PROSPECTIVE COHORT STUDY OF THE EFFECT OF URETHRAL STRICTURE AETIOLOGY ON THE SHORT-TERM OUTCOMES OF PATIENTS TREATED WITH URETHRAL DILATATION AT THE UNIVERSITY TEACHING HOSPITAL, LUSAKA, ZAMBIA

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A dissertation submitted to the University Of Zambia in partial fulfillment of the requirements for the award of Master of Medicine degree in Urology

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SCHOOL OF MEDICINE

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DECLARATION

I hereby declare that this dissertation herein presented for the degree of Master of Medicine in Urology has not been previously submitted wholly or in part for any other degree at this or any other university nor is it being currently submitted for any other degree. I further declare that all sources I have quoted have been indicated and acknowledged by means of complete references. It has been prepared in accordance with the prescribed guidelines for the postgraduate studies dissertations of the University of Zambia.

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CERTIFICATE OF APPROVAL

This dissertation of Dr. Mumba Chalwe is approved as fulfilling part of the requirements for the award of the Degree of Master of Medicine in Urology by the University of Zambia.

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ABSTRACT

The aetiology of urethral strictures is an important predictor of the course of urethral stricture disease as it influences the choice of treatment of a particular stricture and subsequently affects the outcomes of treatment. In low and middle income countries (LMICs) such as Zambia, which have a high prevalence of urethral strictures, urethroplasty- the golden standard of treatment, is not feasible for all strictures due to the lack of adequate operating theatre facilities. As such, urethral dilatation, a relatively inexpensive procedure that can be performed on an outpatient basis with local anesthesia is the treatment of choice for most patients with urethral strictures at the University Teaching Hospital in Lusaka, Zambia. There is however no clinical evidence that dilatation is the most suitable treatment modality for all types of strictures regardless of etiology. The study aimed to determine the effect that urethral stricture aetiology has on the short term outcome of urethral dilatation. This was a prospective cohort study conducted on patients presenting to the Urology section at the University Teaching Hospital, Lusaka between December 2015 and December 2016. Patients were recruited upon presentation to the urology section. The aetiology of the urethral strictures was elicited from the patient's medical history and symptoms assessed using a validated symptom score, the International Prostate Symptom Score (IPSS) prior to dilatation. Patients were then followed up for two months after urethral dilatation, and re-evaluated using the same IPSS. The collected data was then analyzed using SPSS Version 23. Other parameters included were patient demographics (age, sex, marital status, education, residence, employment status).   A total of 77 patients were recruited in this study. The total participant retention was 90% (n=70). The average age was 42.9. In terms of aetiology, 42.9% (n=30) had a history of self reported sexually transmitted infection; 14.3% (n=10) had a history of previous catheterization; 24.3 % (n=18) had a history of urethral trauma; and 11.4% (n=8) had a history of a urological procedure with urethral involvement, 4.3% (n=3) had no known cause. One patient had a history of both previous catheterization and trauma. Analysis showed a significant association between aetiology and outcomes of dilatation. Post infectious strictures had better outcomes evidenced by a statistically significant improvement in symptoms evidenced by lower IPSS scores post dilatation (p=0.007), those caused by trauma and catheterisation also showed some improvement p=0.032, 0.012 respectively. Post urological procedure strictures showed poor outcomes with no significant improvement of symptoms after dilatation (p=0.180). The aetiology of a stricture affects the outcome of urethral dilatation. Post infectious and post catheterization strictures respond better to dilatation in comparison to other types of strictures in the short term, therefore indications for urethral dilatation should be based on the aetiology of the urethral stricture.

DEDICATION

To my family, Simba and our boys Kundiso and Ariko for being pillars of strength throughout this demanding process. To my parents, siblings and friends, for always believing in me. I thank you all. And finally, to all the Urology patients with urethral strictures, – it was for your enhanced care with our currently available resources that this research was conducted.

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ABBREVIATIONS

AUR	Acute Urinary Retention
BOO	Bladder Outlet Obstruction
DVIU	Direct Vision Internal Urethrotomy
HIV	Human Immunodeficiency Virus
IU	Internal Urethrotomy
IPSS	International Prostate Symptom Score
LIMCS	Low to Middle Income Countries
LUTS	Lower Urinary Tract Symptoms
RTA	Road Traffic Accident
STI	Sexually Transmitted Infection
UTH	University Teaching Hospital

CHAPTER ONE

INTRODUCTION

1.1 Background

Urethral stricture generally refers to anterior urethral disease, or a scarring process involving the spongy erectile tissue of the corpus spongiosum, known as spongiofibrosis (Schlossberg, 2006). The scar causes obliteration of the urethral lumen leading to weak or poor urine stream or subsequent cessation of urine flow and consequently acute urinary retention (AUR). The resultant scar can be of various depths, densities and lengths, replacing portions of the corpora spongiosum with loss of urothelium and subsequent circular contraction of the lumen (Attah 1982). Posterior urethral stricture results from an obliterative process in the posterior urethra that has caused fibrosis, and is generally the result of a distraction injury caused by either trauma or radical prostatectomy (Schlossberg, 2006).

Strictures can be broadly classified as post infectious or inflammatory and post traumatic. Post infectious/inflammatory strictures are most commonly secondary to poorly treated or untreated gonococcal infection. If adequately treated, gonococcal urethritis rarely results in urethral strictures. Inflammatory strictures are caused by processes leading to chronic inflammation and eventually stricture formation. There has been a recent increase in strictures associated with balanitis xerotica obliterans (BXO), BXO usually begins with inflammation of the glans and generally leads to meatal stenosis, or stricture of the fossa navicularis. Post traumatic strictures can be categorised as internal (iatrogenic) strictures caused by urethral catheterization, cystoscopy, transurethral resections, prostatectomy, brachytherapy, hypospadias repair or external caused by perineal or straddle injury, pelvic fracture, gunshot and stab wounds or penile fracture (Heyns, 2012).

The mechanism of injury determines the depth of stricture and any process that injures the urethral epithelium or the underlying corpus spongiosum to the extent that healing results in a scar can cause a urethral stricture (Schlossberg, 2006). Stricture

characteristics such as depth, length and location have been found to affect choice of treatment modality as well as outcomes of treatment (Hampson, 2014). Furthermore, various etiological factors have different mechanisms of injury on the urethra, thus, understanding the aetiology and epidemiology of urethral strictures helps to identify risk factors for disease occurrence or progression, which may be amenable to preventive measures resulting in reduced disease severity (Alwaal, 2014). Aetiology plays a major role in determination of stricture characteristics such as location, depth, and length. For example iatrogenic strictures secondary to catheterization tend to be longer (Popoola, 2012), while infectious strictures tend to be multi focal (Ahidjo , 2012), traumatic strictures tend to be short and occur almost exclusively in the bulbar urethra (Fenton, 2005), these strictures are generally deeper due to extensive scarring and fibrosis (Hampson, 2014). These characteristics all affect outcomes of management and can be used as predictors of recurrence of stricture after treatment (Zehri, 2009)

Patients with urethral stricture disease become symptomatic only after the urethral caliber falls to less than 10 Fr (3.33mm) which occurs several years after initial insult in the case of infectious and inflammatory strictures. The majority of patients with urethral stricture experience moderate complications, such as bothersome LUTS (Lower Urinary Tract Symptoms) and or recurrent urinary tract infection (Santucci, 2007). More severe complications, including acute urinary retention, renal failure, Fournier's gangrene, and bladder atony have been reported in a small minority of men with stricture disease (Anger, 2010). In general, open urethral reconstruction is the most successful management option for urethral strictures, but it requires surgical expertise, adequate operating room facilities, and has a longer recovery period (Husain, 2008).

The oldest and simplest form of management of urethral strictures is urethral dilatation, which can be performed with a number of different devices (Buckley, 2014). Different devices for dilatation include balloon devices, filiforms and followers, urethral sounds, or self-dilatation catheters (Hampson, 2014). Urethral dilatation using metal bougies is the most readily available treatment modality and as reported by Labib, (2013) is the only employed method at the local University Teaching Hospital in Lusaka, Zambia and

is the preferred initial treatment modality for urethral strictures. Dilatation is considered a minimally invasive treatment modality for urethral strictures and according to Steenkamp, (1997) has outcomes that are similar to internal urethrotomy, the other form of minimally invasive treatment for urethral strictures.

Internal urethrotomy requires operating theatre settings and as such, dilatation, a relatively inexpensive procedure can be performed on an outpatient basis with local anaesthesia (Steenkamp, 1997). Minimally invasive procedures generally are indicated for short, single site strictures, while complex strictures are more amenable to open reconstructive methods of repair (Olajide, et al., 2013). Dilatation remains the mainstay of management of urethral strictures for patients with urethral strictures at the University Teaching Hospital in Lusaka, Zambia. Despite its wide spread use for management of urethral strictures, recurrences are high and it remains unclear whether dilatation is indeed the most suitable treatment modality for all strictures regardless of the etiology. The study aimed at establishing a relationship between etiological factors and outcomes of urethral dilatation to enable clinicians to predict which strictures are likely to respond best to dilatation.

1.2 Statement of the problem

Management of urethral stricture disease takes up a notable proportion of the time spent treating urological patients at the institution as evidenced by the Surgical department audit during the period beginning from January 2013 to December 2013, the urology clinic had a total of 9425 outpatient visits, 1300 of which were for urethral stricture disease management. According to the urology outpatient clinic register during the same period, an average of 785 visits are recorded monthly, 108 (13%) of these visits were stricture related. The outpatient procedure records for the previous year beginning January 2012 to January 2013 showed that 156 urethral dilatation procedures were carried out, which represented 16.7% of all outpatient procedures, in the following period between January 2013 and January 2014, this number increased to 165 (17.2%). From the surgical department audit for the period beginning January 2013 to Dec 2013 it is found that a total of 335 elective operations were carried out by the urology section,

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95 (28%) of these were related to urethral stricture management by either dilatation, optic urethrotomy or urethroplasty. Despite the benign nature of the condition, it is evident that there is a significant amount of time devoted to the surgical management of urethral strictures. This disease has high morbidity due to a high recurrence rate and requires time and financial resources from both the patient as well as the health care providers. Urethral strictures remain a challenge for management, as patients continue to attend the urology clinic for protracted periods of time with a diagnosis of urethral stricture disease with no established aetiology of their disease. As such, even potentially modifiable causes of disease recurrence and potential progression remain unknown. As it stands, there is a paucity of local evidence to justify the use of dilatation as the initial treatment modality for most strictures as is the current common practice at the University Teaching Hospital, Lusaka, Zambia.

1.3 Significance of the study

Information gathered from the study will be important in establishing the relationship between the aetiology of a particular stricture and the outcomes following urethral dilatation. This information will be useful to both clinicians and future patients and will serve as a tool for identifying potentially modifiable and/or preventable causes of urethral stricture recurrence as well as predicting the outcomes of urethral stricture disease management by dilatation based on the prevailing etiological factors. This will enable clinicians to opt for the best treatment modality based on etiological factors thus avoiding exacerbating strictures that may not be suitable for dilatation as a treatment option.

Worldwide, the most common minimally invasive procedures used for managing urethral strictures are dilatation (92.8%) and optical internal urethrotomy (85.6%) (Ferguson, 2011) outcomes however remain poor and recurrence rates high. With recurrence rates recorded as high as 40-50% (Chhetri, 2009), establishing the effect that aetiology has on the outcome of dilatation could provide useful information for improved management of urethral strictures by dilatation by providing a basis on which to select the most suitable strictures for this treatment modality. It has been suggested that stricture characteristics influence outcomes of treatment (Hampson, 2014) and that

the aetiology of a stricture will determine its characteristics, it is therefore vital to establish these etiological factors and determine how they directly correlate with treatment outcomes. An understanding of the underlying cause of a particular stricture is helpful in determining the most appropriate type of treatment as it may also impact the outcome and sequelae of treatment (Latini, 2014, Zehri, 2009). In a resource limited setting such as ours, where dilatation is the most commonly used treatment modality, there is a need to identify factors that may affect the outcomes of our management such that the most appropriate procedure is selected initially which would result in less treatment attempts, better outcomes and be more cost effective.

Urethral stricture disease remains a common cause of morbidity among men; a recent survey in the USA showed that stricture disease occurred in 0.6% of men, being more common in the elderly and in black patients (Anger, 2010). Urethral stricture in developed countries mainly involves the anterior urethra, in particular, the bulbar tract, with the most common cause of strictures being iatrogenic (Santucci, 2007, Palminteri , 2013). In low to middle income countries however the trend is different with post infectious strictures followed by post traumatic strictures representing a large majority of cases of urethral strictures. Factors that have been postulated to influence the outcomes of the various treatment modalities available include stricture length, site and depth, as well as patient age, and co morbidities (Steenkamp, 1997). In spite of this, there is a lack of clinical data directly correlating the etiological factors contributing to this disease in our setting to the management and subsequent outcome.

Currently a large volume of data describes the disease in other regions, and recent trends show that more attention has been focused on studying the causes and presentation of urethral stricture as predictors of outcomes (Harraz, 2015). Factors leading to stricture formation and management techniques differ from region to region thus may be completely different in our own setting. Due to these differences, outcomes following urethral dilatation may also differ. This study aims to identify the etiological factors leading to formation of strictures in our population and establish the impact of these factors on the short term outcomes of urethral dilatation.

1.4 Research question

Does the aetiology of urethral stricture have an effect on the short-term outcome of urethral dilatation?

1.5 Hypothesis

Null hypothesis (H₀): The etiology of urethral strictures has no effect on short term outcomes of treatment by urethral dilatation.

1.6 Objectives

General objective

To determine the effect of the urethral stricture aetiology on the short-term treatment outcomes of urethral strictures by urethral dilatation.

 Specific objectives

1. To determine the relationship between the cause of urethral stricture and the outcome of urethral dilatation.
2. To establish the causes of urethral stricture disease in patients with Lower Urinary Tract Symptoms.
3. To evaluate the clinical presentation in patients with urethral stricture disease.
4. To identify the socio-epidemiological characteristics of patients with urethral strictures.

CHAPTER TWO

LITERARTURE REVIEW

2.1 Literature review

Urethral strictures have been studied widely by clinicians worldwide, efforts have been made to determine various factors that may predict outcomes of management and thus improve the results achieved by the various treatment modalities. In recent years the aetiology of urethral strictures has increasingly been studied as a predictor of outcomes (Zehri, 2009, Fenton, 2005).

As evidenced by research carried out in an Indian combined prospective/retrospective study on the prognosis of strictures based on aetiology over a ten year period, it was revealed that urethral trauma was the most common aetiology of urethral strictures, accounting for 54% of all cases. The most common stricture location was the membranous urethra (35%), 30% were bulbar and 27.5% were penile while 7.5% patients had multiple urethral strictures. Of all the etiologies, post catheterization strictures were associated with more adverse outcomes following treatment including infection and re-stenosis whereas impotence, incontinence, urethra-cutaneous fistulae, and ejaculatory disturbances were less common (Mathur, 2011). The study duration was considerable and it was both prospective and retrospective in nature thus giving enough time for establishing substantial long term outcomes. The relationships that were established between the various etiological factors and their respective outcomes can therefore be considered significant. The study however did not focus on any particular treatment modality but rather focused solely on stricture etiology.

Another study carried out in Karachi, Pakistan on the predictors of recurrence of urethral strictures in 2009 revealed that idiopathic strictures (32%) were the most common followed by inflammation and transurethral manipulation in 17% each, and traumatic in 16% of patients. The recurrence rate after internal urethrotomy or dilation is lower for single, short (less than 1–2 cm) bulbar strictures and the risk of recurrence is higher for penile strictures and those with periurethral scarring (Zehri, 2009). The same study

associated treatment failure with presence of periurethral fibrosis, perioperative UTI and the stricture aetiology; post infective strictures were the worst in terms of overall prognosis. The findings in this study further re-affirm the use of minimally invasive treatments of urethral strictures in resource limited settings. This study however did not sufficiently define aetiology as a predictor of recurrence due to the fact that a substantial number of strictures were idiopathic thus had no established cause, as such the association between post infective strictures and worse outcomes may not be a complete reflection of the total outcomes.

A marked contrast is seen in African countries where post infectious and post traumatic strictures are predominant as evidenced by a retrospective study performed in Osogbo, South western Nigeria between July 2007 and July 2012 on the limitations of stricture management in a resource limited setting which showed that inflammation from sexually transmitted infection was the commonest aetiology (58.3%). Substitution urethroplasty was the most common repair because most of the strictures were complex and not amenable to simple treatments like dilatation (Olajide, 2013). This study confirms that aetiology plays a key role in the management of urethral strictures as treatment modality is based on the stricture etiology and characteristics, and that not all types of strictures are amenable to simple, minimally invasive treatment methods such as dilatation.

In a retrospective analysis of adult patients who underwent direct vision optic urethrotomy (DVIU) at a referral institution in North Africa between January 2002 and 2013, patients' demographics and stricture characteristics were analysed. The study aimed to find features that may be used to predict treatment failure after DVIU. The primary outcome was procedure failure, defined as the need for regular self-dilatation, redo DVIU or substitution urethroplasty. It was found that most strictures were idiopathic followed by iatrogenic in 51.6% and 26.3% of patients, respectively. Most patients presented with obstructive lower urinary tract symptoms (68.9%) and strictures were bulbar. Correlation analysis showed that older age and obesity were independent predictors of recurrence after DVIU, while for stricture characteristics; idiopathic strictures were independent predictors of recurrence and were found to have higher

failure rates (Harraz, 2015). In this cohort study several factors such as patient age, BMI, co morbidities, stricture aetiology, and stricture length were analysed to give a broader spectrum of predictors of failure for a single intervention. The duration of the study was sufficient enough to allow for thorough follow up on the various outcomes as well as to establish correlations between the independent variables and the outcomes.

Patient selection for a particular treatment modality is an important step in insuring success of treatment. In a study carried out by Naude (2005) at a referral centre at the University of Stellenbosch, South Africa, aimed to establish the efficacy of internal urethrotomy (IU) as a minimally invasive treatment for urethral strictures it was found that overall, IU has a lower success rate (±60%) than urethroplasty (±80–90%), but if used for selected strictures, the success rate of IU could approach that of urethroplasty. Various stricture characteristics were analysed and it was established that location (penile and membranous strictures), length (>2 cm), site (multiple strictures), aetiology (untreated perioperative urethritis) and depth (extensive periurethral spongiofibrosis) were risk factors for poor outcomes (Naudé, 2005). A prospective, randomized study carried out in another South African referral centre concluded that multiple, longer (> 2 cm), post-traumatic, and previously untreated strictures responded better to dilatation, whereas those men presenting with urinary retention and complications related to stricture were better treated with urethrotomy (Steenkamp, 1997). The study aimed to compare dilatation and internal urethrotomy based on the outcomes and took in to account various stricture and patient characteristics, and brought to light the aspect of clinical presentation as an additional factor for predicting outcomes of minimally invasive treatment.

Locally, in a prospective cohort study on the short-term outcomes of urethral stricture disease management in HIV and non-HIV patients in Lusaka carried out from October 2009 – December 2010 (Labib, 2013) it was established that of all strictures 45% resulted from urethritis and the prevalence of HIV in patients presenting with post urethritis urethral strictures was 50%. The study showed that dilatation had the highest rate of recurrence (28%) in comparison with the other treatment modalities but did not

directly relate this to any stricture aetiology. The author recommended that more attention be paid to stricture length and stricture location in the management of urethral stricture disease, as these variables were found to be associated with urethral stricture disease recurrence (Labib, 2013).

From the above studies, it is apparent that stricture aetiology determines the nature of the stricture which consequently affects outcomes of the different treatment modalities, with various regions reporting better outcomes of certain etiologies over others. Treatment modalities are also chosen based on stricture characteristics with certain strictures more suited to one modality over the other. It is also evident that there are differences in patterns of urethral stricture disease in various regions which could be due to numerous factors, including, but not limited to; the varying socio-epidemiological characteristics of patients, the differences in approach to management of urological disease; for example use of more endoscopic interventions as well as more urethral instrumentation in the developed world for diagnosis and treatment of urological disease.

The use of aetiology as a pre-intervention assessment tool to guide clinicians in choice of management is also apparent. Evidence shows that the aetiology of urethral strictures plays a role in the subsequent outcomes and prognosis during management of urethral strictures (Lumen, 2008). As such, this study aims to establish a relationship between the locally prevailing etiological factors and outcomes of management with urethral dilatation which will provide vital clinical data for improved patient selection for treatment and subsequent successful management.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Research methods

3.1.1 Study design

This was an observational, prospective cohort study conducted on patients who presented with urethral stricture disease.

3.1.2 Setting

Urology section, units I, II, III in the Department of Surgery at the University Teaching Hospital Lusaka, Zambia, the National Referral Centre.

3.1.3 Case definition

A case was defined as a patient with a urethral stricture confirmed by a retrograde urethrogram and due for urethral dilatation.

3.1.4 Duration of the study

The study was carried out between December 2015 and December 2016. Patients who were recruited were followed up for a period of 2 months after removal of urethral catheter; this is done 2 weeks after urethral dilatation. Stricture recurrence usually occurs within the first 4-6 weeks after dilatation (Steenkamp, 1997) as such the follow up period of 2 months is sufficient to allow for the short term outcome to be established.

3.1.5 Study site

The study was conducted in the Department of Surgery; Urology section at the University Teaching Hospital in Lusaka, the largest referral centre in the country. Patients were recruited upon presentation to the hospital, as well as Urology outpatient clinic. Follow up was done on an out-patient basis in the Urology outpatient clinic.

3.1.6 Target population: All patients presenting with bladder outlet obstruction secondary to urethral stricture.

3.1.7 Study population: Patients with urethral strictures satisfying the inclusion criteria.

3.2 Inclusion criteria

    i.   All patients presenting to the urology section of the Department of surgery for management of urethral strictures and booked for urethral dilatation.

   ii.   Patients giving informed consent to participate in the study.

3.3 Exclusion criteria

    i.   Patients with recurrent urethral strictures that have previously been treated by urethroplasty

3.4 Sampling and sample size

Random sampling was done of eligible patients during the study period who met the inclusion criteria, patients were recruited upon presentation to the urology unit.

Sample size: 77

Sample size was calculated using the formula below based on the local recurrence rate of urethral strictures following urethral dilatation (28%)

$$N = \frac{Z^2 \times P(1-P)}{(D)^2}$$

Where:

N = sample size

P = 28%

D = +/-10% the accepted accuracy range

Z = 1.96 (at a 95% Confidence interval)

$$N = \frac{1.96^2 \times 0.28\,(1 - 0.28)}{0.1^2}$$

$$N = 77$$

Data collection**:** This was done using a data collection sheet which included the IPSS scoring sheet. The data was collected through patient interviews and the IPSS administered at time of enrollment and at the 2-month follow up visit.

3.5 Study procedure

Patients that presented with urethral strictures were recruited. A careful history was taken, followed by clinical examination. A radiological study, urethrogram, was done to confirm the diagnosis of urethral stricture as is routinely carried out on all patients being managed by the Urology section. Only patients with surgical indications for treatment by urethral dilatation were recruited. Data was collected using a data collection sheet, the IPSS was explained carefully to the patients who thereafter completed the IPSS scoring sheet. Identifying details such as name, and file number were not captured; instead patients were allocated case numbers. Enrollment was determined by the inclusion/ exclusion criteria. Information was obtained from 1) interviews of the patients 2) clinical records of patients 3) physical examination findings.

After counseling, all patients were required to fill in a written informed consent. Outcomes were determined on the basis of presence or absence of lower urinary tract symptoms (LUTS) 2 months after catheter removal post urethral dilatation, using the IPSS. All procedures, examinations and follow up that were carried out were those that are routinely carried out on all patients with urethral strictures, no additional or special procedures were performed.

Urethral dilatation:

This procedure was performed on an outpatient basis in the urology clinic by the respective unit clinicians under safe surgical principles. Patients were positioned in lithotomy position, cleaned and draped. Local anaesthetic- Intraurethral lignocaine gel 2% was applied and a urethral clamp placed. After 10 minutes, local anaesthesia took effect and serial urethral dilatation was done using a standard dilatation set comprised of metal bougies in an increasing order of size from size 6/9 to size 12/14. The patients were then catheterized with size F16 or size F18 2-way catheter, catheter balloon

inflated with 10mls saline and patient allowed home on ciprofloxacin and paracetamol. After 2 weeks, the patients were reviewed in the outpatient clinic and catheter removed. Dilatation was carried out once per patient by their respective clinicians. Patients thereafter continued routine monthly follow-up as per scheduled appointment in the Urology outpatient clinic and on the 2-month visit outcomes were assessed by means of the IPSS. At this time the short term outcomes were expected to be established.

3.6 Variables

Based on the main objective of the study to establish the effect of urethral stricture etiology on the short term outcome of urethral dilatation, the following were the dependant and independent variables:

Dependant variables:

Pre dilatation IPSS and Post dilatation IPSS score

Independent variables:

Stricture aetiology

3.7 Data analysis

This was a quantitative study, with categorical data that was not normally distributed. The data was recorded using Microsoft excel 2010 and exported to SPSS version 23 for statistical analysis. A Chi square test of independence was used to assess of the association between etiology and outcomes of urethral dilatation.

Crosstabulations were used to compare the individual pre dilatation IPSS score against the post dilatation IPSS score for each etiological factor. Each etiological factor was analysed individually as the data could not be cross tabulated in one single table.

The Wilcoxon Signed Ranks Test was employed to make statistical inferences on the significance of relationship between the pre and post dilatation scores of the patients according to the various aetiology. A P value less than 0.05 was considered statistically significant.

3.8 Ethical considerations

The study was conducted according to the principles of research involving human subjects as prescribed by the Declaration of Helsinki (World Medical Association in 2008). The following ethical considerations were made.

1. Risks: Dilatation, a minimally invasive treatment modality of urethral strictures, is performed under local anesthesia, as such; patients risked experiencing some discomfort during the procedure. There was also the possibility of some psychological trauma due to the sensitive or intrusive nature of some of the questions asked in the patient interview such as past sexual behavior.

2. Benefits: There were no direct benefits of the study to the patient. No financial remuneration was provided to the patients recruited in the study as all procedures, investigations and follow up was confined to routine procedures that are part of standard care and management as provided by the patients' respective physicians in the urology section. The cost of urethrograms was covered by the investigator.

3. Voluntarism: Participation in this study was voluntary, patients participated of their own accord, no coercion was used and if patient felt injured or inconvenienced by participation in the study they were free to withdraw from study at any time without any implications to their management

4. Written informed consent: Written informed consent was obtained from every patient participating in the study prior to their enrolment in the study

5. Confidentiality: The data collected was kept confidential and available only to the researcher. It was locked in a locker with keys kept by the researcher, once transferred to a computer; the data was kept securely under password protection accessible only by the researcher.

Ethical clearance and approval was obtained from the University Of Zambia Biomedical Research Ethics Committee (UNZABREC). Permission was also obtained from UTH Management, and the Department of Surgery.

CHAPTER FOUR

RESULTS

4.1 Data presentation

77 patients were recruited into the study, with the aim of establishing a relationship between stricture aetiology and outcomes of urethral stricture dilatation. Seven patients did not complete the entire follow up process due to the following reasons; one patient died of non urological causes, and six were lost to follow up and thus did not complete the post dilatation evaluation. Seventy patients were retained, and subsequently analysed, however, on preliminary analysis it was found that three patients had no known cause of their strictures, and one patient had mixed aetiology these were excluded from subsequent associative analysis. Four different etiological factors were included in the study; self reported history of Sexually Transmitted Infection (STI), history of catheterisation, history of urological procedure, and history of trauma involving urethra, outcomes were defined as the post dilatation symptoms.

4.2 Socio-epidemiological data

Figure 1 shows the age distribution of the patients; according to the histogram below most of the patients were within the range of 25 to 35 years of age. The data showed that 13 patients (18.6%) were aged 15-30 years, 33 patients (47.1%) were aged 31-45 years, 14 patients (20.0%) were aged 46-60 years, and 10 patients (14.3%) were aged above 60 years. The average age was 42.9 and the modal age was 36. The range was 69 with a standard deviation of 15.82.
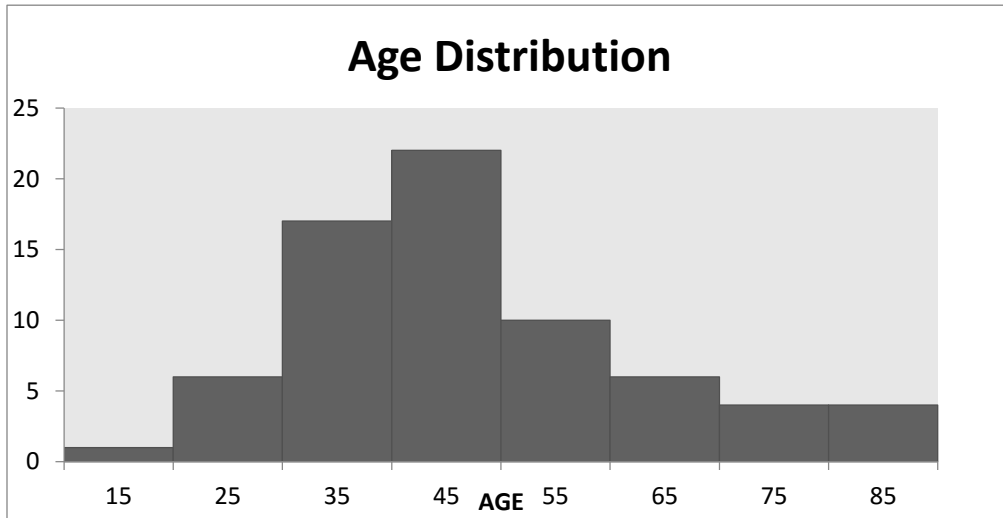
Figure 1 histogram showing age distribution

Figure 2 represents the education levels of the patients and shows that 23 (32.9%) patients had no formal education, 11 patients (15.7%) had attained primary education, 32 (45.7%) had attained secondary education, and 4 patients (5.7%) had attained tertiary education.
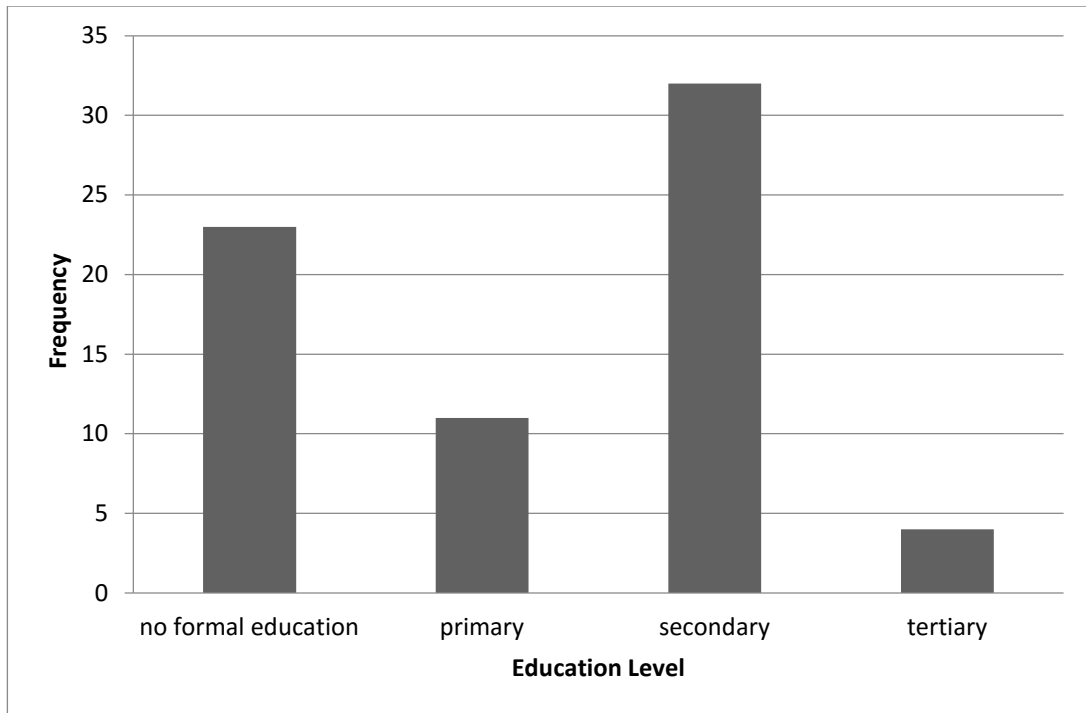
Figure 2 Highest education levels

Figure 3 shows that 39 (55.7%) patients were unemployed, 16 (22.9%) were in formal employment, and 15 (21.4%) were self-employed while Figure 4 shows the distribution of patient residence; 48 (68.6%) patients were living in urban areas, 6 (8.6%) were living in peri-urban areas, and 16 (22.9%) were living in rural areas.
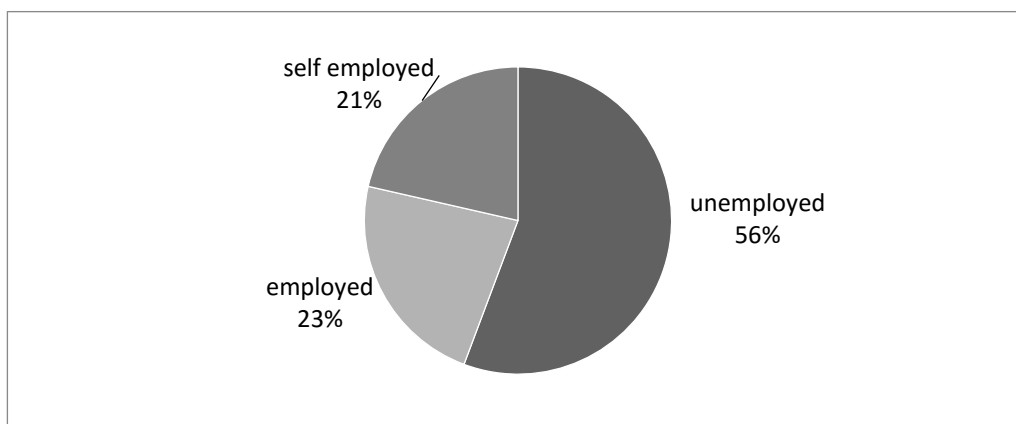
Figure 3 Employment status
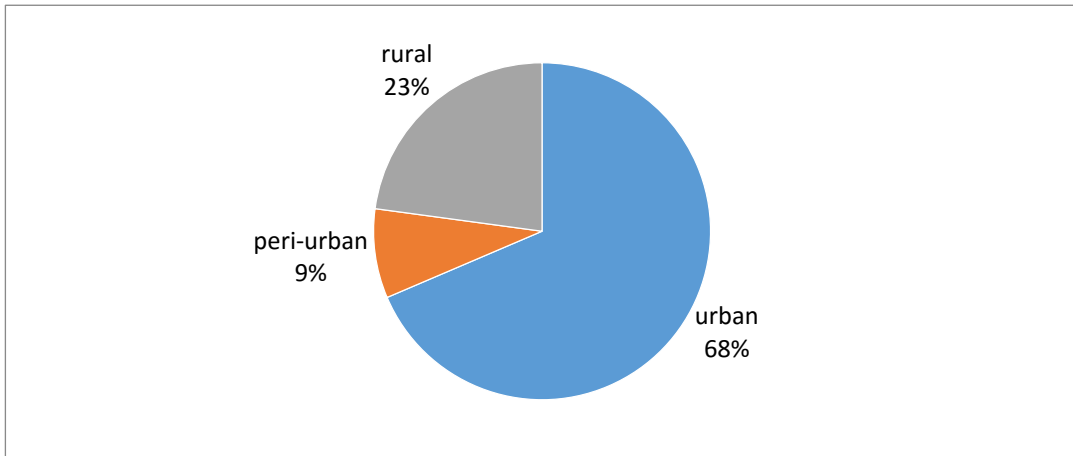
Figure 4 Area of residence

4.3 Aetiology of stricture

Figure 5 shows that 42.9% (n=30) of patients had a history of sexually transmitted infection; 14.3% (n=10) had a history of previous catheterization; 24.3% (n=17) had a history of urethral trauma; and 11.4% (n=8) had a history of urological procedure with urethral involvement, 4.3% (n=3) had no known cause. One patient (1.4%) had a history of both catheterization and trauma.
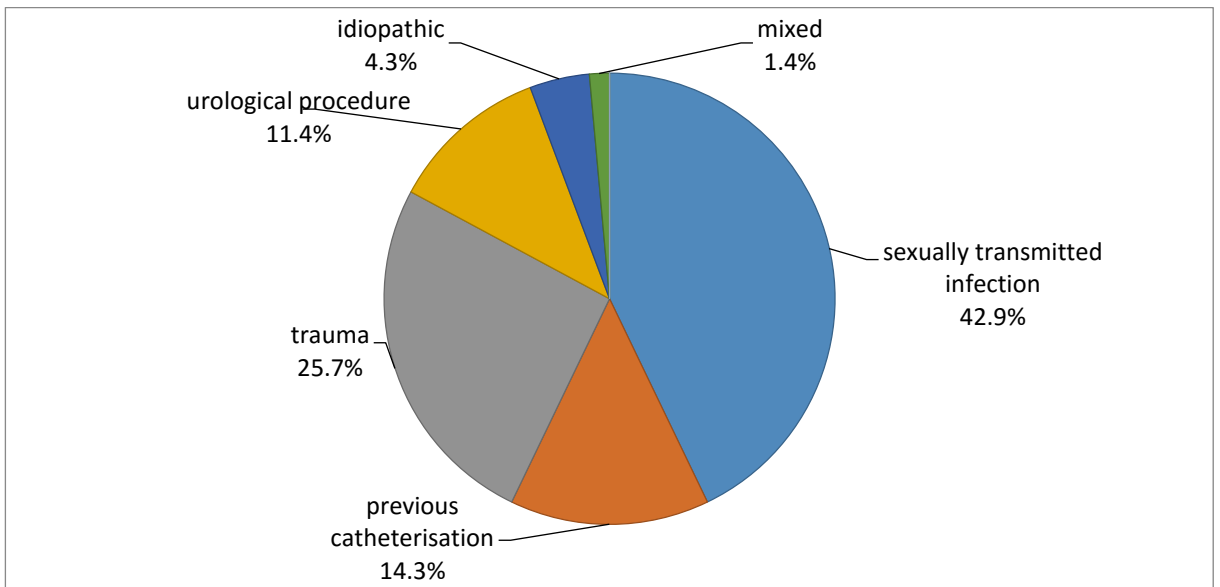
Figure 5 Stricture aetiology

4.4 Clinical presentation

Symptoms at presentation

Two main categories of clinical presentation where elicited; patients presented with either Lower urinary tract symptoms (LUTS) or Acute urinary retention (AUR). Figure 6 shows that 67% (n=47) of patients presented with Lower Urinary Tract Symptoms (LUTS) while 33% (n=23) presented with Acute urinary retention (AUR).

International Prostate Symptom Score

According to figure 7, the overall pre dilatation IPSS score results show that 5.7% patients experienced mild symptoms, 20.0% experienced moderate symptoms, and 74.3% experienced severe symptoms. The pre dilatation mean score was 26.8 with a standard deviation of 10.0. Post procedure results showed that 34.8% experienced mild symptoms, 18.8% experienced moderate symptoms, and 46.4% experienced severe symptoms. The post dilatation mean score was 17.72 with a standard deviation of 14.6. The majority 67.1% of the patients rated their quality of life before the dilatation as being terrible; after dilatation 40.6% rated their quality of life as being terrible.
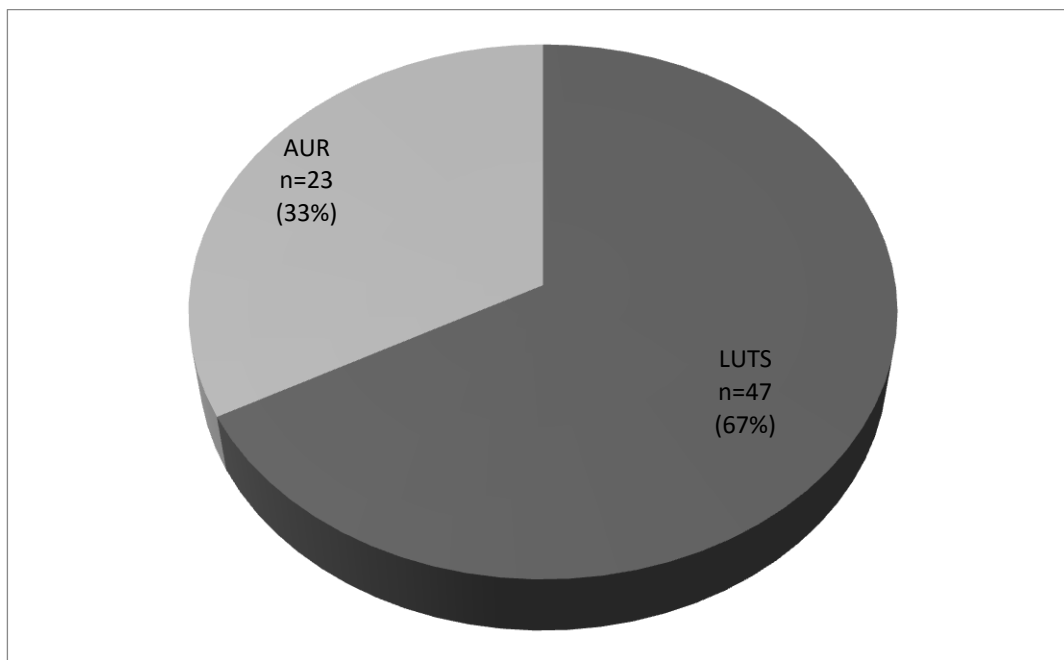
Figure 6 Clinical presentation
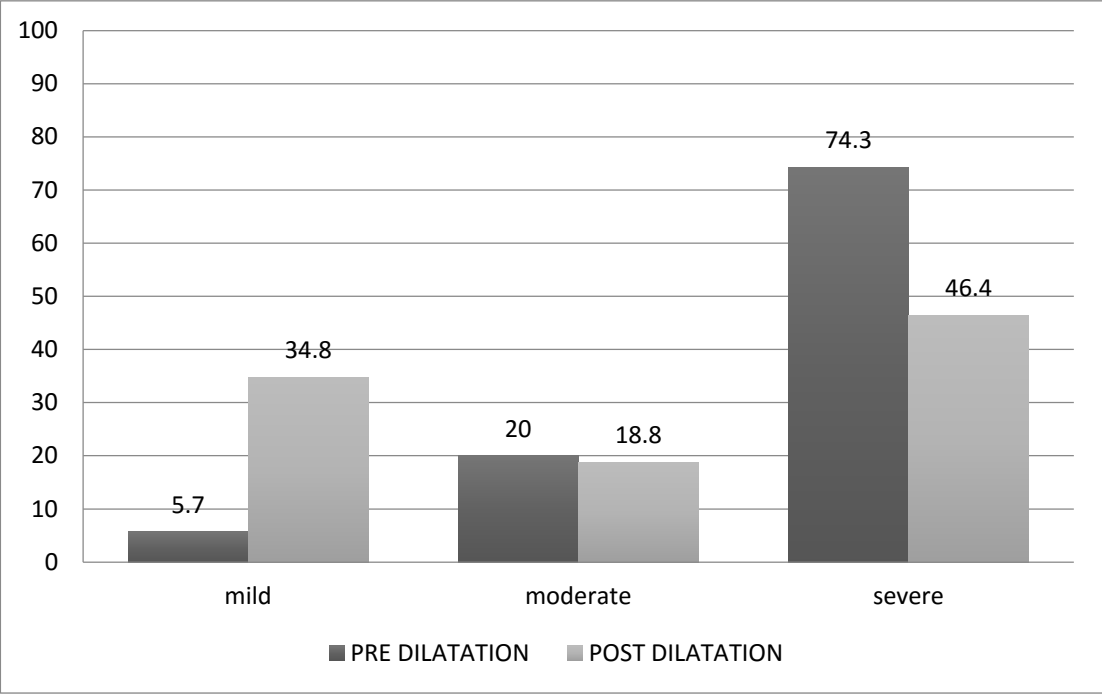
Figure 7 overall pre and post dilatation IPSS scores

4.4.1 Association between aetiology and outcomes

A Chi square test of independence was performed to evaluate the relationship between aetiology and outcomes of dilatation. A statistically significant relationship at p=0.05 was found, as shown in table 1 below.

Table 1 summary statistics chi square test

	df	Mild		Moderate		Severe		Retention		Comment
		n	Exp. value	n	Exp. value	n	Exp value	n	Exp value	
STI	9	11	10.9	9	6.55	5	2.91	5	3.64	Reject H_0
Trauma	9	6	5.45	1	3.27	3	1.45	8	1.82	Reject H_0
Urological procedure	9	0	5.45	0	3.27	4	1.45	4	1.82	Reject H_0
Catheterisation	9	7	8.18	2	4.91	0	2.18	1	2.73	Reject H_0

In order to assess the direct effect of etiology on the outcomes of dilatation, patients were divided into two groups based on their clinical presentation of either Lower Urinary Tract Symptoms or Acute Urinary Retention. A total of 70 patients were analyzed, 47(67%) presented with LUTS and 23 (33%) presented with AUR (figure 6) and were grouped accordingly.

In the LUTS group, aetiology was established in 43 patients, 3 patients had no identifiable aetiological factors while 1 had mixed aetiology. These were therefore not included in the subsequent associative analysis. In the AUR group, aetiology was established in all 23 patients.

4.4.2 Lower Urinary Tract Symptoms group

A total of 47 patients were in this group, patients from the four etiological factor groups; post infectious strictures, post traumatic strictures, post catheterisation strictures and post urological procedure strictures were represented, each of these subgroups was analysed individually. The three patients with unknown etiology and the one with mixed etiology were excluded from this analysis.

1. Post infectious strictures

There was a statistically significant improvement of symptoms after dilatation in patients with a history of STI ($p= 0.007$).The results show that a total of 20 patients in the LUTS group had a history of STI. Pre dilatation, 10% (n= 2) had mild symptoms, 45% (n=9) had moderate symptoms and 45% (n=9) had severe symptoms. Table 2 shows the crosstabulation between pre dilatation and post dilatation IPSS scores for strictures secondary to STI.

After dilatation the 2 patients with mild symptoms remained with mild symptoms. From the 9 patients with moderate symptoms, 44% (n=4) had an improvement to mild symptoms, 44% (n= 4) had no improvement and remained with moderate symptoms while 11% (n=1) reported worsening symptoms from moderate to severe. The patients that presented with severe symptoms showed a trend towards improved symptoms with 30% (n=3) reporting mild symptoms and 22% (n=2) reporting moderate symptoms, while 44% (n=4) patients remained with severe symptoms.

Table 2 Cross tabulation between pre and post dilatation scores for post infectious strictures

			post dilatation score		
		Total	mild symptoms	moderate symptoms	severe symptoms
pre dilatation score	mild symptoms	2	2	0	0
	moderate symptoms	9	4	4	1
	severe symptoms	9	3	2	4
Total		**20**	9	6	5

Figure 8 summarizes the overall outcome of dilatation for post infectious strictures, most patients presented with severe and moderate symptoms and there was a subsequent reduction in the number of patients with severe symptoms post dilatation.
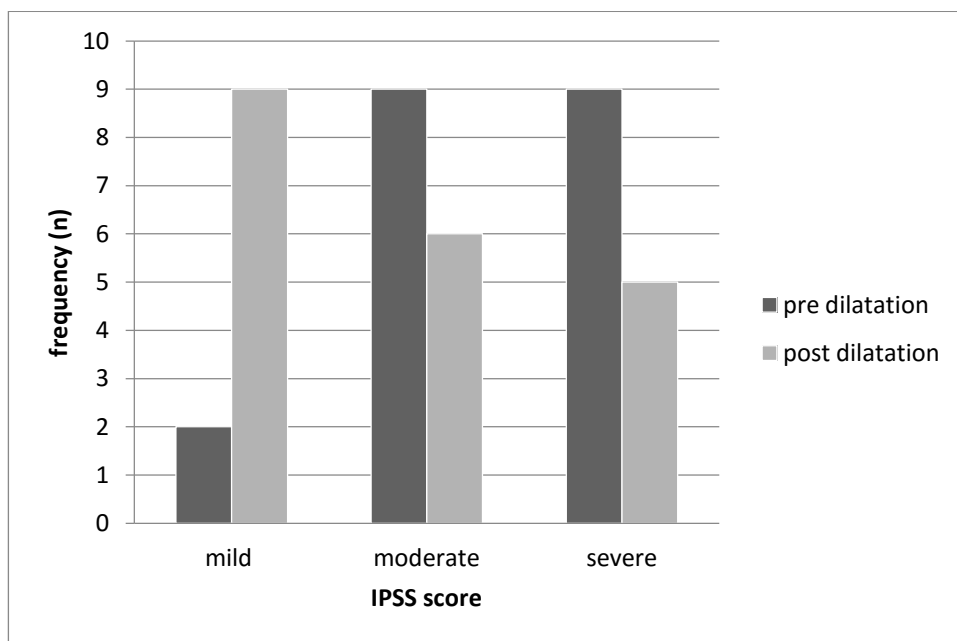
Figure 8 pre and post dilatation IPSS scores for post infectious strictures

2. Post catheterization strictures

The results show that a total of 9 patients in the LUTS group had a history of catheterization. On presentation, none had mild symptoms, 20% (n=2) had moderate symptoms and 77% (n=7) and severe symptoms. Table 3 shows the cross tabulation between pre dilatation and post dilatation IPSS scores for strictures secondary to catheterization. There was a general improvement in symptoms after dilatation. Of the two patients with moderate symptoms one improved to mild symptoms while the other remained unchanged. Those that had severe symptoms showed improvement with none recording severe symptoms, 66% (n=6) recording mild symptoms and 11% (n=1) moderate symptoms post dilatation.

Table 3 crosstabulation between pre and post dilatation IPSS scores for strictures secondary to catheterization

		post dilatation score		
		total	mild symptoms	moderate symptoms
pre dilatation score	moderate symptoms	2	1	1
	severe symptoms	7	6	1
Total		**9**	7	2

Figure 9 shows that most patients presented with severe symptoms pre dilatation and there was significant reduction in symptom severity post dilatation (p=0.012). After dilatation more patients reported mild and moderate symptoms with none reporting severe symptoms.
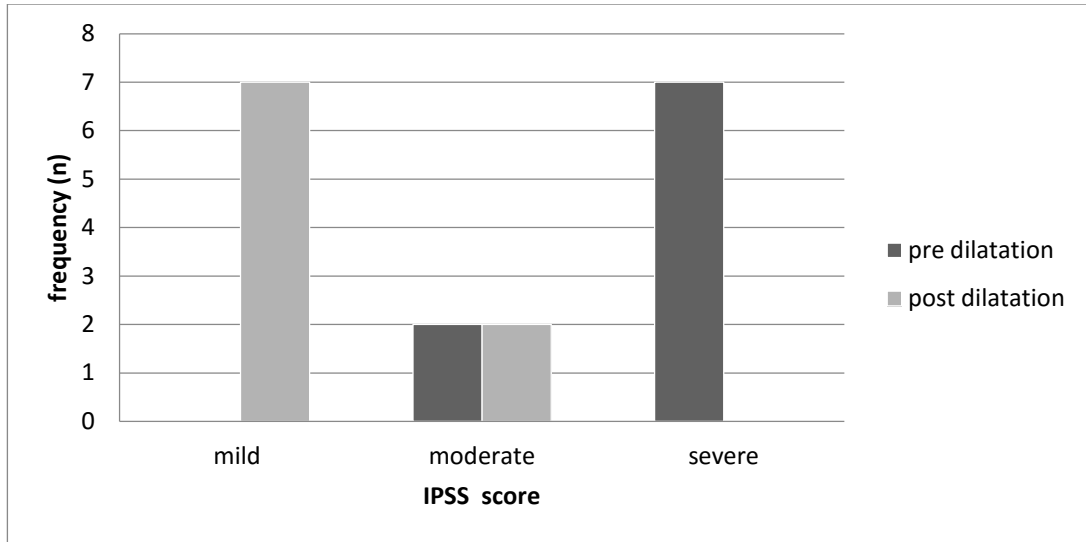
Figure 9 pre and post dilatation IPSS scores for post catheterization strictures

3. Post traumatic strictures

The results reveal that a total of 10 patients in the LUTS group had a history of urethral trauma. Pre dilatation, 20% (n=2) had mild symptoms, 20% (n=2) had moderate symptoms and 66% (n=6) had severe symptoms. Table 4 shows the cross tabulation between pre dilatation and post dilatation IPSS scores for post traumatic strictures. After dilatation the 2 patients who had mild symptoms remained with mild symptoms, the 2 with moderate symptoms remained with moderate symptoms. Those that had severe symptoms showed improvement with 33.3% (n=2) recording mild symptoms and 16.7% (n=1) moderate symptoms post dilatation, 50% (n=3) patients remained with severe symptoms.

Table 4 cross tabulation between pre and post dilatation IPSS scores for strictures secondary to trauma

			post dilatation score		
		Total	mild symptoms	moderate symptoms	severe symptoms
pre dilatation score	mild symptoms	2	2	0	0
	moderate symptoms	2	2	0	0
	severe symptoms	6	2	1	3
Total		**10**	6	1	3

Figure 10 shows that overall, most patients presented with severe symptoms pre dilatation and there was a reduction in severe symptoms post dilatation. After dilatation patients reported a significant improvement (p=0.032) to mild symptoms, despite this, 50% of the patients that presented with severe symptoms still remained unchanged after dilatation.
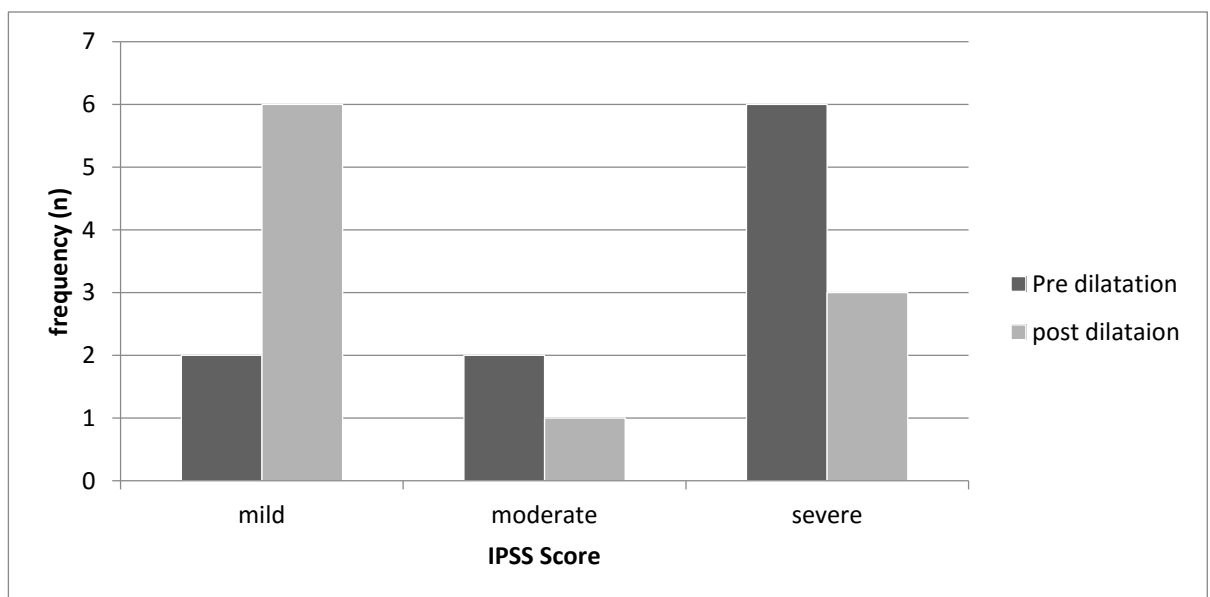
Figure 10 pre and post dilatation scores for post traumatic strictures

4. Post urological procedure stricture

A total of 4 patients in the LUTS group had a history of urological procedure with urethral involvement. Pre dilatation, none had mild symptoms, 25% (n=1) had moderate symptoms and 75% (n=3) had severe symptoms. After dilatation, all the patients had severe symptoms. Table 5 shows the cross tabulation between pre dilatation and post dilatation IPSS score for strictures secondary to urological procedures.

Table 5 cross tabulation between pre and post dilatation IPSS scores for strictures secondary to urological procedures

		Total	post dilatation score severe symptoms
pre dilatation score	moderate symptoms	1	1
	severe symptoms	3	3
Total		**4**	4

Figure 11 shows that most patients presented with severe symptoms pre dilatation with only one patient who had moderate symptoms. There was no significant change in symptoms post dilatation (p=0.180). After dilatation all patients even the one who presented with moderate symptoms had severe symptoms.
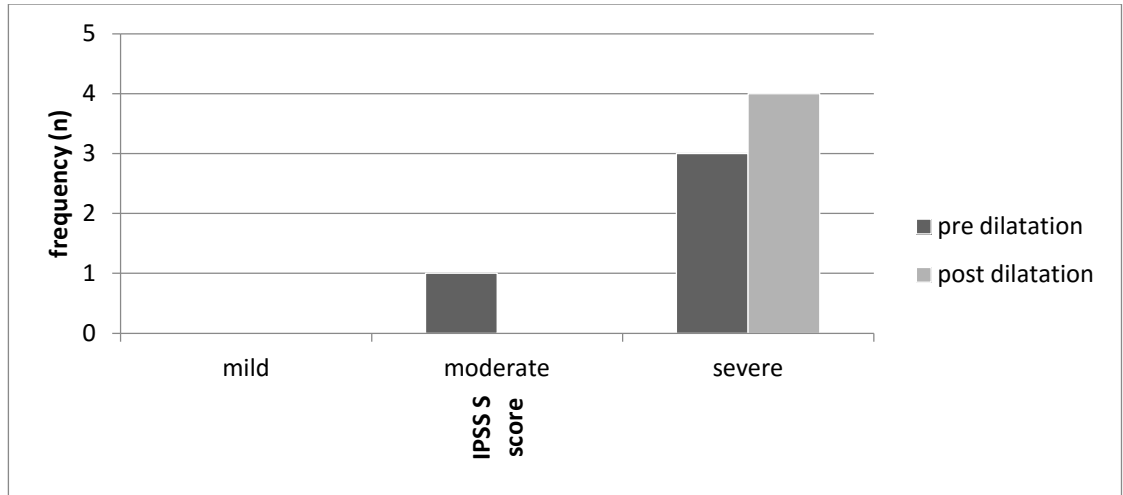
Figure 11 pre and post dilatation IPSS scores for strictures secondary urological procedures

4.4.3 Acute Urinary Retention group

A total of 23 patients were represented in this group, the tables below show the cross tabulation between pre and post dilatation outcomes in the respective etiological groups. All the patients that presented with acute urinary retention showed no significant change and mostly remained in retention even after dilatation. The only exception were patients with post infectious urethral strictures who showed a 50% improvement in IPSS scores after dilatation while 50% remained unchanged.

Sexually Transmitted Infection

Table 6: cross tabulation between pre and post dilatation IPSS scores for strictures secondary to STI

| | | pre dilatation score | **Total** |
		Retention	
post dilatation score	mild symptoms	2	2
	moderate symptoms	3	3
	retention	5	5
Total		10	10

Catheterization

Table 7: cross tabulation between pre and post dilatation IPSS scores for strictures secondary to catheterization

| | | pre dilatation score | **Total** |
		Retention	
post dilatation score	retention	1	1
Total		1	1

Trauma

Table 8: cross tabulation between pre and post dilatation IPSS scores for strictures secondary to trauma

			post dilatation score	**Total**
			retention	
pre dilatation score	Retention		8	8
Total			8	8

Urological procedure

Table 9: cross tabulation between pre and post dilatation IPSS scores for strictures secondary to urological procedure

			post dilatation score	**Total**
			retention	
pre dilatation score	Retention		4	4
Total			4	4

CHAPTER FIVE

DISCUSSION

5.1 Socioepidemiological data

The average age of patients in this study was 42.9 this is close to mean age reported in other studies in the region. A comparative study on the outcomes of treatment of urethral strictures in HIV and non HIV patients at the same institution reported an average age of 38.04 (Labib, 2013) similarly, in a study on the changing picture of urethral stricture in Nigeria the range of ages was between 15-45years (Temple, 2006). In contrast, studies in Europe and other developed countries show age patterns of 65 years and above (Anger ,2010, Ferguson, 2011). The results also show that most patients were between 25 and 35 years old, with the modal age of 36. The age distribution revealed that most patients in the study tended to be younger; this is an important patient characteristic as the disease has a significant impact on the quality of life for the most economically active population bracket. It has been shown that urethral strictures in low to middle income countries are associated with urethritis secondary to Sexually Transmitted Infections which have been found to be more common in the younger patient demographic group (Labib, et al., 2013, Mugalo, et al., 2013, Ahidjo, et al., 2012), incomplete treatment of STIs as well as increased risky sexual behaivour in this age group has also been cited as a factor predisposing such patients to formation of post infectious urethral strictures (Mugalo, et al., 2013).

In terms of education 23 (32.9%) patients had no formal education, 11 patients (15.7%) had attained primary education, 32 (45.7%) had attained secondary education, and 4 patients (5.7%) had attained tertiary education. A majority 39 (55.7%) patients were unemployed, 16 (22.9%) were in formal employment, and 15 (21.4%) were self-employed, the patients also showed a tendency of residing mostly in urban areas. Education levels and employment status have been shown to have an association with prevalence of urethral strictures in LMICs, with higher prevalence in the unemployed, younger male patient demographic (Olajide, et al., 2013, Heyns, et al., 2012). This could

be due to several reasons ranging from defaulting or avoiding treatment of STIs leading to stricture formation, or poor accesibilty to specialist centres for treatment of urethral strictures.

5.2 Stricture aetiology

Results showed that post inflammatory strictures in patients with a self reported history of sexually transmitted infection were the most common, 42.9% (n=30) had a history of sexually transmitted infection; 14.3% (n=10) had a history of catheterization; 24.3% (n=17) had a history of urethral trauma; and 11.4% (n=7) had a history of urological procedure with urethral involvement, 4.3% (n=3) had no known cause. Two patients (2.9%) had a history of both previous catheterization and trauma. This pattern is characteristic of stricture aetiology in LMICs as evidenced by studies in the region (Attah,1982, Ahidjo, 2012, Heyns, 2012). In contrast, developed countries record a higher number of iatrogenic strictures especially in the older populations (Anger 2010, Palminteri, 2013), as gonococcal strictures are becoming rare due to widespread use of broad spectrum antibiotics. In another study in the developed world, most strictures were found to be iatrogenic, fewer were inflammatory or traumatic (Fenton, 2005). There is an obvious difference in the etiologically patterns across the regions, this may be attributable to the more widespread use of transurethral manipulations for treatment of urological disease in the developed world, such as transurethral resections for tumors, and benign prostatic disease. In LMICs these facilities and/ or expertise may not be readily available hence the disparity in incidence of iatrogenic strictures in developed countries versus LMICs.

Post infective strictures are predominant in sexually active men with high risk behavior such as multiple sexually partners as reported by Heyns (2012). Other centers cited incomplete treatment of STIs as a reason for such high prevalence of post infectious strictures in resource limited settings (Mugalo, et al., 2013, Olajide, et al., 2013). In a local study at the same referral centre, similar findings with a higher number of post infective strictures compared to other etiologies were reported and it was suggested that this type of stricture was common in younger men as they were the most sexually active group (Labib, 2013). Post infectious strictures are evidently a common finding across

the region, and more attention is needed to adequately treat STIs and possibly avoid stricture formation in the first place.

Post traumatic strictures secondary to road traffic accidents (RTA) were the second most common etiological factor; this could be due to the fact that high energy trauma as would occur in RTAs, results in multiple trauma including pelvic injuries. Pelvic injuries are known to be associated with injury to the posterior urethra and subsequent stricture formation.

Only 11 patients had a history of a urological procedure with urethral involvement, which may also be attributed to the age bracket, as most young men do not routinely have urethral instrumentation, compared to older men who may be investigated and treated for BOO secondary to prostatic hyperplasia by cystoscopy or transurethral resection of the prostate. Post catheterisation strictures made up a total of 14.3% of the etiological factors; these are patients who had been catheterized on prior admissions to a health facility even for non urological reasons. Various factors lead to stricture formation after catheterisation such as material of catheter, length of time of catheterisation and catheterisation technique. In resource limited settings less reactive and more tissue friendly catheters such as silicone based catheters are expensive thus latex catheters are used more often (Popoola, et al., 2012). This leads to local tissue reaction and subsequent stricture formation. Though not as common as post infectious strictures this etiological factor is modifiable thus may be explored as a possible means of stricture prevention.

5.3 Clinical presentation

Results show that 67% (n=47) of patients presented with LUTS and were scored using the IPSS based on these symptoms. The rest of the patients, 33% (23) presented with AUR. The overall pre-dilatation IPSS results show that 5.7% patients experienced mild symptoms, 20.0% experienced moderate symptoms, and 74.3% experienced severe symptoms on first presentation. The pre-procedure mean score was 26.8 with a standard deviation of 10.0. Post procedure results showed that 34.8% experienced mild symptoms, 18.8% experienced moderate symptoms, and 46.4% experienced severe symptoms. The post dilatation mean score was 17.7 with a standard deviation of 14.6.

These results are statistically significant at p=0.001 and show that patients had an overall improvement in symptoms after dilatation from severe to moderate symptoms.

In terms of quality of life, the majority 67.1% of the patients rated their quality of life before the dilatation as being terrible; after dilatation only 40.6% rated their quality of life as being terrible. It is evident that despite the benign nature of stricture disease, it impacts patients negatively as evidenced by the quality of life scores. There was a statistically significant difference between the pre and the post dilatation quality of life results at p=0.001, implying that improvement in symptoms does indeed improve patients QoL.

5.4 Association between aetiology and outcomes of urethral dilatation

Patients were grouped into two groups based on their clinical presentation. There were 70 patients in total, 47 (67%) presented with LUTS and 23 (33%) presented with AUR (figure 4.6). In the LUTS group, aetiology was established in 43 patients; one had mixed aetiology and three had no identifiable etiological factors. These were therefore not included in subsequent associative analysis. In the AUR group, aetiology was established in all 23 patients. Analysis revealed an association between etiological factors and outcomes of dilatation at p=0.05. This finding correlates with other similar studies that report that there is a relationship between aetiology and outcome of dilatation of urethral strictures (Mathur, 2011).

Post infectious strictures

Patients with a history of STI showed a general trend of improved symptoms after dilatation. A total of 30 patients had STI as an etiological factor, 20 presented with LUTS while 10 presented with AUR. In the LUTS group, 10% (n= 2) had mild symptoms, 45% (n=9) had moderate symptoms and 45 %(n=9) had severe symptoms. After dilatation the 2 patients with mild symptoms remained with mild symptoms, of the 9 patients with moderate symptoms, 44% (n=4) had an improvement from moderate to mild symptoms, 44% (n= 4) had no improvement and remained with moderate symptoms while 11% (n=1) reported worsening from moderate to severe symptoms. The patients that presented with severe symptoms showed a trend towards markedly

improved symptoms with 30% (n=3) reporting improvement from severe to mild symptoms and 22% (n=2) improved from severe to moderate symptoms while 44% (n=4) patients remained with severe symptoms.

This shows that strictures caused by STI presenting with LUTS have good outcomes after dilatation and may be due to the fact that post infectious strictures are generally epithelial strictures therefore are not deep strictures and as such do not have extensive spongiofibrosis which is known to be associated with stricture recurrence. (Hampson, 2014, Steenkamp, 1997). In the AUR group, a total of 10 patients had STI as an etiological factor and after dilatation 20% improved from retention to mild LUTS, while 30% improved from retention to moderate LUTS this represents a total 50% improvement of symptoms. Despite this improvement, 50% of the patients remained unchanged with no relief from AUR. From this it is evident that strictures secondary to STI had an overall improvement in symptoms regardless of their clinical presentation, following dilatation. Post infectious strictures can therefore be assumed to respond well to dilatation with good short term outcomes. However, reports in similar studies do not agree with this finding, and report that post infectious strictures tend to be longer and thus have poorer outcomes following various treatments (Ahidjo, 2012, Fenton, 2005). The cohort in this study were all selected based on indications for dilatation, these included short, single site strictures as seen on urethrogram. These factors could indeed contribute to the outcomes elicited. The study was also focused on the short-term outcomes and as such it is possible that in the long term, the favourable short term outcomes, may change.

Post catheterization strictures

This group of stricture aetiology had a total of 10 patients, 9 patients presented with LUTS, and 1 presented with AUR. In the LUTS group, pre dilatation, none had mild symptoms, 22.2% had moderate symptoms and 77.8% and severe symptoms. After dilatation, the 2 patients who had moderate symptoms showed a 50% improvement, with 1 patient reporting improved symptoms from moderate to mild symptoms while 1 was unchanged and remained with moderate symptoms. Those that had severe symptoms

represented 77.8% of the LUTS group and showed marked improvement with 66.7% (n=6) reporting mild symptoms, 11.1% (n=1) reporting moderate symptoms and no reports of severe symptoms post dilatation. The one patient that presented in AUR remained in AUR even after dilatation. This implies that patients with a history of catheterization presenting with severe LUTS respond well to dilatation, while those that present with moderate symptoms have a 50% chance of either improving or remaining the same after dilatation, those who present with AUR do not respond to dilatation. Such findings might be due to the nature of strictures formed from catheterization, these strictures tend to be bulbar and short (Thomas, 2009, Popoola, 2012) and as such are amenable to dilatation, unless they present in AUR.

Post traumatic strictures

A total of 18 patients had a history of urethral trauma as an etiological factor. Ten presented with LUTS prior to dilatation. Twenty percent had mild symptoms, 20% had moderate symptoms and 60% and severe symptoms. After dilatation the 2 patients who had mild symptoms remained with mild symptoms, the 2 with moderate symptoms remained with moderate symptoms. Only those that had severe symptoms showed improvement with 33.3% (n=2) improving from severe to mild symptoms and 16.7% improving from severe to moderate symptoms post dilatation, 50% patients remained unchanged and persisted with severe symptoms. The remaining 8 patients presented in AUR and remained in AUR even after dilatation. From the above results it can be postulated that in cases of post traumatic strictures only those that present with severe LUTS should be treated with urethral dilatation while those presenting with mild and moderate symptoms do not show any improvement after dilatation thus may not require dilatation. For strictures presenting in AUR, dilatation does not give any effect and as such this group may benefit from other treatment modalities. It has been shown that post traumatic strictures tend to be posterior and usually involve the corpus spongiosum with significant spongiofibrosis (Schlossberg, 2006, Zehri, 2009) this can explain the high number of patients presenting with severe symptoms and could account for the failure of dilatation in patients with AUR.

Post-urological procedure strictures

A total of 8 patients in the study had a history of urological procedure with urethral involvement as an etiological factor. Of these, 57.1% patients presented with LUTS while 42.9% presented with AUR. Prior to dilatation none in the LUTS group had mild symptoms, 25% had moderate symptoms and 75% had severe symptoms. After dilatation, all the patients in the LUTS group had severe symptoms, while in the AUR group all patients remained in AUR. The results clearly show that of all the etiologies, urological procedures confer the worst outcomes regardless of clinical presentation. This finding is in contrast to findings in other centres where urological procedures are the most common etiological factor causing urethral strictures and outcomes are variable depending on treatment modality used. (Latini, 2014, Palminteri, 2013). In our centre, the number of patients undergoing urological procedures urethral manipulation may not be comparable to those in a specialised unit in a developed country with larger patient volumes, this fact can account for the difference in numbers of post urological procedure strictures found in this study and those cited in the other centres.

Stricture aetiology can be used as a predictor of outcomes in the short term with post inflammatory strictures secondary to STI being the most amenable to urethral dilatation. Strictures secondary to catheterization and those secondary to trauma respond to dilatation but clinical presentation may need to be taken into consideration. Strictures secondary to urological procedures with urethral involvement are not suitable for dilatation regardless of the clinical presentation.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

1. The aetiology of a urethral stricture has a considerable effect on the outcome of urethral dilatation with post infectious strictures, the most common type of stricture in this study, showing the greatest overall improvement in symptoms after dilatation.

2. Post infectious strictures are the most common type of stricture established in the study, followed by post traumatic and post catheterisation strictures, post urological procedure strictures are the least common type.

2. Patients with urethral strictures commonly present with LUTS of varying degrees or less commonly with AUR. A difference in outcomes is evident with the different clinical presentations.

4. Urethral strictures are common in younger adult male population demographic.

Dilatation should therefore only be offered as a treatment modality for those strictures that are most amenable to this treatment for best outcomes, based on the aetiology also taking into consideration the individual clinical presentation.

6.2 Recommendations

1. More robust treatment protocols and algorithms of urethral stricture management by dilatation based on locally prevailing etiological factors should be developed with clear indications, should be formulated and strictly adhered to.
2. Post traumatic strictures and iatrogenic strictures are found to respond poorly to dilatation and therefore dilatation should be avoided in such patients.

6.3 Limitations of the study

1. Tracking of patients was difficult due to incorrect and unreliable contact information provided.
2. Some patients did not complete the entire follow up schedule thus could not be included in analysis.

6.4 Areas for further study

1. Length of time from contact with etiological factor(s) to onset of stricture symptoms and possible interventions to prevent stricture occurrence.
2. The effect of aetiology on the long term outcomes of urethral dilatation.
3. Relationship between etiology and outcomes of other treatment modalities for urethral stricture disease.

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APPENDICES

Appendix A

Data collection sheet

Basic information

Case serial number #............

1. Age……yrs

2. Residence

    ☐ urban   ☐ rural   ☐ peri urban

Socio- economical information

1. Highest level of education completed:

☐ Primary   ☐ Secondary   ☐ Tertiary   ☐ none

2. Marital status

☐ married   ☐ unmarried   ☐ divorced   ☐ widowed

3. Current employment status:

☐ employed   ☐ unemployed   ☐ self employed

Medical history

1. Previous diagnosis of STI (Sexually transmitted infection)?

 yes   ☐ no   ☐ cannot recall

2. If yes, was patient treated?

 yes   ☐ no   ☐ cannot recall

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3. History of previous urethral catheterization

☐ yes   ☐ no   ☐ cannot recall

If yes, details……….

4. History of urethral trauma/injury to the genital region?

☐ yes   ☐ no

If yes, details………

5. History of urological procedure with urethral involvement

☐ yes   ☐ no

Symptoms

1. First episode of stricture

☐ yes   ☐ no

If no, how many previous dilatations done…….

2. IPSS symptom score prior to dilatation:

IPSS symptom score (out of 35)……..

QOL score (out of 6)……

Post operative assessment at 2 months

1. IPSS symptom score after dilatation
    IPSS symptom (out of 35)….
    QOL score (out of 6)….

Appendix B

PATIENT INFORMATION SHEET

The effect of aetiology of urethral strictures on the short term outcomes of patients treated with urethral dilatation at the University Teaching Hospital in Lusaka, Zambia.

Introduction
I, Mumba Chalwe , a Master of Medicine (M.Med) in urology student in the School of Medicine at The University of Zambia, request your participation in the above mentioned research study. This study is in partial fulfillment for the award of a Master of Medicine in Urology. I kindly request you to carefully read this document and ask me anything you do not understand. I would like you to understand the purpose of the study and what is expected of you. Please remember that participation in this study is absolutely voluntary. If you agree to take part in this study, you will be asked to sign this consent form in the presence of a witness.

Purpose of the study
The purpose of the study is to determine the relationship between the cause of urethral stricture (blockage of the urine passageway) and the results of dilatation-the procedure done to unblock the urethra.

Procedure of the study
If you agree to participate in this study, information will be obtained from you and entered into the data collection sheets. You shall undergo a careful history followed by clinical examination. Urethral dilatation- widening of the blocked urethra (urine passageway) will be done using medication to prevent you from feeling pain. A tube will be left in the urine passageway for 2weeks. After that you shall be reviewed in the Urology outpatient clinic for removal of the tube and as a follow up for 2 months thereafter

Possible risks and discomfort
Participation in this study will not expose you to additional risks apart from those usually associated with urethral dilatation that is; you may feel some discomfort during the procedure, apart from this, some of the questions asked during the initial interview may be uncomfortable to answer.

Confidentiality

All the information collected is strictly confidential. Data that will be collected, analysed and reported on will not include your name or other personal details and therefore cannot be traced to you.

Consent

Your participation is absolutely voluntary. Thus you are free to withdraw from the study at any time for any reason without any consequence to you.

I am grateful to you for considering participation in this study. For any concerns and clarifications, please contact Dr. Mumba Chalwe or The University of Zambia Biomedical Research Ethics Committee on the following respective addresses:

Dr. Mumba Chalwe,
University Teaching Hospital,
Private Bag 1X RW,
Lusaka.
Phone +260961966652

OR

The University of Zambia Biomedical Research Ethics Committee (UNZABREC),
School of Medicine,
Ridgeway Campus,
Nationalist Road,
Lusaka.

Appendix C

CONSENT FORM

I… do hereby confirm that the nature of this study has been sufficiently explained to me. I am aware that my personal details will be kept confidential and I understand that I may voluntarily, at any point, withdraw my participation without suffering any consequences. I have been given sufficient time to ask questions and seek clarifications, and of my own free will declare my participation in this research. I have also received a signed copy of this agreement.

………………………............   …………………………
Name of Participant (Print)   Signature/ Thumb print

 ………………………………….
 Date

………………………………   …………………………….
  Witness (Print name)   Signature/Thumb print

…………………………………
Date

Appendix D

International Prostate Symptom Score (I-PSS)

Patient Name: _____ Date of birth: _____ Date completed _____

In the past month:	Not at All	Less than 1 in 5 Times	Less than Half the Time	About Half the Time	More than Half the Time	Almost Always	Your score
1. Incomplete Emptying How often have you had the sensation of not emptying your bladder?	0	1	2	3	4	5	
2. Frequency How often have you had to urinate less than every two hours?	0	1	2	3	4	5	
3. Intermittency How often have you found you stopped and started again several times when you urinated?	0	1	2	3	4	5	
4. Urgency How often have you found it difficult to postpone urination?	0	1	2	3	4	5	
5. Weak Stream How often have you had a weak urinary stream?	0	1	2	3	4	5	
6. Straining How often have you had to strain to start urination?	0	1	2	3	4	5	
	None	1 Time	2 Times	3 Times	4 Times	5 Times	
7. Nocturia How many times did you typically get up at night to urinate?	0	1	2	3	4	5	
Total I-PSS Score							