FACTORS INFLUENCING THE TREATMENT OUTCOMES OF PATIENTS UNDERGOING URETHROPLASTY FOR URETHRAL STRICTURE AT MUHIMBILI NATIONAL HOSPITAL

Naomi Herbert Mtafu, MD

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By

Naomi Herbert Mtafu

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CERTIFICATION

The undersigned, certify that they have read and hereby recommend for acceptance by the Muhimbili University of Health and Allied Sciences a dissertation titled: **"Factors influencing the treatment outcomes of patients undergoing urethroplasty for urethral stricture at Muhimbili National Hospital"** in fulfillment of the requirements for Award of the Master of Medicine in Urology of Muhimbili University of Health and Allied Sciences.

_____

PROF. ABOUD MUHSIN, MD MMed MSc (Urology)

(Supervisor)

Date:_____

_____

DR. GABRIEL MTATURU, MD MMed MSc (Urology)

(Co-Supervisor)

Date:_____

DECLARATION AND COPYRIGHT

I **Naomi Herbert Mtafu** declare that this dissertation is my original work and has not been presented and will not be presented to any other Higher Learning Institution for a similar or any other degree award.

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DEDICATION

I would like to dedicate my dissertation research to my beloved son Travis, my mother Christina whose unwavering love and support have been my driving force through my academic pursuits; her encouragement and belief in me has been a constant source of inspiration, and I am forever grateful for her guidance and wisdom. My cousin brother Oberd who has supported me since the death of my daddy Herbert who didn't even know if I will become a doctor, but I know he would be proud.

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ABSTRACT

Background: Urethral stricture disease poses a substantial challenge in Sub-Saharan Africa, where the prevalence is notably high. This condition predominantly impacts men, and the underlying causes in the region are diverse and varied. There is a significant research gap in understanding the patient-related factors that contribute to the outcomes of urethroplasty for urethral strictures at Muhimbili National Hospital.

Objectives: To determine the factors influencing treatment outcomes among patients undergoing urethroplasty for urethral stricture at Muhimbili National Hospital.

Methodology: This cross-sectional analytical retrospective study was carried out at Muhimbili National Hospital. Through convenient sampling, data from the hospital's patient database, specifically from patients aged 10 years and above, were extracted using a structured abstraction form. Patient information, clinical findings, treatment offered and treatment outcomes were collected. The collected data were analyzed using SPSS 23.

Results: This study examined 126 patients with urethral stricture who underwent urethroplasty at MNH between January 2020 and December 2022. The mean age was 51 years, with the bulbar urethra being the most common stricture site (54%) and trauma the leading cause (44.4%). The comorbidities included diabetes (21.4%) and hypertension (71.4%). Most strictures were short (77%). Excision and primary anastomosis (EPA) procedures were preferred over buccal mucosal grafting (BMG) procedures (60.3% vs. 39.7%). The success rate of urethroplasty was 85.7%, with a 15.9% complication rate. Early complications included surgical site infections (54.5%), painful scrotum (36.4%), and wound dehiscence (9.1%). Late complications predominantly consisted of irritative lower urinary tract symptoms (83.3%), stress incontinence (5.6%), and erectile dysfunction (11.1%). Younger patients (<60 years) and those with infectious etiologies had significantly higher success rates. The type of

stricture, length of stricture, surgical approach, and catheter type did not significantly impact outcomes.

Conclusion: Urethroplasty had a high success rate of 85.7%, particularly in younger patients and those with infectious etiologies. Trauma was identified as the most common cause of urethral strictures, primarily affecting the bulbar urethra. Postoperative complications, both early and late, were observed, indicating the need for careful postoperative monitoring. Factors such as stricture level, length, surgical approach, and catheter type did not significantly impact the success of urethroplasty.

Key words: Influencing factors, treatment outcomes, urethroplasty

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LIST OF ABBREVIATIONS

BMI	Body Mass Index
BMG	Buccal Mucosa Grafting
DVIU	Direct Vision Internal Urethrotomy
EPA	Excision and Primary Anastomosis
GU	Genitourinary
LUTS	Lower Urinary Tract Symptoms
MCS	Microscopic Culture and Sensitivity
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Science
MUS	Male urethral stricture
NLR	Neutrophil to Lymphocyte Ratio
TUR	Transurethral resection
UTI	Urinary Tract Infection
USD	Urethral stricture disease
SPSS	Statistical Package for the Social Sciences

OPERATIONAL DEFINITIONS

Urethral stricture is a condition in which a scar causes the urethra to be narrowed so that urine passes with difficulty.

Urethroplasty is a reconstructive surgery performed to repair or reconstruct a damaged or narrowed urethra, typically due to conditions such as urethral strictures or other urethral abnormalities.

Treatment outcome in this research refers to the culmination of the surgical intervention's effects on patients' health, quality of life, and urinary function following urethroplasty. Urethroplasty will be deemed successful once there is resolution of the stricture and a restoration of normal urine flow and this goes together with improvement in quality of life. In contrast stricture recurrence and other surgical complications can occur immediately, in the short term or in the long term.

Immediate outcomes (within 24 hours)-The immediate outcome included surgical success and complications that could occur within 24 hours post-surgery such as bleeding, catheter drop out or blockage.

Short term outcomes (days to weeks): In the short term, the focus is on wound healing, reduction of swelling, and resolution of immediate complications such as bleeding or infection. Depending on the extent of the surgery and individual healing progress, the urinary catheter placed during urethroplasty can be removed within a few days to a few weeks after the procedure.

Long term outcome (months to years): Long-term outcomes include the continued absence or reduction of urinary symptoms, such as improved urinary flow and elimination of urinary retention, prevention of stricture recurrence and preservation of urinary continence. In the long term, successful urethroplasty can significantly enhance a patient's quality of life, including the ability to urinate normally, improved sexual function, and reduced dependence on interventions or treatments.

Influencing factors: Factors influencing urethroplasty outcomes can include various elements that may influence the success or effectiveness of the procedure and the subsequent outcomes. These influencing factors can vary based on individual patient characteristics, the nature of the urethral condition being treated, and the specific surgical technique employed. Examples of factors influencing urethroplasty outcomes; include urethral condition and stricture location, previous treatments, surgeon's experience and skill, surgical technique and approach, patient-related factors, postoperative care and follow-up, complications and comorbidities.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Developed and developing countries experience urethral stricture on a regular basis, but the patterns of causation in the two circumstances are different. Only men develop urethral strictures, this is due to their anatomical factors that they have corpus spongiosum compared to women [1].

Urethral stricture disease (USD), is a condition characterized by constriction or narrowing of the urethra. This narrowing occurs due to infections or trauma, leading to the formation of scar tissue within the corpus spongiosum and urethral mucosa. USD can arise from various aetiologies, including iatrogenic (resulting from medical intervention), traumatic, congenital, infectious, and other causes. The presence of USD can lead to urinary retention, blockage of the bladder outlet, irritation of the genital-urinary system, recurrent urinary tract infections, and impaired ejaculatory function. These, significantly impact an individual's quality of life. [2].

The causes of urethral stricture can be classified as iatrogenic, infectious, or traumatic, with iatrogenic strictures being the most prevalent, accounting for 33% of cases. Traumatic causes constitute 19% of cases, and infectious causes contribute to approximately 15% of urethral strictures [3].

Iatrogenic causes of urethral strictures can be categorized into five main factors. Trans-urethral resection (TUR) accounts for 41% of these cases. Prolonged urethral catheterization is responsible for 36% of urethral strictures. The use of silicone instead of latex in catheter materials and design has played a role in reducing the occurrence of strictures [3]. Cystoscopy (12.7%) also results in epithelial injury, contributing to the development of strictures. Additionally, hypospadias repair accounts for 6.3% of iatrogenic strictures. It is noteworthy that children who undergo this repair procedure have a 10% chance of developing urethral strictures later in life [4]. Prostatectomy (for both benign and malignant prostate) at 3.2 percent, represents an additional factor contributing to the occurrence of urethral strictures.

Within the context of prostate cancer treatment, including procedures such as radical prostatectomy, radiotherapy, and chemotherapy, urethral strictures can complicate 8.4% of men. These strictures typically occur in the bulbar urethra or stenosis in the posterior urethra [5].

In contrast to those in developing countries, infectious strictures are rare in developed countries. Although they can be found in many urethral portions, they are most frequently found in the bulbar urethra [3]. It is commonly suggested that in many tropical countries, approximately 95% of urethral strictures are attributed to infectious causes [6]. Thus, roughly 20% of Ugandan men who were sexually active reported having gonorrhea at least once a year in 1963, according to Griffith [3]. Especially in developed countries, there has been a growing concern regarding the role of organisms that cause non-specific urethritis as a significant etiological factor in infectious urethral strictures.

In the world, urethral stricture is estimated to have a prevalence of 229-627/100,000 [7]. Male urethral stricture is a relatively common condition, with varying prevalence rates across different countries. In the United States, the prevalence of MUS is approximately 200 cases per 100,000 among younger men and over 600 cases per 100,000 among men aged 65 and older. The estimated annual incidence rate in the United States is 0.9%. This condition leads to approximate 5,000 hospital admissions and 1.5 million clinic visits each year in the United States alone. In the United Kingdom, the prevalence is comparatively lower, with an estimated rate of 40 cases per 100,000 among men up to the age of 65, and 100 cases per 100,000 among men above that age [8].

Urethral stricture disease poses a substantial challenge in the Sub-Saharan African region, indicating a notable burden on healthcare systems and patients in the area. The disease primarily affects men, and the region's major etiology is a mixed bag. Patients frequently have difficulties and arrive late to seek healthcare services. Although the type and breadth of treatment vary amongst subregions, urethroplasty has gained popularity [5]. From the study done by Mugalo et al from Moi Hospital in

East Africa, the etiology of cases involving trauma were split almost evenly between iatrogenic (28%) and external trauma (25%) [9].

Based on the findings of Nyongole et al [3]., in Tanzania, iatrogenic trauma, which is specifically associated with endoscopic procedures or catheterization, can lead to the development of urethral strictures. Among these cases, catheter strictures at MNH account for approximately 13% of all urethral strictures observed.

In general, the treatment of urethral strictures can be categorized into two main approaches: transurethral methods (such as dilation and internal urethrotomy) and open surgical procedures (including excision and anastomosis, augmented urethroplasty, and perineal urethrostomy). DVIU cannot treat all types of strictures; hence, urethroplasty is considered the gold standard treatment for the majority of strictures [10,11]. Urethroplasty procedures can be influenced by factors such as the cause of the stricture, its location within the urethra, and the length of the affected area. When two methods can be used effectively, the surgeon's preference is important. Igenge et al [10], concluded that, in Tanzania, the urethroplasty success rate appears to be similar to that of other tertiary hospitals throughout the globe.

It is known that stricture surgery, substitution urethroplasty yields the best results. Because anastomotic urethroplasty is used more liberally for strictures longer than 2 cm, it has more problems and the highest rate of recurrence [7]. For a considerable duration, urethral dilation using sounds and boogies has been established as the primary treatment approach. Following either of these procedures, prophylactic antibiotics should be administered as a preventive measure for postoperative complications [8]. Urethroplasty is the gold standard for the treatment of urethral stricture, and despite its good success rate, it can cause minor or major complications that can occur either early or late. In their study on the complications of urethroplasty, Al Qudah and Santucci attempted to explain these complications in detail [12]. Early minor complications included hesitance or failure to void, mild scrotal tenderness, Foley catheter fall out, scrotal ecchymosis, small wound dehiscence and urgency, while early major complications included urosepsis and surgical site infection.

Late minor complications include penile pain, penile shortening, scrotal pain, post void leak, stress incontinence, urine spraying, irritative LUTS, ejaculatory dysfunction and perineal hypoesthesia, while late major complications include erectile dysfunction and chordee [10,12]. Levy et al [13], defined successful urethroplasty as the freedom from additional procedures after surgery to correct the stricture.

Their main result was functional success one year after the procedure. Furthermore, in their research, secondary outcomes after surgery included functional success over the course of the study as well as anatomic success at 3 months, one year, and over the course of the study.

Several factors can influence the outcome of urethroplasty, including the length, location, and complexity of the urethral stricture [14]. The experience and expertise of surgeons performing the urethroplasty play a significant role in surgical outcomes [15]. Thorough preoperative evaluation, including imaging studies and assessment of the patient's overall health, helps in identifying the optimal surgical approach and predicting the expected outcome. The specific surgical technique used for urethroplasty can influence the outcome. Adequate postoperative care, including catheter management, wound care, and follow-up, is crucial for a successful outcome [2].

1.2 Problem statement

Urethral stricture is a prevalent and challenging urological condition that predominantly affects men [10]. Globally, approximately 90% of men with urethral stricture experience complications related to their condition. The treatment and management of urethral stricture can give rise to various complications. Among the immediate adverse outcomes of urethral surgery, the most commonly encountered include stricture recurrence, infection, bleeding, and incontinence [16].

Despite the increasing burden of urethral stricture disease and the growing number of patients undergoing urethroplasty at Muhimbili National Hospital (MNH), comprehensive research investigating the factors influencing the treatment outcomes of urethroplasty is lacking. The literature does not provide sufficient information on the factors that may influence the success or failure of urethroplasty procedures in this specific setting. Therefore, there is a significant research gap in understanding the factors influencing the outcomes of urethroplasty for urethral strictures at MNH.

1.3 Rationale

Urethral stricture has become a serious health concern among male patient and there might be a limited amount of research specifically focusing on the patient population at Muhimbili National Hospital. Factors influencing treatment outcomes might differ based on factors such as patient demographics, healthcare infrastructure, and local practices. Therefore, this study will add to the existing knowledge about urethroplasty for urethral stricture at Muhimbili National Hospital and similar healthcare facilities with limited resources. In the local context, the MNH serves a specific population and operates within a unique healthcare context. The study's findings can be relevant not only for improving patient outcomes at the hospital but also for informing healthcare practices in similar settings, contributing to the advancement of medical knowledge on a broader scale. The results of this study may also add value to treatment guidelines.

1.4 Conceptual framework

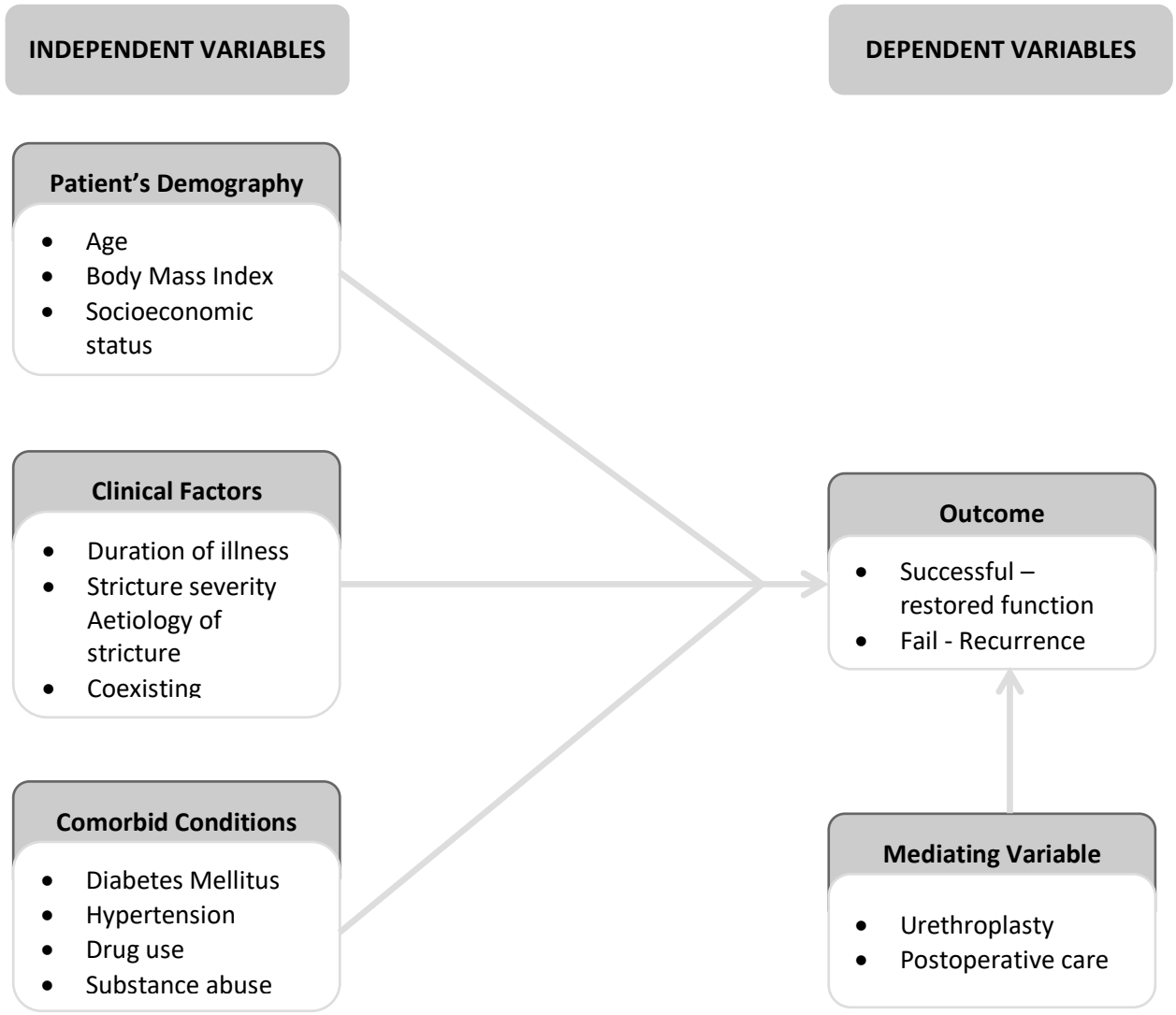


Figure 1: Conceptual Framework

Hypothesized Relationships:

a. Patient Demographics → Treatment Outcomes:
   - Age: Older patients may have a greater likelihood of having comorbid medical conditions and decreased physiological reserves, which can increase the risk of surgical complications and impact overall recovery. Furthermore, age-related factors such as reduced tissue elasticity and slower healing processes may affect surgical procedure success. However, outcomes can vary widely depending on the individual's overall health, so age should be considered alongside other factors when assessing the potential impact on urethroplasty outcomes.
   - Socioeconomic status may impact access to follow-up care.

b. Comorbid conditions
   - Diabetes Mellitus: Diabetes is known to impair the body's ability to heal wounds. High blood sugar levels can lead to poor circulation and reduced oxygen delivery to tissues, which can slow the healing process after urethroplasty. This can increase the risk of postoperative complications, such as delayed wound closure or infection [2,5,17].
   - Hypertension: can impact urethroplasty outcomes by increasing the risk of surgical complications and negatively affecting postoperative recovery. Elevated blood pressure can strain the cardiovascular system during surgery, potentially leading to cardiovascular events such as heart attacks or strokes. Additionally, hypertension can impair wound healing and increase the risk of bleeding, infection, and other surgical complications [5].
   - Substance abuse, particularly the use of drugs such as tobacco and alcohol, can impair overall health and weaken the immune system, increasing the risk of surgical complications such as wound infections and delayed healing [18].

c. Clinical Factors → Treatment Outcomes:
    - The duration of illness in urethral strictures can impact urethroplasty outcomes. Longer durations of untreated or poorly managed strictures may result in more severe tissue damage and scarring, making successful repair more challenging. Early intervention tends to lead to better outcomes, while delayed treatment can increase the risk of complications and stricture recurrence.
    - Stricture characteristics
        i. Location of the stricture
        ii. Length of the stricture
    - Coexisting conditions might affect postoperative complications. Eg. UTI, sepsis and high Neutrophil to lymphocyte ratio (NLR).
    - Causes of stricture: Trauma, infection, congenital, catheterization, TUR, and idiopathic.
d. Surgical Technique → Treatment Outcomes:
    - Surgical technique and intraoperative complications may affect long-term outcomes.
e. Postoperative Care → Treatment Outcomes: Fail or Success
    - A longer catheterization duration might affect postoperative complications. Prolonged catheterization may induce inflammation which impairs wound healing leading to formation of fibrotic scar.
    - Follow-up compliance may influence early detection of complications.

1.5 Research Question

1.5.1 Broad Research Question

What are the factors influencing the treatment outcomes of patients undergoing urethroplasty for urethral stricture at MNH?

1.5.2 Specific Research Question

1. What is the profile of patients with urethral stricture undergoing urethroplasty at MNH?
2. What are the outcomes of urethroplasty among patients with urethral stricture at MNH?
3. What are the factors influencing the outcomes of urethroplasty among patients with urethral stricture at MNH?

1.6 Study Objectives

1.6.1 Main objective

To determine the factors influencing the treatment outcomes of patients undergoing urethroplasty for urethral stricture at MNH

1.6.2 Specific objectives

1. To determine the profile of patients with urethral stricture undergoing urethroplasty at MNH.
2. To determine the outcomes of urethroplasty among patients with urethral stricture at MNH.
3. To determine factors influencing the outcomes of urethroplasty among patients with urethral stricture at MNH.

CHAPTER TWO

2.0 LITERATURE REVIEW

Complications can occur following urethroplasty for the treatment of urethral stricture. The most common complications include stricture recurrence, infection, bleeding, and incontinence [16].

2.1 Profile of patients with urethral stricture

The number of people with urethral stricture dramatically increased in the Western population after age 55 [7]. The primary causes of urethral strictures are congenital abnormalities of the mucosal membrane, infections, scarring resulting from traumatic pelviperineal injuries, urethral instrumentation, and catheterization. Additionally, failures in hypospadias repair and inflammatory conditions affecting the corpus spongiosum, such as lichen sclerosus, are also significant contributors to the development of urethral strictures according to previous studies [6]. In affluent nations, urethral strictures are typically caused by idiopathic and iatrogenic etiologies. The most frequent cause of urethral strictures in developing and Third World countries continues to be trauma [16,19]. However, according to Cheng et al., the socioeconomic status of a country has an impact on the genesis of urethral stricture [20].

Levy et al [13]. explained the management of urethral stricture in age groups that contain significantly sizable age-specific communities on the level of the largest recently reported case series using the data from the current investigation. They concluded that age itself has no influence on the outcomes of various surgical techniques after a thorough analysis of all ages involved in urethroplasty. Numerous studies have commented that despite the fact that older men are more prone to have more comorbidities, the eligibility of a man for urethroplasty should be determined by his general health, not by his age [2,13]. This study will describe comorbidities and other patient’s conditions that influence the outcome of urethroplasty in patients with urethral stricture.

Obesity can increase the risk of recurrence of urethral stricture following urethroplasty due to the fact that it is associated with impaired wound healing and tissue perfusion [21]. According to a study conducted by Kay et al. [2], obesity was identified as a significant predictor of recurrence in patients who underwent anterior anastomotic urethroplasty. This finding aligns with earlier research and is supported by evidence highlighting the known perioperative risks and comorbidities associated with a body mass index (BMI) greater than 30. Similarly, a study by Chapman et al. [22] involving 596 patients who underwent isolated bulbar urethroplasty found that obesity independently predicted stricture recurrence. In another study examining 381 patients, Breyer et al. [23], revealed that a BMI ranging from 25 to 35 strongly correlated with the failure of urethroplasty, as observed in the univariate analysis. Obesity is often accompanied by chronic low-grade inflammation throughout the body. Inflammatory processes can interfere with the normal healing process, leading to a higher likelihood of complications and stricture recurrence after urethroplasty [24].

2.2 Urethroplasty Outcome in Patient with Stricture

The gold standard for treating urethral stricture with adequate long-term success is urethroplasty with success rate of about 90% [25]. The criteria used to diagnose and assess stricture recurrence following urethral repair, however, are still very subjective. To ascertain the terms and standards used to define and rate stricture recurrence, a thorough study of the urological literature was performed [2]. The majority of these strictures are short enough to create urethral opposition from end to end. Grafts are typically employed when the length of stricture is significant or when a patient has already had a failed effort at reconstruction. The most popular graft source is buccal mucosa.

According to Falavolti et al [25], staged repairs that are amenable to Buccal Mucosa Grafting-only repairs have high long-term success rates. In phased urethral reconstruction, higher stricture length and the addition of split-thickness skin graft were linked to decreased success rates. Patients who require staged repairs frequently have recurrence in a much-delayed manner, emphasizing the importance

of thorough, ongoing monitoring. Buccal mucosa is preferable because it is easier to harvest, more widely available, and has good tissue properties that make it resistant to infection [26]. But the success rate of BMG falls when the stricture is longer than 2cm. Breyer et al [23], in their multivariate analysis of risk factors for long-term urethroplasty outcome commented that the length is the most crucial factor in the treatment and prognosis of urethral strictures. Endoscopic treatment should be avoided for strictures greater than 1 cm because preceding urethrotomy has been demonstrated to increase the probability of failure and make urethroplasty more challenging. Tanzania is advancing in urology field, and the study by Musau and Mteta shows that the total three-month success rate of urethral stricture treatment was 90.8%, with various treatment modalities having varying success rates: staged urethroplasty success rates were 80%, DVIU success rates were 88.4%, anastomotic success rates were 91.7%, and substitutional success rates were 100%. Urethroplasties had a 92.1% total success rate [11].

2.3 Factors influencing the outcomes of urethral stricture surgery

The factors commonly influencing stricture recurrence following urethroplasty include the comorbidities, stricture characteristics, previous unsuccessful urethroplasty or endoscopic treatments, smoking or tobacco usage, and the presence of lichen sclerosus. However, it is worth noting that these risk factors are not consistently included in less than half of the studies addressing this topic [18].

Diabetes Mellitus (DM) is one of the infrequently identified additional comorbidity [13]. According to Alwaal et al, DM increases the risk of urethral stricture recurrence following urethroplasty due to several interconnected factors. Elevated blood sugar levels in diabetic individuals can impair wound healing by reducing blood flow to the surgical site, leading to delayed tissue repair. Additionally, diabetes compromises the immune system, making patients more susceptible to infections, which can contribute to inflammation and scar formation [17]. Similar study conducted by Gür et al demonstrated that, the metabolic disturbances associated with diabetes can hinder the body’s response to surgical stress and injury. Overall, DM poses a multifaceted challenge in urethral stricture management, emphasizing the

importance of careful monitoring and meticulous surgical care to mitigate the risk of recurrence [27]. Furthermore, in a retrospective analysis conducted by Yildiz et al, it was observed that diabetes mellitus emerged as a significant standalone predictor for the incidence of urethral stricture recurrence. The recurrence of this condition may potentially be attributed to insufficient blood supply to the urethra, a phenomenon often associated with diabetes. This connection could be attributed to endothelial dysfunction, which disrupts the normal functioning of blood vessels across various sizes. Consequently, it contributes to the development of systemic atherosclerosis, a condition characterized by the narrowing and hardening of arteries throughout the body [28].

Conversely, the research conducted by Aydemir and colleagues yielded different results. They discovered that conditions such as diabetes, hypertension, BMI, and smoking did not exhibit a significant association with the likelihood of stricture recurrence. However, a history of coronary artery disease (CAD) was prevalent in 13.3% of patients who did not experience recurrence, while it was notably higher at 46.2% in patients who did face recurrence. This discrepancy revealed a statistically significant, moderate correlation between the number of recurrences and the presence of CAD [29]. Other studies identified smoking as a risk factor for stricture recurrence did not find any associations between smoking-related comorbidities such as COPD, peripheral vascular disease, and coronary artery disease with the recurrence of strictures [22]. The use of tobacco, in particular, may be viewed as controversial and hence a confounder. An African study reports that due to the higher prevalence of post-infective urethritis together with various etiologies, Sub-Saharan Africa likely has a higher incidence [14]. Over the years, treating urethral stricture has remained difficult, with recurrent stricture being a prominent problem.

According to the findings of Kay et al [2], individuals who encountered postoperative complications, including UTI, surgical site infection, and catheter obstruction, were at a higher risk of experiencing stricture recurrence compared to those who did not experience such complications. It is plausible to infer that the immune response that results from any of these issues may hinder the anastomosis or graft site's ability to heal, increase the risk of urethroplasty failure, and cause stricture recurrence. However, due to sample size and follow-up duration, there aren't many researches that discuss how problems during the first 90 days after surgery affect the likelihood of stricture recurrence. In a study conducted by Roehrborn et al., it was found that if a patient had a positive preoperative urine culture despite receiving antibiotic treatment, the risk of failure after urethroplasty was twice as high. However, no information was provided regarding postoperative urine cultures or UTIs during the follow-up period [30].

Based on the studies, patients with penile strictures were much less likely to have stricture recurrence. This is in contrast to earlier research that either found no relationship between the site of the stricture and its recurrence or found bulbar strictures to be less likely to do so. It is probable that the reason why the literature on the effect of stricture placement appears to vary so widely is because it is now impossible to account for all known potential confounding factors. Given the differences in surgical technique, cohort sizes, ignored confounding factors, etc. that exist across the literature; it is difficult to draw significant conclusions from investigations of stricture location [2,23]. No matter where, how long, or how the stricture was repaired, various studies have shown that Lichen Sclerosus contributes to stricture recurrence after urethroplasty [31]. However, patients with other factors apart from Lichen Sclerosus had lower recurrence rate as demonstrated in the research by Ofoha et al [14] and Igenge et al [10], this could be attributed to improved methodology and experience. In this study we are going to determine the recurrence rate in Tanzania and discuss the possible factors associated with the recurrence.

Ofoha et al [14] went further to assess the urologist's level of training and it appears to have an effect on the recurrence rate. They found that compared to urethroplasty performed by residents, the consultants' procedures showed a lower rate of stricture recurrence. These findings may be attributed to the fact that the consultants have more expertise and technical skills than the residents because they have been in the urology profession longer. Therefore, like Bello this will put focus on highlighting significance of the surgeons' knowledge and skill in estimating re-stricture rates [32]. It is important to note at this time that there aren't many publications explicitly comparing the level of a surgeon's ability to their level of experience. The majority of research mostly focuses on preoperative and postoperative features.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design

This was a cross-sectional study in which data were retrospectively collected from patients undergoing urethroplasty for urethral stricture at MNH between January 2020 and December 2022.

3.2 Study area

The study took place at Muhimbili National Hospital, in Dar es Salaam, Tanzania, which is also a teaching hospital for Muhimbili University of Health and Allied Sciences (MUHAS). It serves all patients referred from upcountry and neighboring countries. The hospital has a total of 33 departments and bed a capacity of 1500, 120 of which are set apart for adult general surgery services, including the Urology Department. The department has diagnostic tools, surgical equipment, and 14 specialized medical personnel. Patients have access to postoperative rehabilitation programs, counselling, and support groups. All urological surgical cases were handled by this department. The urologists perform both open and endoscopic urological operations, of which urethral stricture is one of the top ten urological conditions treated at the facility. Approximately 50 urethroplasty were performed in one year based on hospital records.

3.3 Study population

All male patients aged 10 years and above diagnosed with urethral stricture and underwent urethroplasty at the Urology department in MNH.

3.4 Inclusion and Exclusion Criteria

3.4.1 Inclusion criteria

- All patient records that met the standard of variable requirements to be assessed were included in the study.

3.4.2 Exclusion criteria

- Patients with congenital urethral anomalies (e.g. those with urethral stricture due to hypospadias repair) were excluded from this study.
- Records with incomplete data.

3.5 Sample size and sampling technique

3.5.1 Sampling procedure

Due to the specific data requirements of the study, a convenient sampling approach was employed. All patients who met the inclusion criteria and underwent urethroplasty between January 2020 and December 2022 were included in the study until the sample size was reached.

3.5.2 Sample size estimation

The sample size was determined using Cochran's formula for a single population proportion, as developed in 1963. A minimum of 50 patients undergoing urethroplasty yearly based on MNH records, and the complications rate was 9%, according to previous studies [33].

$$n = \frac{Z^2 P (1-P)}{E^2}$$

Where: -

Z =1.96 (for 95% confidence interval)

P = 9%.

E = Desired precision, which is set at 5% (maximum likely error)

$$n = \frac{1.96^2 \times 9 (100 - 9)}{5^2}$$

Sample size (n) =126

Therefore, a total sample size of 126 patients was selected from the study population using a convenient sampling method.

3.6 Variables

3.6.1 Dependent variable

The outcomes included urethral function and complications. This refers to the extent to which the surgery effectively resolved the urethral stricture and restored normal urinary function. In this regard urethral function refers to improvement in urinary symptoms (both irritative and obstructive LUTS), and postvoid residual urine volume. If the stricture returns after surgery, it was considered a recurrence. The study also examined factors that contribute to recurrence, including stricture complexity, inadequate resection, tissue healing and scarring, infection, surgical technique and patient factors (smoking, diabetes mellitus and other comorbidities).

However, complications resulting from urethroplasty can be divided into early and late complications which can be further divided into minor and major complications. Early minor complication includes; hesitance or failure to void, mild scrotal tenderness, Foley catheter fall out, scrotal ecchymosis, small wound dehiscence and urgency, while early major complications include, urosepsis and surgical site infection (SSI). Late minor complications include penile pain, penile shortening, scrotal pain, post void leak, stress incontinence, urine spraying, irritative LUTS, ejaculatory dysfunction and perennial hyposthesia, while late major complications include erectile dysfunction and chordee.

3.6.2 Independent variable

a) Patient Demographics:
    i. Age: Measure in years
    ii. Body mass index (BMI): Measured in kg/m^2
    iii. Smoking: Yes/No
    iv. Alcohol: Yes/No
b) Clinical Factors:
    i. Duration of Illness: Measure in months or years (e.g., 3 years).
    ii. Stricture level: bulbar, penobulbar, prostate-membranous
    iii. Length of stricture: greater than 2.5 cm, less or equal to 2.5 cm

iv. Aetiology of Stricture: Categorize the cause of the stricture (e.g., traumatic, infectious, iatrogenic).

v. Coexisting Conditions: Create binary variables (e.g., presence/absence) for coexisting conditions such as UTIs.

c) Surgical Factors: The specific surgical technique employed, type of reconstruction (graft versus excision and primary anastomosis - EPA), and type of catheter used (silicone versus latex) can influence the outcome of urethroplasty.

d) Preoperative Care: Urethral catheterization.

3.7 Data collection techniques and tools

The sample for this study was accessed through the hospital Jeeva database, and patient files. The secondary data were collected by reviewing patients' medical records in the MNH computerized database. The data on patients who underwent urethroplasty was obtained from patient records extracted from patients' database. Information on a minimum of 126 patients who underwent urethroplasty at MNH from January;2020 to December;2022 was retrieved from patient's database and files by the principal investigator assisted by the hospital data manager. The data was collected using a structured tool attached in appendix I. The data collected included factors influencing the treatment outcomes of patients who underwent urethroplasty as explained in various sections above. The patient's profile included age, symptom duration, days of admission and history of smoking and the comorbidities included diabetes, lichen sclerosus, hypertension and COPD. The level of the stricture and the type of reconstruction were recorded in data collection tool.

Before commencing data collection, two assistants were chosen and provided with training to review the medical records of pertinent patients during the first two days, in preparation for data extraction.

3.7.1 Recruitment and training of research assistants

Two research assistants with experience were recruited to facilitate data collection. The research assistants were medical doctors with good English commands both written and spoken, previous experience in research settings, effective communication skills and proficiency in using common software tools. They received two days of training from the principal investigator on the study's objectives, data collection protocols, tools, and ethical considerations.

3.7.2 Piloting tool

To assess the accuracy and consistency of the research tool, a sample of patients' medical records from MNH was used. The preliminary testing phase involved administering the checklist to 10 patient records. The responses were analyzed to evaluate the validity and internal consistency of the questions, prompting and adjustments were made if inconsistencies were identified.

3.8 Data processing and analysis

3.8.1 Data Management

The collected data were entered into Microsoft Excel for data processing. Quality control checks was done to ensure that the collected data are complete and accurate before being analyzed. Data were analyzed using SPSS software version 23.

3.8.2 Data analysis

Objective 1

Descriptive statistical analysis was employed to summarize the patients' profiles. Frequencies, percentages, means, medians and standard deviations (SD) were calculated to provide a comprehensive overview of the patient population. Summary statistics and frequency tables were generated to summarize the results and presented using tables, and charts.

Objective 2

Statistical analysis was performed to evaluate the treatment outcomes. This involved calculating measures such as success rates, improvement percentages, or complication rates. The chi-square of Fisher's exact test was applied to examine associations between surgical outcomes and categorical factors such as surgical technique.

Objective 3

Logistic regression was used to assess the relationship between the variables (such as patient demographics, clinical factors, surgical techniques) and a binary outcome (successful outcome or recurrence). Additionally, mediating variables were examined using mediation analysis to assess their impact on treatment outcomes. In the bivariate analysis, all variables that demonstrated a significant association (with a crude odds ratio and 95% confidence interval) at a significance level of ≤ 0.05 were considered. These significant variables were included in the multiple logistic regression analysis to account for confounding factors. The degree of association between the variables were determined using adjusted odds ratios and their corresponding 95% confidence intervals. A p-value ≤ 0.05 was considered to indicate a statistically significance between the variables.

3.9 Ethical considerations and approval

Ethical approval was obtained from the MUHAS Institutional Review Board. Permission to collect data at the MNH General Surgery department, Urology Unit and Medical Records Department was sought from the MNH administration. The confidentiality of the collected data was assured. Only personnel directly involved with the research had access to the data and data were used only for purposes of research and results publication. In this study, there was a waiver for documentation of informed consent because only secondary data was collected and the researcher relied on patient's files and available records in the database rather than interacting directly with the patient.

3.10 Study limitations and mitigation

The limitations of this study stem from its single-center design and retrospective nature, lack of objective assessment tool like uroflowmetry to determine the success or failure. Although efforts were made to collect comprehensive data from patient files, some information were missing or incomplete. To address this limitation, rigorous checks of the data were conducted using a checklist, and any patients whose information was incomplete were excluded from the analysis. Despite these measures, the inherent constraints of a single-center retrospective study impacted the breadth and depth of the data available for analysis.

CHAPTER FOUR

4.0 ANALYSIS AND RESULTS PRESENTATION

4.1 Profile of patients with urethral stricture

Between January 2020 and December 2022, a total of 126 patients who met the inclusion criteria among those who underwent urethroplasty were included. The youngest patient was 14 years old, while the oldest patient was 97-year-old. The mean age ± SD was 51 ± 20 years, indicating that a broad age range was affected by urethral stricture. The bulbar urethra was the most common level of stricture (38 patients, 54.0%), followed by the peno-bulbar (39 patients, 31.0%), penile (14 patients, 11.1%), and bulbo-membranous (5 patients, 4.0%) urethras. There were no strictures involving the prostatic urethra.

Trauma was the most common aetiology of stricture, with 56 cases (44.4%), followed by iatrogenic causes (22 cases, 17.5%), infectious causes (19 cases, 15.1%), and unknown causes (29 cases, 23.0%). Comorbidities were observed in some patients, with 9 (21.4%) having diabetes, 30 (71.4%) having hypertension, and 3 (7.2%) having non-urological malignancies. Regarding the length of the stricture, 29 patients (23%) had long segment (>2.5 cm) and 97 patients (77%) had short segment (≤2.5 cm). Among the urethroplasties, 50 (39.7%) BMG and 76 (60.3%) EPA procedures were performed, indicating a preference for EPA over BMG. This trend might be attributed to the predominance of younger participants in the research cohort, who constituted the majority among patients with strictures, and the greater frequency of trauma as the primary cause of stricture, particularly at the level of the bulbar urethra. Regarding the urethral catheter used, 52 (41.3%) were latex catheters, and 74 (58.7%) were silicone catheters.

Table 1: Characteristics of patients undergoing urethroplasty, N=126

Variables	Frequency	Percent
Age in years (mean ± SD)	51 ± 20	
Length of stricture		
Long segment (>2.5 cm)	29	23
Short segment (≤2.5 cm)	97	77
Stricture level		
Penile	14	11.1
Peno-bulbar	39	31.0
Bulbar-urethra	38	54.0
Bulbo-membranous	5	4.0
Aetiology of stricture		
Traumatic	56	44.4
Iatrogenic	22	17.5
Infectious	19	15.1
Unknown	29	23.0
Comorbidities		
Diabetes	9	21.4
Hypertension	30	71.4
Non-urological malignancy	3	7.2
Surgery type		
BMG	50	39.7
EPA	76	60.3
Urethral catheter type		
Latex	52	41.3
Silicone	74	58.7

BMG - Buccal mucosa graft;
EPA - Excision and primary anastomosis

4.2 Urethroplasty Outcomes

The results indicate that 85.7% of the urethroplasty procedures were successful, while 14.3% resulted in failure or recurrence. Complications were observed in 15.9% of patients, with early complications including surgical site infection (SSI) in 54.5%, painful scrotum in 36.4%, and wound dehiscence in 9.1%. Late complications predominantly consisted of Irritative ± obstructive Lower Urinary Tract Symptoms (LUTS) in 83.3% of patients, with a smaller percentage experiencing stress incontinence (5.6%) and erectile dysfunction (11.1%). These findings suggest that while the majority of urethroplasty surgeries were successful, a notable portion of patients experienced postoperative complications, emphasizing the importance of careful monitoring and management of patients undergoing such procedures. See Table 2 below.

Table 2: Outcome of urethroplasty among patients undergoing BMG and EPA

Variables	Frequency	Percent
Surgical outcome		
Success	108	85.7
Fail/recurred	18	14.3
Complication rate		
Yes	20	15.9
No	106	84.1
Early complications		
SSI	6	54.5
Painful scrotum	4	36.4
Wound dehiscence	1	9.1
Late complications		
Irritative ± Obstructive LUTS	15	83.3
Stress incontinence	1	5.6
Erectile dysfunction	2	11.1

LUTS; Lower urinary tract symptoms
SSI; Surgical site infection

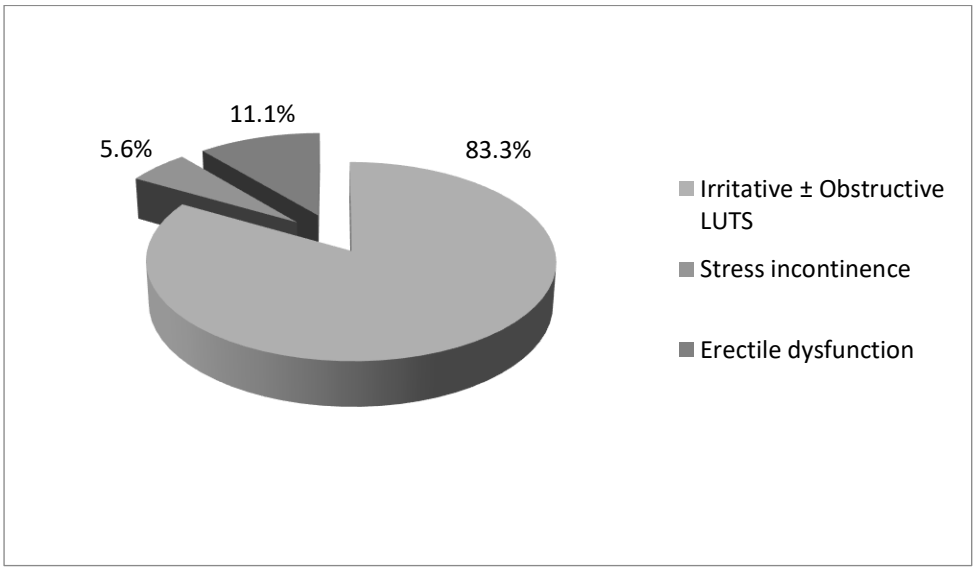


Figure 2: A pie chart demonstrating late complications among patients undergoing urethroplasty

Table 3: Chi-square test for factors associated with success of urethroplasty

Variable	Success		p-value
	Yes	No	
Age during treatment (years)			0.001
Young (<60)	74 (94.9)	4 (5.1)	
Old (≥ 60)	34 (70.8)	14 (29.2)	
Etiologies			0.138
Traumatic	47 (83.9)	9 (16.1)	
Iatrogenic	19 (86.4)	3 (13.6)	
Infectious	14 (73.7)	5 (26.3)	
Unknown	28 (96.6)	1 (3.4)	
Level of stricture			0.578
Penile	11 (78.6)	3 (24.1)	
Peno-bulbar	35 (89.7)	4 (10.3)	
Bulbar-urethra	58 (85.3)	10 (14.7)	
Bulbo-membranous	4 (80.0)	1 (20.0)	
Length of stricture (cm)			0.763
Short segment ≤2.5	82 (84.5)	15 (15.5)	
Long segment >2.5	26 (89.7)	3 (10.3)	
Surgical approach			0.795
BMG	42 (84.0)	8 (16.0)	
EPA	66 (86.8)	10 (13.2)	
Catheter type			0.447
Latex	43 (82.7)	9 (17.3)	
Silicone	65 (87.8)	9 (12.2)	

4.3 Factors influencing success among patients undergone urethroplasty

Age was classified into two groups: younger individuals under 60 years old and older individuals aged 60 years and above, referring to methodologies used in comparable prior studies [13].

Table 3 presents a chi-square test analysis of factors associated with the success of urethroplasty. The success rates vary significantly with age; younger patients (<60 years) have a higher success rate compared to older patients (≥60 years) with a statistically significant p-value of 0.001. Etiologies of the condition do not show significant differences in success rates, with traumatic, iatrogenic, infectious, and unknown causes all having varying but non-significant success rates (p=0.138). The level of stricture (penile, peno-bulbar, bulbar-urethra, bulbo-membranous) also does not significantly affect success rates (p=0.578). Similarly, the length of the stricture (short segment ≤2.5 cm vs. long segment >2.5 cm) shows no significant impact on success (p=0.763). The surgical approach, whether BMG or EPA, does not significantly influence success rates (p=0.795). Lastly, the type of catheter used (latex vs. silicone) also shows no significant difference in success rates (p=0.447).

The findings from the multivariable logistic regression analysis of factors influencing the success rate among patients undergoing urethroplasty revealed several significant associations. Younger patients (<60 years) have significantly higher success rates (94.9%) compared to older patients (70.8%), with COR 0.13 and AOR 0.09. Among etiologies, infectious causes have higher odds of success (73.7%) compared to unknown causes, with COR 10.0 and AOR 13.12. Traumatic and iatrogenic causes do not show significant differences. The level and length of the stricture, surgical approach, and catheter type do not significantly impact success rates. Notably, younger age and infectious etiology are associated with better treatment outcomes. See table 4 below.

Table 4: Multivariable logistic regression of factors affecting urethroplasty success rate

Variable	Bivariate		Multivariable	
	COR (95%CI)	***P*-value**	**AOR (95%CI)**	***P*-value**
Age during treatment (years)				
Young (<60)	0.13 (0.04 – 0.43)	0.001	0.09 (0.03 – 0.33)	**<0.001**
Old (≥ 60)	Ref		Ref	
Etiologies				
Traumatic	5.3 (0.65 – 44.60)	0.120	8.14 (0.89 – 73.79)	0.062
Iatrogenic	4.42 (0.43 – 45.75)	0.213	2.38 (0.22 – 26.02)	0.477
Infectious	10.0 (1.06 – 94.01)	0.044	13.12 (1.23 – 139.67)	**0.033**
Unknown	Ref		Ref	
Level of stricture				
Penile	1.09 (0.08 – 13.78)	0.946		
Peno-bulbar	0.46 (0.04 – 5.16)	0.527		
Bulbar-urethra	0.70 (0.07 – 6.82)	0.751		
Bulbo-membranous	Ref			
Length of stricture (cm)				
Short segment ≤2.5	1.5 (0.43 – 5.90)	0.492		
Long segment >2.5	Ref			
Surgical approach				
BMG	1.26 (0.46 – 3.44)	0.656		
EPA	Ref			
Catheter type				
Latex	1.51 (0.55 – 4.11)	0.419		
Silicone	Ref			

1. AOR: Adjusted Odds Ratio
2. COR: Crude Odds Ratio
3. Cl: Confidence limit
4. Bold p-value means significant at $p < 0.05$

CHAPTER FIVE

5.0 DISCUSSION

The American Urological Association released updated guidelines in 2016 for the treatment of urethral stricture disease. These guidelines outline various approaches to managing urethral strictures, such as end-to-end primary anastomosis (EPA) and augmented urethroplasty, typically using buccal mucosa graft (BMG). The selection of the appropriate technique depends on factors such as the specific location within the urethra affected by the stricture and the length of the stricture itself [7]. The current study investigated the factors influencing the treatment outcomes in patients undergoing urethroplasty for urethral stricture at MNH. The findings of this study are discussed in this chapter.

5.1 Patients Characteristics

Until now, the majority of urethroplasty studies have been characterized by relatively small sample sizes and considerable diversity in patient populations, which has restricted the possibility of conducting subgroup analyses based on particular demographic and clinical features [13,14]. However, the present study faced challenges in achieving a large sample size.

Urethral stricture can occur across a wide age range, but there is a notable difference in prevalence between younger and older individuals. This study demonstrated this finding and is in line with studies conducted by Levy et al in Italy, Tinaut-Ranera in Spain and Ofoha et al in Nigeria [13,14,34]. In younger patients, trauma tends to be a more common aetiology, possibly due to activities associated with higher risk, such as sports or motor traffic crash. The findings of this study indicate that trauma is the predominant cause of urethral stricture in younger individuals, accounting for 73.2% of cases. On the other hand, older patients may develop urethral stricture due to a range of factors, including age-related alterations in tissue elasticity, urinary tract infections, or complications arising from medical procedures. Notably, iatrogenic causes were responsible for 70.0% of strictures in older patients in our study. This observation

suggested that urinary problems and hospitalizations requiring urethral catheterization and instrumentation may contribute significantly to the development of urethral stricture in this age group. These findings are consistent with those reported in studies by Kimu et al., Musau et al., and El et al [9,11,33].

5.2 Outcomes of BMG and EPA urethroplasty

Conventionally, the primary approach for treating urethral stricture involves urethral dilatation and/or direct vision internal urethrotomy (DIVU) or Sachse procedures. These methods are preferred due to their simplicity and minimal morbidity. However, despite initial symptom improvement, urethral dilatation or urethrotomy often results in a high rate of recurrence, with endoscopic procedures frequently demonstrating low efficacy. Falavolti et al. highlighted this issue [25]. The current section discusses the findings of various urethroplasty techniques and their respective outcomes.

Anastomotic urethroplasty and graft urethroplasty are the prevailing techniques, and exhibit comparable long-term success rates [5,12,13,34]. Despite the increased incidence of urethral strictures with advancing age, there remains a dearth of literature on urethroplasties in elderly patients. In this study, a majority of urethroplasties were performed in younger patients (61.9%) compared to elderly patients (38.9%), a trend consistent with findings from studies by Erickson et al [35]. and Falavolti et al [25]. The contemporary definition of success encompasses both anatomical (where a flexible cystoscope can traverse the reconstructed urethra without difficulty) and functional (with patient-reported amelioration of voiding symptoms and urinary quality of life) criteria [35]. The success rate of urethroplasty in this study was 85.7%. Corresponding studies have reported success rates ranging from approximately 90%, as delineated by Falavolti et al [25]. and Wong et al [36]., with simpler procedures demonstrating higher success rates than complex repairs.

Buccal mucosa grafts are favoured due to their ease of procurement, greater availability, resistance to infection, and favourable tissue characteristics [37].

Numerous studies have indicated superior success rates with buccal mucosa grafts compared to end-to-end urethroplasty, even in managing short bulbar strictures [25]. Interestingly, the present study revealed a slightly greater success rate in EPA than in BMG urethroplasty, consistent with the findings from Levy et al [13]., who reported that EPA was superior to BMG for achieving 3-month anatomic success after adjusting for other factors. The outcome of this study could be explained by the preference of surgeons preferring EPA over BMG in MNH. Overall, 15.9% of patients in this study experienced complications, some of whom experienced early complications, some late complications and some experienced both. Findings from this study were slightly lower compared than those of Al-Qudah et al, who reported complication rates of 21% for anterior anastomotic urethroplasty and 40% for fasciocutaneous onlay urethroplasty [12,36]. Similarly, Andrich et al [38]. Reported a significantly greater complication rate after fasciocutaneous urethroplasty (33%) than after anastomotic urethroplasty (7%). Surgical site infection has emerged as the most prevalent early complication, a topic that has been underexplored in recent literature. The recurrence of stricture manifested as LUTS in patients undergoing both EPA and BMG procedures, albeit more pronounced in BMG patients. Furthermore, erectile dysfunction was reported in 2 patients who underwent EPA, consistent with findings from Al-Qudah et al [12].

5.3 Factors influencing urethroplasty outcomes

While previous studies have explored factors predicting postoperative outcomes of urethroplasty, such as success, complications, and recurrence in patients with urethral strictures, these studies frequently have limited scope, focusing solely on specific stricture locations (e.g., bulbar strictures) or individual urethroplasty techniques. Given the size and diversity of the patient, this study could incorporate variables such as stricture length and location, among others to study urethroplasty outcomes. To explore potential predictors that may impact the outcomes of urethroplasty, factors including age, aetiology, level and length of stricture, surgical technique, and type of catheter employed were considered.

There is conflicting evidence regarding the successful outcomes of urethroplasty in the elderly population [31,40,41]. This study revealed that younger age was significantly associated with successful urethroplasty, while older age was associated with lower odds of success. This finding aligns with findings from previous studies investigating age in relation to urethroplasty. For instance, Schwentner et al [40]. observed a greater urethroplasty failure rate in older patients, although the study did not account for variations in comorbidities between groups. Conversely, in a series of 604 urethroplasties conducted in a tertiary referral center, factors such as stricture length, lichen sclerosus, iatrogenic and infectious aetiology, rather than age over 50 years, were independently linked to stricture recurrence [31]. Similarly, Santucci et al [39] demonstrated in a multicentric series involving different urethroplasty techniques that there was a comparable incidence of postoperative complications and treatment failure in patients older than 65 years compared to their younger counterparts (<65 years old).

Age had a notable impact on outcomes, particularly concerning success rates and complications. Interestingly, despite the older group exhibiting significantly greater rates of comorbidities, the outcomes remained statistically similar. Specifically, hypertension was notably more prevalent among older men; however, it did not emerge as a significant predictor of either success or complication rates. Although many 60-year-old men may exhibit functional and biological characteristics that suggest that they are younger than their chronological age, it is a well-established epidemiological fact that the prevalence of comorbidities tends to increase with advancing age. In terms of surgical approach, EPA initially appeared to outperform BMG, but it did not emerge as a statistically significant predictor for success when other factors were controlled ($p=0.656$). However, it is important to note that this comparison was not the primary focus of the study but rather a factor that was controlled for as a confounder. Notably, stricture length did not emerge as a predictor of functional success, potentially due to the relatively small sample size.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study evaluated 126 patients who underwent urethroplasty, revealed diverse demographics affected by urethral stricture, with trauma being the leading cause. The bulbar urethra was the most commonly affected site, and comorbidities such as diabetes and hypertension were observed. A preference for EPA over BMG procedures was noted, potentially influenced by patient age and aetiology, particularly trauma at the bulbar urethra level. The complication rates were notable, emphasizing the importance of thorough postoperative care. Additionally, younger age and infectious aetiology were associated with higher success rates of urethroplasty, while iatrogenic aetiology was correlated with lower success rates. Overall, these findings emphasize the need for personalized management approaches in urethroplasty patients, considering individual factors such as age and aetiology to optimize outcomes and minimize complications.

6.2 Recommendations

Based on the findings of this research, it is recommended that urethroplasty be considered as a viable option for treating urethral strictures, even in older patients. Further studies should aim to investigate the impact of specific comorbidities, such as hypertension, on the outcomes of urethroplasty in older patients. Additionally, longitudinal studies with larger sample sizes are needed to validate the findings of this research and explore the long-term success rates and complications associated with different urethroplasty techniques. Furthermore, research focusing on the optimal management strategies for urethral strictures in elderly populations, considering factors such as age-related changes in tissue elasticity and vascular supply, would be beneficial for informing clinical practice.

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APPENDICES

Appendix I: Data Collection Tool

Socio-Demographic Profile

Form number		MR No.	
Date of admission		Date of discharge	
Sex		Age	years

Aetiology of stricture

Iatrogenic		Infectious		Traumatic	
Unknown					

Comorbidities (Yes vs. No)
Put (X) where appropriate

	Yes	No		Yes	No
Diabetes			Hypertension		
Hyperlipidemia			Cancer		
CAD			Lichen sclerosus		

Level of Stricture, Length & Type of Reconstruction
Put (X) where appropriate

Level of stricture				**Length of stricture**	
Prostato-membranous		Membrano-bulbar		Length < 2.5 cm	
Penile		Bulbar		Length > 2.5 cm	
		1. BMG		2. EPA	

Reconstruction type				
Type of catheter	1. Latex		2. Silicone	

Early complications Put (X) where appropriate				
Folley catheter fall out		Hesitancy		Scrotal ecchymosis	
Failure to void		Painful scrotum		Wound dehiscence	
Urgency		Urosepsis		SSI	

Late complications Put (X) where appropriate				
Post void leak		Urine spraying		Stress incontinence	
Penile pain		LUTS		Penile shortening	
Ejaculatory dysfunction		Chordee		Perineal hyposthesia	
Erectile dysfunction					

*BMG – Buccal Mucosa Grafting
*CAD – Coronary Artery Disease
*EPA – Excision And Primary Anastomosis
*LUTS – Lower Urinary Tract Symptoms
*SSI – Surgical Site Infection

Appendix II: Ethical Clearance

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS
AND INNOVATION

Ref. No DA.282/298/01.C/1964 Date: 31/10/2023

MUHAS-REC-10-2023-1964
NAOMI HERBERT MTAFU
COLLEGE OF MEDICINE
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: PATIENTS' PROFILE AND FACTORS ASSOCIATED WITH TREATMENT OUTCOMES AMONG PATIENTS WITH URETHRAL STRICTURE WHO UNDERWENT URETHROPLASTY AT MUHIMBILI NATIONAL HOSPITAL

Reference is made to the above heading.

I am pleased to inform you that the Chairperson has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 31/10/2023
EXPIRATION DATE OF APPROVAL: 31/10/2024

STUDY DESCRIPTION:
Purpose:

To determine the profile and factors associated with outcomes of patients with urethral stricture who underwent urethroplasty at Muhimbili National Hospital.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided:
https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2014801.pdf and in the MUHAS archives.

Appendix III: Permission Letter

THE UNITED REPUBLIC OF TANZANI

MINISTRY OF HEALTH

MUHIMBILI NATIONAL HOSPITAL

In reply please quote.

Ref. No.: MNH/CRTCU/Perm/2023/568 Date: 05th December, 2023

Head of Department

- Medical Records

Muhimbili National Hospital

RE: PERMISSION TO COLLECT DATA AT MNH

Name of Student	**Naomi H. Mtafu**
Title	**" Patient Profile and Factors Associated with Treatment Outcome Among Patients with urethral Stricture who Underwent Urethroplasty at MNH"**
Institution	Muhimbili University of Health and Allied Sciences
Supervisor	Prof. Aboud Muhsin (MUHAS)
Co-supervisor	Dr. Gabriel Mtaturu (MNH)
Period	05th December, 2023 to 05th February, 2024

Approval has been granted to the above principal investigators to collect data at MNH. Dissemination of study findings at MNH shall be overseen by **Dr. Gabriel Mtaturu (MNH)** supervisor.

Kindly ensure the named principal investigator abide to the ethical principles and other conditions of the research approval.

Sincerely,

Dr. Charles Pallangyo
For: Head of Clinical Research, Training and Consultancy Unit

c.c DICT
c.c **Naomi H. Mtafu**
c.c **Dr. Gabriel Mtaturu**

Upanga West, Kalenga Street, Plot No. 10480/3, P.O. BOX 65000, Dar es Salaam, Tanzania.
Telephone: +255-22-2151367-9, Telephone: +255-22-2151351-2
Email: info@mnh.or.tz, Website: www.mnh.or.tz