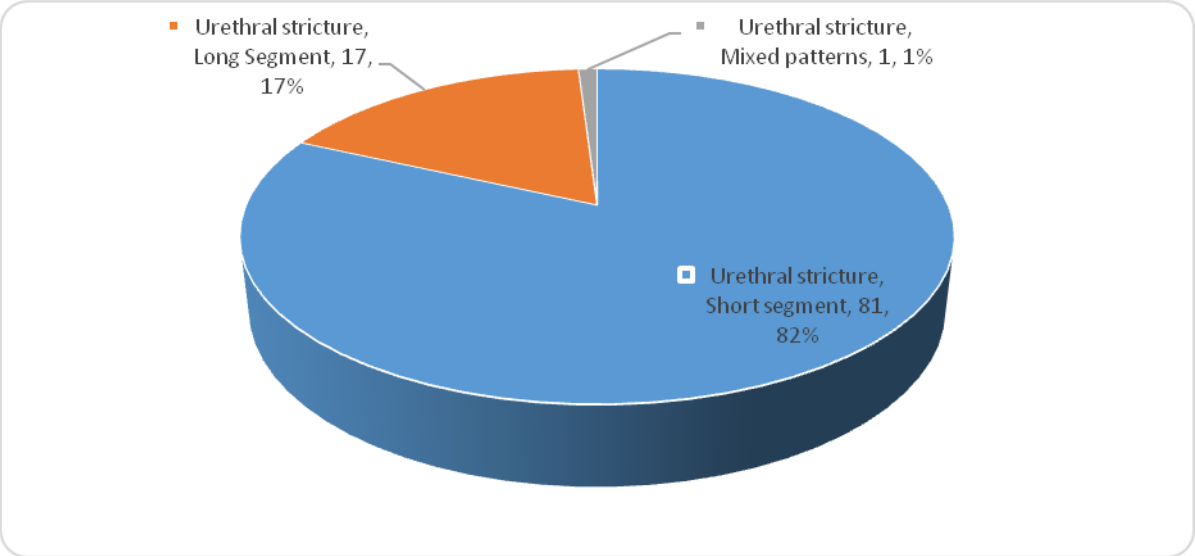


Figure 4: The distribution of urethral stricture length among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016. N=107

Findings show that most of patients found to have urethral strictures had short segment strictures (82%) rather than long (17%) and few had mixed types of urethral strictures (1%) as summarised in the pie chart above**.**

Table 5: The distribution of urethral mucosal patterns with urethral stricture among patients with micturition abnormalities at Muhimbili National Hospital from June to December 2016 N=107

		Urethral stricture			P value (Pearson's X^2) at 95%CI
		No	**Yes**	**Total**	
Urethral Mucosal pattern	Irregular	1 (0.9%)	19 (17.8%)	**20 (18.7%)**	**0.896**
	Smooth	5 (4.7%)	82 (76.6%)	**87 (81.3%)**	
	Total	**6 (5.6%)**	**101 (94.4%)**	**107 (100%)**	
Urethral mucosal disruption	No	5(4.67%)	97(90.7%)	**102(95.3%)**	0.152
	Yes	1(0.93%)	4(3.74%)	**5(4.7%)**	
	Total	6(5.6%)	101(94.4%)	**107(100%)**	
Intravasation	No	6 (5.6%)	96 (89.7%)	**102 (95.3%)**	
	Yes	0 (0.0%)	5 (4.7%)	**5(4.7%)**	0.577
	Total	**6(5.6%)**	**101(94.4%)**	**107 (100.0%)**	

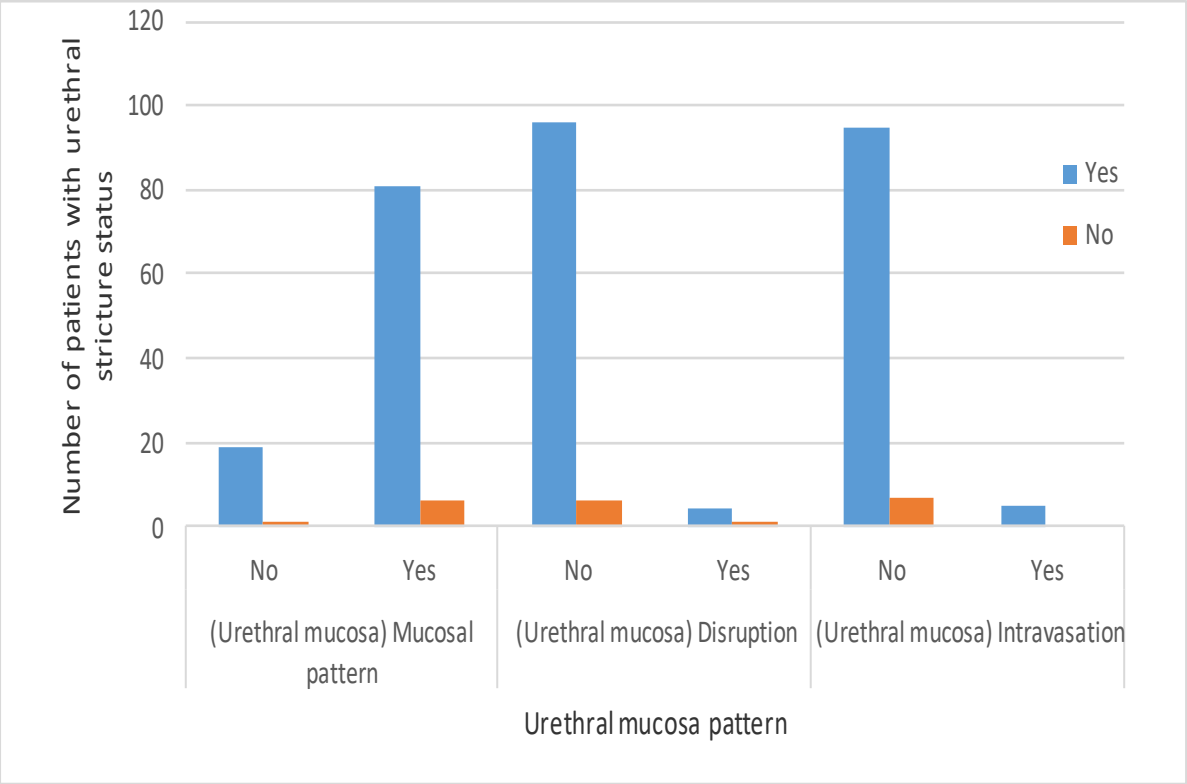


Figure 5: The distribution of urethral mucosal patterns with urethral stricture status among patients undergoing urethrography at Muhimbili National Hospital from June 2016 to December 2016. N=107

The results revealed that most of the patients with urethral stricture presented with smooth mucosal pattern(76.6%) rather than irregular pattern(17.8%). Few patients had mucosal disruption(3.74%) and contrast intravasation(4.7%) as shown in table 5 and figure 5 above.

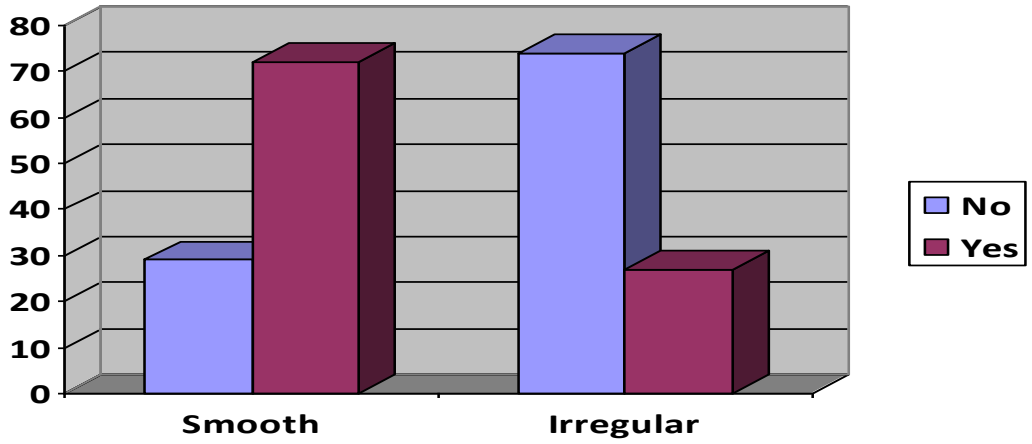


Figure 6: Urethral stricture mucosal patterns frequency distribution bar chart.

Most of the patients with urethral stricture presented with smooth stricture patterns (76.6%) rather than irregular patterns (17.8%) as shown in the bar chart above.

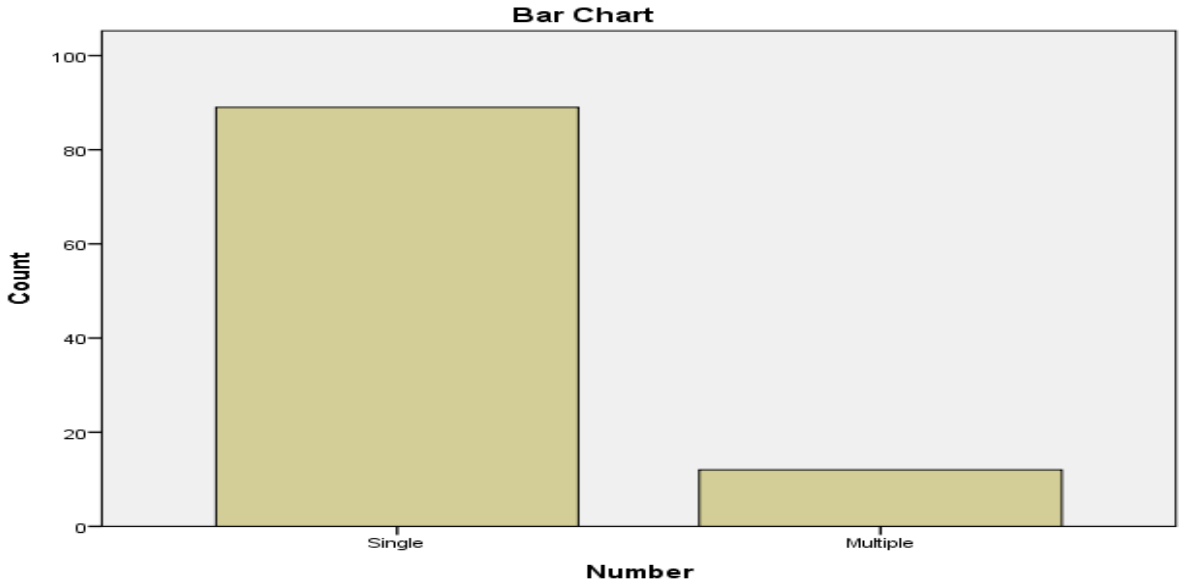


Figure 7: Number of urethral strictures frequency distribution bar chart.

Most of patients with urethral strictures presented with single stricture(88.1%) rather than multiple(11.9%) as depicted in the bar chart above.

Table 6: The relationship between urethrographic patterns of urethral stricture and indications among patients with micturating abnormalities at Muhimbili National Hospital from June to December 2016

Correlations						
Patterns		**Infection**	**Trauma**	**Radiation**	**Catheterization**	**Post Prostatectomy**
	Pearson r	**.251***	-0.165	-0.104	0.122	-0.16
Penile	P value	**0.011**	0.1	0.302	0.222	0.111
	N	**101**	101	101	101	101
	Pearson r	0.105	-.294**	-.342**	**.340****	0.033
Bulbous	P value	0.295	0.003	0	**0.0001**	0.741
	N	101	101	101	**101**	101
	Pearson r	-.218*	**.488****	**.371****	-.416**	-0.046
Membraneous	P value	0.029	**0.0001**	**0.0001**	0	0.646
	N	101	**101**	**101**	101	101
	Pearson r	-0.071	-0.071	-0.044	-0.099	**.295****
Prostatic	P value	0.483	0.483	0.659	0.325	**0.003**
	N	101	101	101	101	**101**
(Mucosal	Pearson r	-.453**	-.234*	0.122	**.349****	0.193
pattern of	P value	0	0.019	0.225	**0.0001**	0.053
stricture)						
Smooth	N	101	101	101	**101**	101
(Mucosal	Pearson r	**.486****	0.149	-0.11	-.325**	-0.176
pattern of	P value	**0.0001**	0.137	0.272	0.001	0.078
stricture)						
Irregular	N	**101**	101	101	101	101
	Pearson r	-0.079	-.397**	0.151	**.227***	0.102
Short segment	P value	0.434	0	0.133	**0.022**	0.31
	N	101	101	101	**101**	101
	Pearson r	0.108	**.308****	-0.141	-.201*	-0.081
Long Segment	P value	0.28	**0.002**	0.16	0.044	0.42
	N	101	**101**	101	101	101
	Pearson r	-0.05	**.201***	-0.031	-0.07	-0.048
Mixed patterns	P value	0.622	**0.044**	0.756	0.489	0.633
	N	101	**101**	101	101	101

The results show that some of the urethrographic patterns of urethral stricture had positive correlation with indications among patients reffered for urethrography. In the table 6 above,it's shown that infection had significantly weak positive correlation with penile urethral strictures [r = 0.251, P=0.011].Trauma is shown to have significant correlation with membranous,[r=0.488, p=0.0001] long segment as well as mixed type of urethral stricture patterns. The table 6 above also showed that post urethral catheterization significantly correlated with bulbous urethral strictures[r=0.340, p=0.0001] that are smooth and of short segment. Post prostatectomy strictures had statistically significant correlation with prostatic anatomic site as summarised in the table 6 above.

CHAPTER FOUR

4.0 DISCUSSION

This hospital based cross sectional study involving patients with micturating abnormalities who were referred for urethrography at Muhimbili National Hospital, aimed at looking into various demographic characteristics of urethral stricture disease, indications leading to referral of these patients, characterisation of urethrographic patterns and further looking at the relationship between these patterns and their indications(aetiological factors) . Study findings show estimate of extent of urethral stricture disease.

Correlation between urethral stricture patterns and various indications helps to determine the effect of these aetiological factors on the radiographic presentation of urethral stricture disease.

All patients in this study were males. This is similar to what has been reported in various previous researches including a study done by Stein et al and a study done in Dar-Es-Salaam by by Nyongole et al in which it was reported that urethral stricture is a predominantly male disease [10][1],though it can also affect women. This is largely due to the fact that a male urethra is way longer than their female counterparts and as a result its more prone to numerous types of injuries

Most of the patients were in the oldest age group of above 60 years old, lowest proportion was in <30 years age group. This is similar to a research by Yongole et al. They reported the highest incidence of urethral strictures in the age group of above 60 years old[1].This was also similar to a study done by Mundy et al[8]. This is explained by the fact that most of male patients in this age group are the ones that attend urology clinics due to prostate conditions leading to urinary obstruction such as Benign prostatic hyperplasia .As a result they are exposed to recurrent catheterization and also development of post prostatectomy urethral strictures as well.

Among the aetiological conditions for urethral strictures, urethral catheterization appeared to be the dominant indication with which patients who were reffered for urethrography presented ie 68(68%) patients with [P=0.0001], followed by infections 20 (20%),pelvic trauma 20 (20%) and post prostatectomy strictures in 19 (19%) patients .Urethral catheterization as one of the iatrogenic traumatic causes of urethral stricture, has been reported in several studies, to be the leading aetiology of urethral stricture especially in males above 45 years old.[1][11][15][17]. Prolonged urethral catheterization causes repeated inflammation of the urethral mucosa leading to healing by scar formation and narrowing of the urethral lumen[17]

Results show that infections are still a significant cause of urethral stricture in our communities ie 20 (20%) patients . A study done in West Africa on the spectrum of urologic disease in the year 2002 showed that most of urethral strictures found ie 58% were of infectious origin.[12]

This study has shown that among the anatomic patterns of urethral strictures, the bulbous urethra was the most commonly involved anatomic site(54.5%) followed by membranous urethra(41.5%) and by far the penile(9.9%) and last one was prostatic urethra(2%).This is similar to most of studies done in the past. A study which was done in midwestern Nigeria to assess the changing patterns of urethral stricture showed that bulbar strictures were the commonest location(35.3%) followed by membranous strictures(19.1%) and bulbo-membranous strictures and penile strictures(10.1%). Similar findings were also reported by a study done in Dar-Es-Salaam by Nyongole et al.[1]

Most of patients found to have urethral strictures had short segment strictures (82%) rather than long (17%) and few had mixed types of urethral strictures (1%). Most of the patients with urethral stricture presented with smooth mucosal pattern rather than irregular pattern. Most of patients presented with single stricture rather than multiple. This is similar to a study done by Kimu et al at KCMC hospital in Tanzania in which most of patients were found to have single and short segment strictures of 1cm or less.[19]

Results show that Trauma has statistically significant correlation with membranous[r=0.488, p=0.0001] long segment [r=0.308, p=0.002] as well as mixed type of urethral stricture patterns[r=0.201, p=0.044]. Urethral catheterization significantly correlated with bulbous urethral strictures[r=0.340, p=0.0001] that are smooth[r=0.349,p=0.0001] and of short segment[r=0.227, p=0.022]. Post prostatectomy strictures had statistically significant correlation with prostatic anatomic site.[r=0.295,p=0.003] It's also shown that infection had significantly weak positive correlation with penile urethral strictures [r = 0.251, P=0.011]. Most of the accidental trauma in our community result from pelvic injury due to motor traffic accidents mainly motor vehicles and "bodaboda". Pelvic fractures are highly associated with membranous urethral strictures. Catheterization is likely to injure the anterior urethra due to its long course and anatomical kinks and curves.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Urethral stricture disease is a predominantly male disease affecting males of all age groups although it has also been shown to affect females.Bulbous urethral strictures are the commonest site.Urethral catheterization,trauma due to motor traffic accidents and infections are still the major aetiological conditions for urethral stricture disease.There is a statistically significant relationship between urethral stricture patterns and their aetiologies.

5.2 Recommendation

The study had limitation of time and resources therefore more researches are required in studying the magnitude of urethral stricture disease in order to get precise prevalence at community level as it is truly a disease that causes long term morbidity and suffering.

All patients aged 60 years and above presenting with lower urinary tract symptoms should undergo urethrogram to rule out urethral stricture disease provided prostatic enlargement has been ruled out as a cause.

REFERENCES

1. East I, Afr C, Online J. ISSN 2073-9990 East Cent. Afr. J. surg. (Online). 2013;18(April):84–9.

2. Heyns CF, van der Merwe J, Basson J, van der Merwe A. Etiology of male urethral strictures-Evaluation of temporal changes at a single center, and review of the literature. African J Urol [Internet]. University of Cairo.; 2012;18(1):4–9. Available from: http://dx.doi.org/10.1016/j.afju.2012.04.009

3. Ahidjo A, Abdulkadir AY, Ibrahim AG, Saad ST. Evaluation of radiographic pattern of male urethral strictures in Nigeria: A preliminary report of a proposed new scoring system for developing countries. Iran J Radiol. 2012;9(1):212–4.

4. Fall B, Sow Y, Diallo Y, Sarr A, Ze ondo C, Thiam A, et al. Urethroplasty for male urethral strictures: Experience from a national teaching hospital in Senegal. African J Urol. 2014;20(2):76–81.

5. Tritschler S, Roosen A, Füllhase C, Stief CG, Rübben H. Urethral Stricture : Etiology , Investigation and Treatments. 2013;110(13):220–6.

6. Jackson MJ, Chaudhury I, Mangera A, Brett A, Watkin N, Chapple CR, et al. A prospective patient-centred evaluation of urethroplasty for anterior urethral stricture using a validated patient-reported outcome measure. Vol. 64, European Urology. 2013. p. 777–82.

7. Ofoha C.G. SSI. AIC ,Daku. NK. RV. Anastomotic Urethroplasty for Short Segment Bulbar Urethral Stricture; Experience at the Jos University Teaching Hospital, Jos\n. IOSR J Dent Med Sci [Internet]. 2015;14(1):01–5. Available from: http://www.iosrjournals.org/iosr-jdms/papers/Vol14-issue1/Version-5/A014150105.pdf

8. Mundy AR, Andrich DE. BJU INTERNATIONAL Urethral strictures. 2010;

9. Ali M, Safriel MY, A MSJ. CT Signs of Urethral Injury 1. 2003;11203:951–63.

10. Stein DM, Thum DJ, Barbagli G, Kulkarni S, Sansalone S, Pardeshi A, et al. A geographic analysis of male urethral stricture aetiology and location. 2013;830–4.

11. Imaging of urethral disease: a pictorial review. Radiographics. 2004;24 Suppl 1:S195–216.

12. Mbibu, N H,Nwofor A M E KL. Spectrum of Urologic Disease in the West African Subregion. Vol. 1, Annals of African Medicine. 2002. p. 44–52.

13. Nzeh DA, Braimoh KT. Comparison Of Sonographic And Radiographic Urethrography In The Evaluation of The Male Urethra: A Preliminary Report. 2006;7.

14. Danfulani M, Saidu SA, Musa MA. Multiple urethral calculus misdiagnosed as urethral stricture: The role of imaging in unknotting the confusion. Asian J Med Sci [Internet]. 2016;7(3):118.

15. Maciejewski C, Rourke K. Imaging of urethral stricture disease. 2015;4(1):2–9.

16. Buckley JC, Anger Jennifer T, Santucci RA, Elliott SP. Management Among Male Medicare. URL [Internet]. Elsevier Inc.; 2011;77(2):481–5. Available from: http://dx.doi.org/10.1016/j.urology.2010.05.055

17. El M, Mmed M, Asea U, So B, Mmed M, Uct U, et al. Aetiology of Urethral Strictures at Moi Teaching and Refferal Hospital. 2013;10(1):11–4.

18. Oguike TC, Onuora C, Obarisiagbon E. The Changing Pattern of Urethral Stricture Disease in Midwestern Nigeria. Jmbr. 2006;5(2):50–4.

19. Kimu N, Nyongole OV, Frank B, Mbwambo J. Late Outcome of Direct Vision Urethrotomy in Patients with Urethral Stricture at Kilimanjaro Christian Medical Center (KCMC), Moshi- Tanzania. 2015;15(4).

20. Ingram MD, Watson SG, Skippage PL, Patel U. Urethral injuries after pelvic trauma: evaluation with urethrography. Radiographics. 2008;28(6):1631–43.

21. Urology R. Pendulous Urethral Stricture: Peculiarities and Relevance of Longitudinal Penile Fascio-Cutaneous Flap Recon- struction in Poor Resource Community. 2012;(March):1088–94.

22. Romanzi LJ, Groutz a, Blaivas JG. Urethral diverticulum in women: diverse presentations resulting in diagnostic delay and mismanagement. J Urol [Internet]. 2000;164(2):428–33.

APPENDICES

Appendix I: Questionnaire

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

SCHOOL OF MEDICINE

DEPARTMENT OF RADIOLOGY

P.O BOX 65001 MUHIMBILI

DAR-ES-SALAAM

TANZANIA

1. Demographic factors
    a. Age ……. (months)
    b. Sex ……. (M/F)

2. Symptoms associated with urethral stricture

a. Asymptomatic	1. Yes	2. No
b. Painful micturition	1. Yes	2. No
c. Urethral discharge	1. Yes	2. No
(1)Purulent	1. Yes	2. No
(2) Bloody	1. Yes	2. No
d. Obstruction	1. Yes	2. No
e. Low stream urine	1. Yes	2. No
f. Dribbling	1. Yes	2. No
g. Painful coitus	1. Yes	2. No
h. Painful ejaculation	1. Yes	2. No

3. What are the most common disease conditions indicated for urethrographic studies
    a. Infection 1. Yes 2. No
    b. Trauma 1. Yes 2. No
    c. Radiation 1. Yes 2. No
    d. Urethral calculi 1. Yes 2. No
    e. Post urethral procedure 1. Yes 2. No
        i. Urethroscopy 1. Yes 2. No
        ii. Cystoscopy 1. Yes 2. No
        iii. Urethrography 1. Yes 2. No
        iv. Catheterization 1 Yes 2 No
    f. Congenital anomalies 1. Yes 2. No

4. What are the most common urethrographic findings associated with urethral stricture:
    a. Normal urethrography 1. Yes 2. No (Continue)
    b. Urinary bladder mucosa
        i. Mucosal pattern 1. Smooth 2. Irregular
        ii. Mass 1. Yes 2. No
        iii. Disruption 1. Yes 2. No
        iv. Intravasation 1. Yes 2. No

    c. Neurogenic bladder 1. Yes 2. No
    d. Urethral mucosa
        i. Mucosal pattern 1. Smooth 2. Irregular
        ii. Mass 1. Yes 2. No
        iii. Disruption 1. Yes 2. No
        iv. Intravasation 1. Yes 2. No

e. Urethral stricture 1. Yes 2. No

i. Number 1. Single 2. Multiple

ii. Anatomic pattern

1. Proximal third 1. Yes 2. No

2. Middle third 1. Yes 2. No

3. Distal third 1. Yes 2. No OR

4. Anterior 1. Yes 2. No

5. Posterior 1. Yes 2. No OR

6. Penile 1. Yes 2. No

7. Bulbous 1. Yes 2. No

8. Membraneous 1. Yes 2. No

9. Prostatic 1. Yes 2. No

iii. Mucosal pattern of stricture

1. Smooth 1. Yes 2. No

2. Irregular 1. Yes 2. No

iv. Short segment 1. Yes 2. No

v. Long segment 1. Yes 2. No

vi. Mixed patterns 1. Yes 2. No

f. Calculi 1. Yes 2. No.

Appendix II: Informed Consent Form (English version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

DIRECTORATE OF RESEARCH AND PUBLICATIONS, MUHAS

INFORMED CONSENT FORM

ID-NO. ☐☐

Consent to Participate in a Study

Greetings! My name is Dr Gilbert Stanslaus Masuma; I am working on this research with the objective of determining urethrogaphic patterns of urethral strictures disease among patients with micturition abnormalities referred referred to Muhimbili National Hospital from June-December 2016.

Purpose of the study

The study is conducted in partial fulfillment of the requirements for the degree of Master of Medicine in Radiology of MUHAS. This study is aiming at establishing; imaging findings, age and sex distribution, clinical causes, urethral stricture patterns and relationship between urethral stricture patterns and clinical causes among patients referred for urethrography at MNH. You are being asked to participate in this study because your information will help to provide valuable data. Kindly please be honest and true for betterment of the results that could lead to better intervention and recommendations for future.

What Participation Involves

If you agree to join the study, your information will be acquired qnd filled in the questionnaire prepared for the study and you will be scanned as per request made by attending Doctor.

Confidentiality

I assure you that all the information collected from you will be kept confidential. Your name will not be written on any questionnaire or in any report/documents that might let someone identify you. Your name will not be linked with the research information in any way. All information collected on forms will be entered into computers with only the study identification number. Confidentiality will be observed and unauthorized persons will have no access to the data collected.

Right to Withdraw and Alternatives

Taking part in this study is completely voluntary. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve penalty.

Benefits

The information you provide will help to establish demographic distribution of various urethral imaging findings, patterns and relationship between these patterns and associated clinical causes.

Who to Contact

If you ever have questions about this study, you should contact the **Principal Investigator**, **Dr Gilbert Stanslaus Masuma,** of Muhimbili University of Health and Allied Sciences, P. O. Box 65001, Dar es Salaam. If you ever have questions about your rights as a participant, you may call **Prof. Said Aboud** , Chairperson of the Senate Research and Publications Committee, P. O. Box 65001, Telephone : 255 22 2152489 Dar es Salaam and **Dr. M . Balowa.** who is the supervisor of this study (Tel. +255 788 002 506).

Signature:

Do you agree?

Participant agrees ……..Participant does NOT agree …….

I ……. have read the contents in this form. My questions have been answered. I agree to participate in this study.

Signature of participant ……

Signature of Research Assistant ……..

Date of signed consent …….

Appendix III: Informed Consent Form (Kiswahili version)

CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI

KURUGENZI YA TAFITI NA UCHAPISHAJI

FOMU YA RIDHAA

Namba ya utambulisho ☐☐

Ridhaa ya kushiriki kwenye utafiti

Habari! Ninaitwa Dr Gilbert S Masuma, nafanya utafiti wenye lengo la **kutathmini matatizo ya kuziba kwa njia za mkojo(urethrographic findings) kwa wagonjwa wenye rufaa ya kuja hospitali ya Muhimbili. Madhumuni ya Utafiti-** Utafiti huu unafanyika katika kutimiza sehemu ya matakwa ya shahada ya uzamili ya matibabu kitengo cha vipimo vya mionzi (Radiology) Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili. Unaombwa kushiriki katika utafiti huu ili tuweze pata matokeo ambayo yatatusaidia kujua kwa uhalisia matatizo yahusuyo njia za mkojo.

Jinsi ya kushiriki- Ukikubali kushiriki katika utafiti huu, utasailiwa ili taarifa zako ziweze kujazwa kwenye dodoso lililoandaliwa. **Usiri** ; Taarifa zote zitakazokusanywa kupitia dodoso zitaingizwa kwenye ngamizi kwa kutumia namba za utambulisho.Kutakuwa na usiri na hakuna mtu yeyote asiyehusika atakayepata taarifa zilizokusanywa. **Uhuru wa kushiriki na haki ya kujitoa** ; Kushiriki kwenye utafiti huu ni hiari.

Nani wa kuwasiliana naye ; Kama una maswali kuhusiana na utafiti huu, wasiliana na Mtafiti mkuu wa utafiti huu, **Dr Gilbert S Masuma** wa Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili, S. L. P. 65001, Dar es Salaam, **Prof. Said Aboud**, Mwenyekiti wa kamati ya

Utafiti na Uchapishaji, S.L.P 65001, Simu: 255 22 2152489 Dar es Salaam au msimamizi wa utafiti huu **Dr M. Balowa.** (Simu: +255 788 002 506) **Sahihi:** Kama umekubali kushiriki weka sahihi

Mshiriki amekubali ……..... Mshiriki
Mimi..... nimesoma maelezo ya fomu hii nimeielewa na nimekubali kushiriki katika utafiti huu.

Sahihi ya mshiriki…… Sahihi ya mtafiti msaidizi……Tarehe ya kutia sahihi ya idhini ya kushiriki……