



**UNIVERSITY OF NAIROBI**

**MICTURITION RELATED QUALITY OF LIFE IN  
SUBSTITUTIONAL URETHROPLASTIES AND ITS  
DETERMINANTS AS SEEN IN KENYATTA NATIONAL  
HOSPITAL**

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A RESEARCH DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT FOR  
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THE UNIVERSITY OF NAIROBI



**DECLARATION**

This research was undertaken in partial fulfillment of the Master of Medicine (Urology) and is my original work and has not been presented for a degree in any other University.

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## LIST OF ABBREVIATIONS AND ACRONYMS

ANOVA	Analysis of Variance
AOR	Adjusted Odds Ratio
AUR	Acute Urine Retention
AUS	Anterior Urethral Stricture
AUA-SI	American Urological Association-Symptom Index
BMG	Buccal Mucosa Graft
BPH	Benign Prostate Hyperplasia
CI	Confidence Interval
DVIU	Direct Visual Internal Urethrotomy
IPSS - QOL	International Prostate Symptoms Score and the Quality of Life
ICIQ SF	International Consultation on Incontinence Questionnaire Short Form
K.N.H	Kenyatta National Hospital
LUTs	Lower Urinary Tract Symptoms
OMG	Oral Mucosal Graft
Q.O.L	Quality of Life
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences
TURP	Trans-Urethral Resection of the Prostate

UK	United Kingdom
UON	University of Nairobi
USA	United States of America
USS PROM	Urethral Stricture Surgery Patient Reported Outcome Measures
UTI	Urinary Tract Symptoms

### **OPERATIONAL DEFINITIONS**

**Urethral stricture** – Urethral narrowing with spongiofibrosis

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## ABSTRACT

**Introduction:** Urethral strictures are a common occurrence in Kenya. Substitution urethroplasty is considered for patients with long strictures. Long term outcomes of patients treated for urethral stricture with substitution urethroplasty are not well known in this region.

This hinders adequate evaluation of the successes and failures of this procedure.

**Objectives:** The main objective of this study was to evaluate the micturition related quality of life and its determinants after undergoing substitution urethroplasty for urethral stricture.

**Methodology:** This was a cross-sectional study. The study included 80 adult male patients who underwent treatment for urethral stricture using substitution urethroplasty. Patients who underwent urethroplasty were called back to the hospital or recruited during routine follow-up clinic visits. Data was collected on current state of micturating quality of life as measured by the American Urological Association-Symptom Index (AUA-SI) score (outcome variable). Exposure variables included, duration since surgery, number of prior procedures, length, and location of stricture.

**Results:** The mean age was 48.3 years, SD 15.3, range (18 – 82). Penile urethral strictures were most common at 28.8% followed by penile at 21.3%. The mean length of stricture was 3.93cm, SD 2.2, median 3.8, Range (1 – 10 cm). Dorsal on-lay procedures were 71.3% compared with 28.8% for ventral on-lay procedures. Majority of patients had no prior urethroplasty (38.5%), with 21.8% having a single previous failed procedure while 32.1% had two prior unsuccessful procedures. The mean AUA SI score pre-operatively was 25.1, SD 7.7 compared to post-operatively at 9.2, SD 7.0 with a statistically significant difference of  $p < 0.001$ . The most important determinants of post-operative AUA SI score were length of stricture ( $p = 0.001$ ) and the number of previous procedures ( $p = 0.001$ ). Determination of level of patient satisfaction using USS PROM questionnaire revealed that 67.5% of patients were satisfied with the procedure with 51.3% reporting that urinary symptoms did not interfere with their day-to-day life and 20% reporting little interference. When assessing for incontinence, 46.3% reported some degree of urine leak.

**Conclusion:** Substitution urethroplasty is a commonly performed procedure at the Kenyatta National Hospital (KNH) just like in many urology hospitals. From the foregoing study the procedure is effective in improving the AUA-SI score and satisfaction among patients but less effective in circumventing the complication of post-operative urinary incontinence. Notable is that the satisfaction compared to other centers is lesser at the KNH. Similarly, the rates of urinary incontinence are comparably high in our center compared to other centers.



## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 Background

The prevalence of urethral strictures in the United Kingdom is approximately 0.5% and associated with around 17,000 hospital admissions. It commonly occurs in men aged 20 to 40 years (1). An abnormal constriction of the urethra is known as a urethral stricture. This abnormal narrowing is hypothesized to be produced by variable degrees of scarring of the corpus spongiosum (spongiofibrosis), which surrounds the urethra. The majority of urethral strictures occur in the anterior urethra, with fifty percent of cases limited to the bulbar urethra, twenty percent in the penile urethra, and thirty percent in the navicular fossa (2). The majority of posterior urethral stenosis, though not common are brought on by pelvic trauma or occur after treatment with prostatic radiation. The causes of urethral stricture formation can be broken down into three categories: traumatic, infectious, and inflammatory. Iatrogenic damage, which can occur as a result of transurethral instrumentation or traumatic catheterization, is responsible for approximately 45% of all cases of anterior urethral strictures (3). Among patients who undergo transurethral resection of the prostate (TURP), the risk of developing a urethral stricture is up to five percent (2). There has been a higher occurrence of up to 20% of urethral strictures in patients with untreated sexually transmitted infections (4).

Congenital hypospadias, chronic inflammatory dermatological disorders like lichen sclerosus, and brachytherapy, which is used to treat prostate cancer, are a few examples of other less prevalent causes of urethral strictures. Idiopathic urethral strictures account for

about 30% of all cases (5). On the other hand, it has been postulated that a good number of these cases are the result of small historical traumas that have been forgotten.

Endoscopic care of the condition, either through urethral dilatation or ocular urethrotomy, had historically been the primary focus of surgical treatment. These have been linked to a high risk of recurrence (over sixty percent), as well as poor rates of success over the long term, which has led to the development of new procedures. Urethroplasty, also known as open reconstruction or repair of the urethra, is a procedure that can be carried out in cases of urethral strictures that are caused by a variety of factors (6). Even though there is a higher risk of open surgery associated with urethroplasty, it has been considered the gold standard for the therapy of strictures. It provides better results and a lower rate of stricture recurrence than the standard conventional procedures (7).

In the United Kingdom, 713 urethroplasties were performed between the years 2014 and 2015, whereas during the same two-year period, 15,000 optical urethrotomies and 8273 endoscopic urethral dilatations were carried out (1). The most common types of anterior urethroplasty practiced were anastomotic and augmentation urethroplasty, with the latter using either buccal or lingual mucosal grafts. There was minimal but supportive evidence for higher effectiveness of urethroplasty in treatment of urethral strictures compared to urethrotomy, showing reduced recurrence rates ranging from 11% to 24% and improvement in urinary peak flow in up-to 86% of patients (8). This was equivalent to a study by Meeks et al that reported a recurrence rate of 15.4% (7). Success in terms of stricture recurrence was seen to be impacted by stricture length. The study identified patients with longer stricture lengths as an ideal subgroup for primary urethroplasty.



Sheikh et al. in an observational prospective study conducted in 2020 at the *KNH* identified patient outcomes and level of patient satisfaction post urethroplasty. Results indicated that 43.8% were very satisfied, 33.4% were satisfied while 21.9% were not satisfied. This provides a platform to come up with better techniques to further facilitate better outcomes post urethroplasty. This is one of the few studies that evaluate post-surgical quality of life in patients. More studies are required for progression and production of more effective and goal-oriented techniques perioperatively (9).

Studies have demonstrated significant improvement of the International Prostate Symptoms Score and the Quality of Life (IPSS - QOL) from baseline. Further emphasis has been made on the Patient Reported Outcomes Measures (PROMs) after urethroplasty (10). Notably, IPSS QOL is not a validated tool to measure the outcomes of urethral stricture disease repair. However, varied authors have used the tool as a measure of the outcomes. A study evaluating use of penile skin compared to buccal mucosal graft in augmented urethroplasty for anterior urethral strictures (AUS) found comparable outcomes including Qmax, IPSS and Urethral Stricture Surgery – Patient Related Outcome Measures (USS-PROM) (11). Due to varying etiologies of strictures and variation in procedures performed, more studies are required to identify interventions with better quality of life.

This study aimed to evaluate the long-term outcomes of substitution urethroplasty focusing on patient reported outcomes as measured by resolution of lower urinary tract symptoms (LUTS).

## **1.2 Statement of the problem**

Paucity of data in the African population presents major challenges to carry out research on the local population. This makes it difficult to get accurate and precise statistical

information to improve on the current practices and techniques. In patients who have undergone reconstructive urethroplasty, some patients are lost to follow up hence not adequate statistical evidence of patients' outcome can be retrieved.

Sheikh *et al* 2020 at the KNH, results of recruited post urethroplasty sample indicated that 43.8% were very satisfied, 33.4% were satisfied while 21.9% were not satisfied. This provides a platform to come up with better techniques to further facilitate better outcomes post urethroplasty. This is one of the few studies that evaluates post-surgical quality of life in patients. More studies are required for progression and production of more effective and goal-oriented techniques perioperatively.

Our study aims to improve understanding of the effects of various baseline factors such as method of treatment on quality of life after BMG urethroplasty by evaluating micturition related quality of life in patients who have undergone substitution urethroplasty. Due to the scarcity of data on urethroplasty outcomes in Africa, our study will contribute to improving the quality of care for patients globally, regionally and locally.

### **1.3 Study Justification**

This study will aim to evaluate the outcomes of substitution urethroplasty. Patients undergoing this procedure have unique urethral strictures since their stricture are long with a potential for higher long-term failure. Inadequate data on outcomes of substitution urethroplasty limits the ability to evaluate on the local surgical practices of the procedure.

Thus, the findings of this study will be used to guide practice and identify areas of improvement in follow-up of such patients.

#### **1.4 Study Questions**

1. What is the long-term micturition related quality of life after substitution urethroplasty and its determinants?

#### **1.5 Study hypothesis**

1. Null: There is no difference in micturition related quality of life post substitution urethroplasty in (ventral versus dorsal onlay urethroplasty / short [ $<2\text{cm}$ ] versus long strictures [ $>2\text{cm}$ ]/ AUS versus posterior urethral strictures / less than 1 yr versus greater than one-year post surgery.

#### **1.6 Study Objectives**

##### **1.6.1 Broad Objective**

To evaluate the micturition related quality of life post substitution urethroplasty.

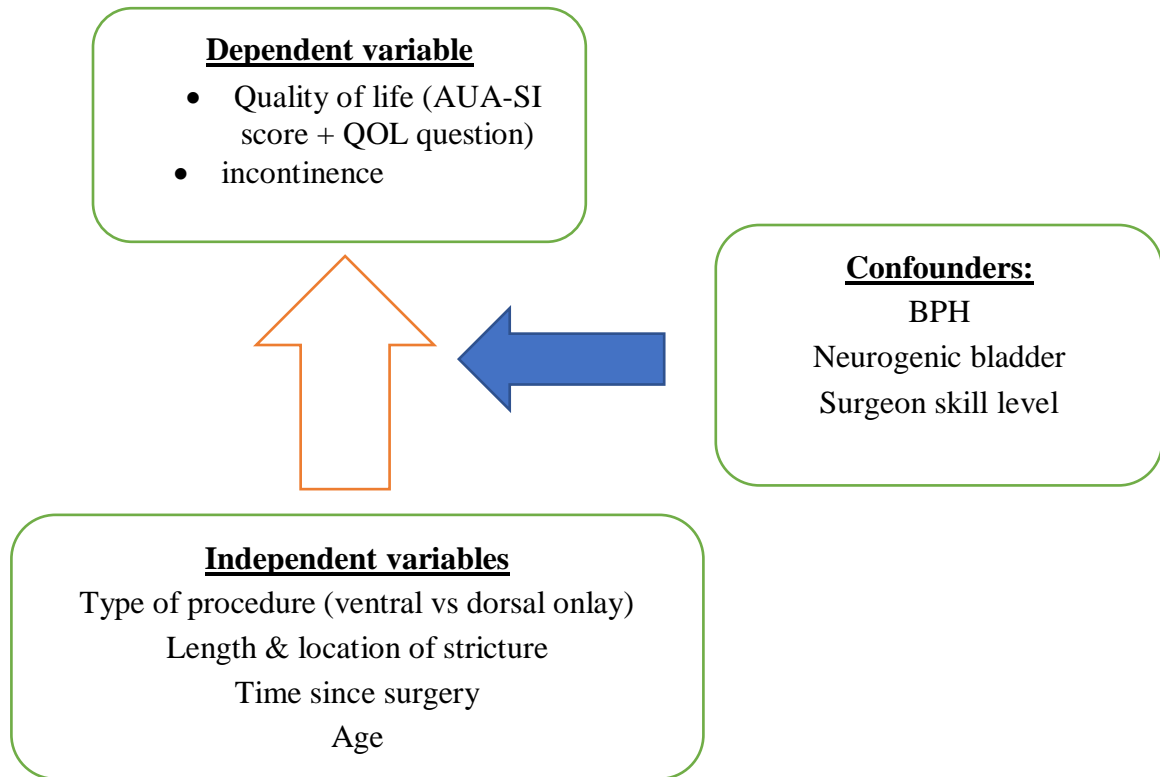
##### **1.6.2 Specific Objectives**

- i. To determine the micturition related quality of life using the AUA-SI score pre-operatively in patients who underwent substitution urethroplasty.
- ii. To determine the micturition related quality of life using the AUA-SI score post-operatively in patients who underwent substitution urethroplasty.
- iii. To outline the determinants of the micturition related quality of life using the AUA SI score post substitutional urethroplasty.

##### **1.6.3 Secondary objective**

To investigate the occurrence of post-micturition incontinence after substitution urethroplasty.

## 1.7 CONCEPTUAL FRAMEWORK



**Figure 1: The conceptual framework**

## CHAPTER TWO

### 2.0: LITERATURE REVIEW

#### 2.1 Epidemiology of urethral strictures

The prevalence of urethral stricture is approximately 200 per 100,000 men in their 20s, increasing to 900 per 100,000 in 70-year-old men. A study in the United States of America quotes an incidence of 0.6% in the susceptible population (12). In the United Kingdom, urethral strictures are seen to affect about 62,000 men at any one time (13). A study conducted by Santucci *et al* in the United States established that urethral structures are commonly occurring among the elderly population with a major rise after the age of 55 years (14). Similarly, another study in USA based on data retrieved from Medicare and Medicaid services among patients older than 65 years established that there was a higher incidence of urethral stricture among these population at 9.0 per 100,000 compared to those who were younger than 65 years at 5.8 per 100,000 (14).

Palminteri et al.,2011, in a study in Italy among 1,439 male patients with urethral stricture revealed that the average age at presentation was 45.1 years. Further analysis established that the mean length of structure was 4.2 cm. The anterior urethra was the most common location for strictures (92.2%), with the bulbar urethra being the most common location (46.9%) (15). This study concurred with research done retrospectively by Stein et al. on 2,589 patients who had urethroplasty procedures performed on them between the years 2000 and 2011 in the United States of America, Italy, and India (16). Patients in this study presented with etiologies of stricture disease that were comparable to the preceding study, at an average age of 41,4 years. A study by Fenton et al. on 175 individuals diagnosed with AUS in Texas and Honduras found that the average length of the stricture was 4.1

centimeters, with the bulbar urethra being the most common region, accounting for 52% of the total number of cases (17). Following idiopathic (31.9% of cases) and iatrogenic (31.9% of cases), the next most common cause of stricture illness was inflammatory strictures, which included infection-induced strictures and lichen sclerosis. This caused 26.6% of all cases of stricture disease (17).

There is scarcity of data on the epidemiology of urethral stricture burden in Sub-Saharan Africa. Yameogo *et al* reported a prevalence of 4.2% in Ouagadougou, Burkina Faso (18). Vuuren *et al* from Southern Africa in a review of 558 men with acute urinary retention, found that 14.3% of them had urethral strictures (19). This was similar to a study in Nigeria by Ofoha *et al* (20). Ngaroua *et al* in Cameroon reported that urethral stenosis was responsible for 0.6% of consultations, 11.36% of surgical hospitalizations, and 6.96% of surgical procedures. This suggests that urethral strictures are responsible for a significant amount of the disease burden in the area (21). A mixed etiological picture has been obtained in Sub-Saharan Africa regarding urethral strictures with published work from the rural and suburban centers having reported urethritis as the leading cause while urban centers document trauma as the predominant cause (22). For example, Tijani *et al* from Lagos, Nigeria, reported urethral trauma from catheterization as the most common cause of navicularis fossa stricture in their recent study (23). Ibrahim *et al* from Maiduguri, Nigeria, reported urethritis as the dominant etiology, within the same time (24). South African authors, however, documented trauma either internal (catheterization and transurethral resection) or external (gunshot wounds, straddle injury, pelvic fracture) as the predominant etiology of urethral stricture according to a systematic review and meta-analysis by Eshiobo *et al* (22).

There is very limited local data concerning the prevalence of urethral stricture disease in Kenya. A retrospective five-year study was done in Moi Teaching and Referral Hospital (2003-2007) by Ayuo *et al.* to estimate the etiology of urethral strictures within the locality. The findings showed that the average age at presentation of the urethral structure was 42.7 years. Slightly more than half, 50.9 percent of the cases investigated in the study were secondary to infectious urethritis, 47 percent were due to trauma and 1.8 percent of the cases were due to rare causes which include urethral carcinoma and urethral diverticulum. However, the hospital within which the study was conducted was the second largest national referral hospital in the country hence the findings could not be generalized to reflect the national prevalence of urethral strictures in Kenya (25) however, recent studies from the same region indicate changes in the etiology of the strictures. For example, Otele *et al.* in a 3- year retrospective study, analyzed 235 patients who underwent revision urethroplasty for unsuccessful urethroplasty at KNH, between 2015 and 2018. In this study, trauma was the principal etiology of urethral strictures at 60.4% followed by iatrogenic (16.6%), idiopathic (11.9%), infective (10.2%) and Lichen Sclerosus (LS) causes (0.09%) (26).

## **2.2 Presentation of urethral strictures**

The primary symptoms of urethral stricture are obstructed and irritated micturition, prolonged urination, a sensation of incomplete bladder emptying, along urgency and frequency of urination (2). Because the urinary bladder is able to compensate for the increased intra-vesical resistance early on in the process of stricture formation by detrusor hypertrophy, which results in a rise in intra-vesical pressure during urination. It is possible that some of the patients will not present until they have acute urinary retention. This is because the urinary bladder can compensate for the raised intra-vesical resistance. Later

on, there is a decompensation of the voiding function, which leads to partial voiding. This can lead to acute or chronic urine retention, which can then lead to acute and chronic kidney injury. Progressive lower urinary tract symptoms and a decreased urine flow rate are diagnostic indicators of a urethral stricture.

The Lower Urinary Tract Symptoms (LUTS) include different specific symptoms which are essential in helping understand the basis of urethral strictures. These include obstructive symptoms such as poor or intermittent stream, straining, prolonged micturition, a feeling of incomplete bladder emptying as well as irritative symptoms which include frequency, urgency, urge incontinence, nocturia and dysuria (27). Urine stasis is a nidus for infection, as it enhances bacterial colonization. Patients with urethral strictures may present with a history of recurrent Urinary Tract Infections (UTI) and multiple antibiotic coverage.

In the cases of trauma, such as in pelvic fractures with injury to the posterior urethra, the patients will present with haematuria, blood in semen, pelvic or groin pain, and general hemodynamic instability as pelvic fractures are most commonly associated with poly-trauma (28). If a patient presents with voiding symptoms and a recent history of trans-urethral catheterization, then the likely diagnosis is a urethral stricture. In case the stricture is secondary to a gonococcal infection, the presentation will include a history of per urethral discharge, burning sensation on urination and lower abdominal pain (29).

Over time, a urethral stricture can cause permanent bladder damage, reflux of urine in the kidneys causing hydronephrosis and hydroureter, and kidney damage leading to Chronic Renal Failure (30).



### **2.3 Treatment of urethral strictures**

For anterior and posterior urethral strictures, urethroplasty is the most preferred method of treatment due to better surgical outcomes and lower recurrence rate of strictures compared to the traditional methods such as dilatation and Direct Visual Internal Urethrotomy (DVIU). Following the removal of the diseased tissue, Young and Marion, at turn of 20th century were the first to describe anastomotic urethroplasty as consisting of a direct end-to-end reconnection of the patient's urethra (1). While transecting trauma-induced Anterior Urethral Strictures (AUS) that are less than 1.5 centimeters in length, anastomotic urethroplasty is widely considered to be the procedure of choice in the medical literature (49). There is a wide range of reported success rates for anastomotic urethroplasty in the current body of research, with some studies reporting rates as high as 95% to 98.8% (1, 20). During penile erection, an issue that might arise in younger patients is the shortening of the urethra, which can cause the penile ventral surface to curve inward as well erectile dysfunction other common complications include infection, fistulation, urinary incontinence, wound breakdown and recurrence of the urethral stricture.

Graft urethroplasty, also known as augmented or substitute urethroplasty, is the procedure that is recommended for the treatment of lengthy bulbar urethral strictures (greater than 1.5 centimeters) and all penile strictures. The latter stricture can also benefit from loco-fasciocutaneous flap where appropriate. The basic idea of this procedure is to use a fasciocutaneous flap from the penile skin and a graft from either preputial penile skin or oral mucosa to reconstruct the neourethral lumen. This method was created for individuals with bulbar strictures that involve the penile urethra to varying degrees. There have been various descriptions of autograft tissues, one of which is the oral (buccal, labial, and lingual) mucosal grafts (OMG). Because of their tissue similarities with the urethra,

versatility for usage in multiple urethral locations, simplicity of harvesting, and compatibility in a moist environment, OMG are the most extensively adopted kind of autograft tissue (29). Because of its hairlessness, thick elastin-rich epithelium, and thin, highly vascular lamina propria, buccal mucosa is becoming an increasingly preferred graft tissue for urethral reconstruction. In addition to this, buccal mucosa circumvents cosmetic drawbacks that are created by the use of genital skin (32). However, success has also been achieved with the use of scrotal skin, bladder mucosa and colonic mucosa (1).

In graft urethroplasty, the techniques involved in preparation, approach, and stricture excision are comparable to those used in anastomotic urethroplasty. However, in graft urethroplasty, a simultaneous harvesting of OMG using either a one- or two-team approach is performed. An strategy with two teams is more effective and helps reduce the risk of cross contamination and reduces operating time (33). Before suturing the OMG onto the urethral defect, it is first prepped to fit the size of the stricturotomy, and then it may be fenestrated if necessary. In a one-stage technique, the OMG can be used to augment an anastomotic repair, but in a two-stage technique, a "roof strip" may be formed first, and then tubularisation of the urethra may be performed in a second stage, much later.

When treating strictures that are longer in length, it is more likely that a catheter will be used to protect the repaired urethra.

Pedicled flaps are constructed on the underlying fascia (dartos fascia), and once ready, are swiveled onto the open urethra (34). The subdermal connective tissue is responsible for providing the flaps with a blood supply. These flap procedures involve a significant amount of operating time and are linked to an increased risk of complications like necrosis and the

creation of fistulae. Prospective randomized studies have shown that these flap approaches demonstrate success rates that are comparable to those of the grafting techniques (34).

#### **2.4 Outcomes of urethroplasty**

In correctly selected patients, anastomotic urethroplasty achieves long-term success rates of approximately 90% (2). There are varied factors which influence success rates in OMG urethroplasty. These factors include positioning of graft, autograft tissue type and one versus two stage technique. Success rate vary from 65.8% to 87% for dorsal on-lay grafting, however, it is evident that the success rates are comparably less than in anastomotic urethroplasty (1). Recently, Barbagli et al. looked into the quality of life and satisfaction of 173 patients who had complex anterior urethral stricture disorders treated with temporary or permanent perineal urethrostomy. While the series of patients who underwent perineal urethrostomy had a lower objective success rate (70%), one-stage techniques showed a higher (83.5%) success rate. In the literature, success rates ranging from 73.5% to 87% have been linked to excising spongiofibrosis and creating a neourethral plate with oral grafts in the first stage, followed by delayed tubularization approximately 3 to 6 months after the graft matures (35).

A study by Barbagli et al. that reviewed medical records of 375 patients found that anastomotic urethroplasty had a success rate of 90.9%, enhanced anastomotic repair had a success rate of 60%, and OMG on-lay methods had a success rate of 80% (ranging from 12 months to 218 months of review period (36). However, due to the influence of other factors, such as increased stricture length and placement in augmented or substitution urethroplasties, it is possible that these procedures cannot be directly compared with one another (1).

Tabassi *et al.* reported an overall success rate of 92.3% at 18 months in a study to determine the outcome of single stage, dorsally placed buccal mucosal graft(BMG) in the treatment of long urethral strictures (32).

A three-year retrospective study carried out at Jos University Teaching Hospital by Akpayak *et al.* noted about 87.5% of the patients with successful urethroplasty were symptom free at one year post urethroplasty, while 12.5% had urethral stricture recurrence (37).

A comprehensive study by Sheikh *et al* to elicit the measures of success of urethroplasty, at KNH in 2020 noted improvement in LUTS score from an average of 3.31 preoperatively to 0.97 postoperatively. The total LUTS score also decreased from a mean of 12 preoperatively to 1 post operatively. Peeling's stream picture fell from 3.7 preoperatively to 1.8 postop. In terms of interference with the patients' daily life, 48.1% reported interference with their day-to-day life preoperatively (9). Concerning patient satisfaction, (43.8%) were very satisfied with the result, 33.4% were satisfied while 21.9% were not satisfied. This was attributed to 53.8% of them getting comorbid symptoms related to the illness, and 46.2% reporting no improvements after surgery.

### **2.5 Factors influencing the outcomes of substitution urethroplasty**

Despite being the most definitive management for urethral strictures, recurrence and postoperative complications are common after urethroplasty. Buccal Mucosal Graft can be placed ventrally, dorsally, laterally or combined dorsal and ventral BMG stricture.

Ventral and dorsal placement are the most common (38). Negative outcomes have been associated with obesity and stricture length while a penile stricture is associated with lower recurrence rates, although this is yet to be proven statistically significant (39).

Strom *et al.* reported success rates for one-stage urethroplasty by graft location. success was achieved in 83% for dorsal on-lay, 77% for ventral on-lay, 86% for bulbar-dorsal onlay, 83% for bulbar-ventral onlay, 66% for pendulous-dorsal on-lay and 70% for pendulous-ventral onlay (40).-

According to a meta-analysis conducted by Mangera et al in 2011 reviewing the outcomes for urethroplasties involving graft placement, it was revealed that the mean success rate among 35 studies was 88.4% with an average follow up of 34.3 months. Penile skin grafts have showed lower success rate (41). Another meta-analysis including 66 studies in 2014 found that the mean success rate was 88.3% with an average follow up of 42 months (42). Individuals who had either dorsal onlay or dorsal inlay graft placement were included in the study that Aldaqadossi and colleagues carried out as part of a prospective, randomized research project. They discovered a considerable reduction in the amount of time needed for operations as well as the amount of blood lost with the dorsal inlay group (35).

Following patients over an average of 21 months, Palminteri et al. established an overall success rate of 85%. The study also found that the surgical procedure had a consistent success rate and that there was no associated sexual dysfunction after 49 months on average (15). In multistage urethroplasty, 100% success was achieved in bulbar repair and 80% in pendulous repair (40).

Redmond *et al.* concluded that augmented anastomotic urethroplasty is independently associated with higher stricture recurrence in comparison to a purely dorsal on-lay technique, in a study to determine factors associated with restoration of long bulbar urethral strictures (43). The overall success rate was found to be 93.9%, with increasing stricture length and iatrogenic strictures being associated with higher stricture recurrence.

Comorbidities, prior endoscopic treatment, prior urethroplasty and other etiologies were not associated with the recurrence of stricture disease (43). The dorsal on-lay augmented anastomosis employing buccal mucosa was shown to have a patency rate of 96.9% and was indicated for the restoration of long segment bulbar urethral strictures, particularly those that had a focal segment of obliteration.

Horiguchi reports comparable success rates between dorsal on-lay (Barbagli procedure) and ventral on-lay (44). Aldaqadossi *et al.* on the other hand, reported an overall success rate of 88% on dorsal on-lay group, with a success rate of 86.4% in the dorsal in-lay group during the follow-up period (37). Barbagli, Horiguchi and Aldaqadossi report comparable results irrespective of graft location and technique of application while Strom and Rourke *et al* REPORT results to the contrary (35,43,44).

In other literature, ventral location has been seen to have higher success rates of about 96% since it aids in ease of exposure and good vascular supply. This is majorly attained through avoidance of circumferential rotation of the urethra (38). There have also been reported early success rates of dorsal and ventral on-lay with BMG at 96% and 85% respectively.

## CHAPTER THREE

### 3.0 METHODOLOGY

#### 3.1: Study Design

This was a cross-sectional study. Patients managed for urethroplasty using the substitution urethroplasty method at the KNH between 1<sup>st</sup> January 2011 and 31<sup>st</sup> December 2021 were evaluated for the micturating related quality of life using the AUA-SI Score. A description of patient illness and surgical factors was retrieved from the patients' file.

#### 3.2: Study Setting

The study was conducted at the KNH. This is the leading referral hospital in Kenya and also houses school of Health sciences, University of Nairobi and the Kenya Medical Training College. Its also an affiliate training for several other institutions of higher learning within the region. The hospital offers highly comprehensive specialty services to thousands of patients monthly. The hospital has an 1,800-bed capacity. Data will be collected retrospectively using files from urology clinic, and the health records department. The urology unit is located in ward 5B and run specialty outpatient clinics.

#### 3.3: Study Population

The study included all adult male patients who underwent substitution urethroplasty for urethral strictures disease at the KNH between 1<sup>st</sup> January 2011 and 31<sup>st</sup> December 2021.

#### 3.4: Sample Size Determination

The sample size for this study was calculated based on the Cochran formula.

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

Where:

Z = value which is corresponding standard normal at 96% confidence level.

(Z=1.96 for 95% CI)

P is expected true proportion = 12.5% (recurrence rate of urethral stricture after BMG urethroplasty based on study by Akpayak et al(37)

e is desired precision (half desired CI width). (5%)

$$n = \frac{1.96^2 \times 0.125(1 - 0.125)}{0.05^2}$$

Thus, desired sample size, n, for large population is 169.

Approximately 15 patients underwent the procedure every year, thus in ten years approximately 150 patients were operated.

Therefore, for population less than 10,000, adjusting the sample is essential to attain the desired proportionate sample.

This was done using the formula;

$$n_{adjusted} = \frac{N \times n}{N + n}$$

$$n_{adjusted} = \frac{169 \times 150}{169 + 150}$$

Therefore, when substituting the formula, a sample size of 80 was obtained.

Therefore, in this study, a sample size of 80 participants was ideal.

### **3.5: Sampling Procedure**

Consecutive sampling technique was used to select all the files of patients diagnosed with urethral stricture from the KNH records department for the period of the study. Files for patients who underwent substitution urethroplasty were then sorted out. The files were then serially labelled before data extraction. The patients' clinical, in-patient clinical, and operation records were scrutinized in great detail, and their contact information was compiled in order to get in touch with them. Any file that could not provide appropriate response to the questions presented by the data abstraction tool was replaced.



### **3.6: Recruitment and Consenting Procedures**

After they were identified, the files pertaining to the patients were isolated from the remaining records so that data abstraction and determination of the patient's phone numbers could take place. A trial run was conducted for the identified phone numbers, and patients who had successful encounters were the only ones allowed to participate in the study. Patients who were currently receiving follow-up care at any of the hospital clinics were invited for participation in the interview to take place at the clinic. The remaining patients were conducted and assisted in making their way to the KNH urology clinic for the purposes of obtaining consent and administering the questionnaire.

#### **3.6.1: Inclusion Criteria**

1. The study included adult patients managed for urethroplasty using the substitution urethroplasty method at the KNH between 1<sup>st</sup> January 2011 and 31<sup>st</sup> December 2021.
2. The study also included patients aged above 18 years.

#### **3.6.2: Exclusion Criteria**

1. Patient files that missed contact details of the patient or next of kin were excluded.
2. Patient files that missed key information such as type of procedure done and time since operation were also excluded.

### **3.7: Data Variables**

**Table 1: Data Variables**

<b>Variable</b>	<b>Variable Classification</b>	<b>Source Document</b>
Micturating quality of life	Dependent	AUA-SI questionnaire
Baseline patient factors (length & location of stricture)	Independent	Patient file

Baseline surgical factors (type of procedure – ventral or dorsal on-lay)	Independent	Patient’s file (surgical notes)
Time since operation (months)	Independent	Patient file

**3.8: Data Collection Procedures**

This study was cross sectional in nature hence consent was sought from patients who met the inclusion criteria. Data collection began after approval from KNH-UoN ERC. The principal investigator with the help of two research assistants reviewed patient files to select files that met the inclusion criteria. Once the files were retrieved and contacts obtained, the principal investigator contacted the patients and invited them to participate in the study. Informed consent was administered to those willing to participate in the study. Once sample had been obtained, the researcher used a structured questionnaire which included and the AUA-SI score tool. Data obtained included demographic characteristics, disease characteristics, management of urethroplasty and quality of life assessment.

**3.9: Study instruments**

A structured data abstraction tool was used to capture patient information for all the patients managed for urethroplasty using substitution method. The study also utilized the AUA-SI tool and USS-PROM.

**3.10: Training Procedures**

The research assistants included urology residents since they had medical background to ensure that the information obtained was accurate. The research assistants underwent two-day training to ensure that they effectively understood the purpose of the study and key approaches to use during data collection process. The first day activities included familiarization with the study objectives and data collection tool. The second day activities included familiarization with study setting and key data collection approaches.

### **3.11: Quality Assurance Procedures**

The research assistants were trained to ensure that they captured accurate information during data collection process. The principal investigator employed the services of a trained data manager who reviewed the patient files regularly to ensure that no double entry. Data manager also helped with data cleaning and ensured that accurate data was exported to SPSS for analysis. A pre-test was conducted to ensure that the data collection tool was tested for ambiguity and ensure the questions were easy to understand.

### **3.12: Ethical Consideration**

#### **Approval and permission to conduct study**

The principal investigator sought approval to carry the study from KNH-UoN Ethics and Review Committee which evaluated feasibility and all underlying ethical issues in the study prior to data collection. The study was carried out in conformity with the ethics outlined in the Helsinki declaration on medical research on human subjects. Administrative permission to conduct the study in KNH was sought from KNH administration.

#### **Privacy and confidentiality**

Privacy and confidentiality formed fundamental part of this study based on the nature of the study and questions that participants were required to answer. The study did not capture any unique patient identifiers. The information collected during the study was only used for research purpose and was not shared with any third party. The filled questionnaires and consents documented were placed in different box files and stored in a lockable cabinet. Data was entered into excel spreadsheet and stored in cloud database for enhanced security, privacy and confidentiality.

### **Minimization of risks**

No personal data was captured during the study data collection process. The serialized numbers were used to represent patient files. The participants were given a small private area in the rest room during data collection to ensure that privacy and confidentiality was maintained.

### **Consenting**

Principal investigator with the help of the two research assistants contacted the selected patients managed for urethroplasty using the substitution urethroplasty method at the KNH between 1<sup>st</sup> January 2011 and 31<sup>st</sup> December 2021. A written informed consent was administered to the patients to ensure that they fully understood the study prior to their participation at the urology clinic. Only those who consented to participate in the study were recruited for further interviewing. The informed consent form was also translated into Kiswahili for easy understanding for patients. The study objectives, possible risks, and benefits were explained to all participants both in Kiswahili and English as well as all the questions that related to the study to ensure that the participants had a clear picture of the study before obtaining informed consent.

### **Voluntariness**

Participating in this study was purely on voluntary basis and thus there was no coercion or use of force for any patient to participate in the study against their will.

### **3.13: Data Management and analysis**

Data collected via the printed questionnaires was checked for accuracy, completeness, and freedom from error before keeping it under lock and key, and only accessible to the research assistant and the principal investigator. On completion of the data collection exercise, the data was entered into a Microsoft Excel Spreadsheet 2019, thereafter exported to the SPSS Version 23 to be analyzed.

## **Data analysis**

Data analysis was done objectively. Both both descriptive and inferential analysis were done. Frequencies and percentages were used to summarize categorical descriptive data. Mean and Standard deviation was used to summarize continuous descriptive data.

A Pearson Chi-square test of independence or Fisher's exact tests and independent sample t test were used to test for clinical and demographic factors associated with micturition related quality of life post substitution urethroplasty. Significant variables ( $p < 0.05$ ) under bivariate analysis were exposed to a multivariable model to control for confounders. Adjusted odds ratio (AOR) were calculated to determine the extent of association. Level of significance was evaluated at 0.05.

### **3.14: Study Results Dissemination Plan**

The findings from this study will be shared with KNH administration and the Department of Urology, University of Nairobi. The findings will also be presented in conferences hosted both locally and internationally to help understand the micturition related quality of life post substitution urethroplasty. The findings will also be published in a peer reviewed journal.

### **3.15: Study Limitations and mitigation**

Some data was collected retrospectively which might have contributed to a higher level of bias in this study. Only available data was captured and any file that contained missing information was replaced.

There was difficulties in contacting some patients when they changed their contacts. The patient files included details of next of kin. Thus, in case the patient could not be reached, the investigation team contacted the next of kin to reach out to the patient.

## CHAPTER FOUR

### 4.0 RESULTS

#### 4.1 Background

This study aimed to evaluate the micturition related quality of life post substitution urethroplasty. Specifically, it aimed to i) determine the AUA-SI score pre-operatively in patients who underwent substitution urethroplasty; ii) determine the AUA-SI score post-operatively in patients who underwent substitution urethroplasty; iii) outline the determinants of the AUA SI score post substitutional urethroplasty and finally, iv) to investigate the occurrence of post micturation incontinence after substitution urethroplasty.

Eighty patients who had undergone BMG substitution urethroplasty were evaluated. Results are presented in order of the study objectives.

#### 4.2 Demographic characteristics

##### 4.2.1 Age

The mean age was 48.3 years, Standard Deviation (SD) 15.3, Median 46.5, Range 18 – 82 years.

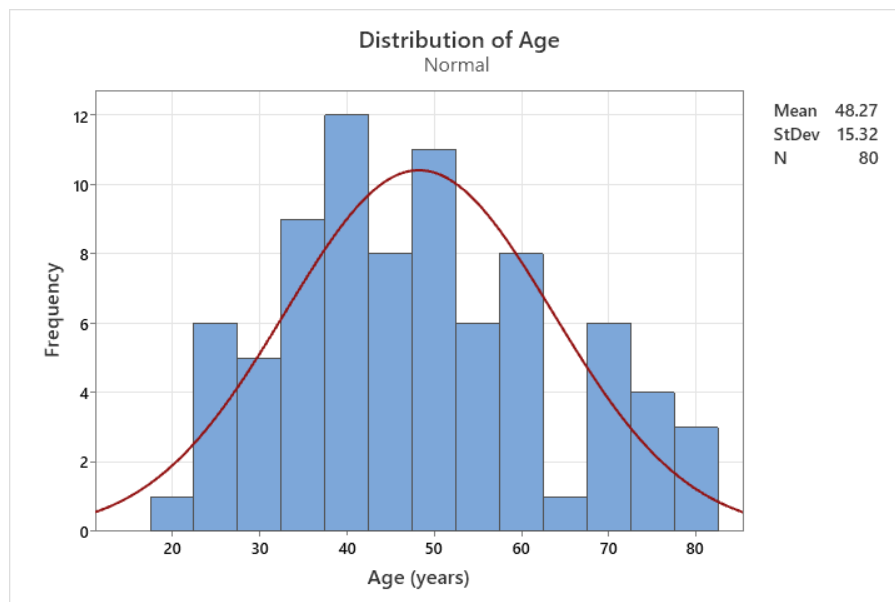


Figure 2: Distribution of age

#### 4.2.2 Location of stricture

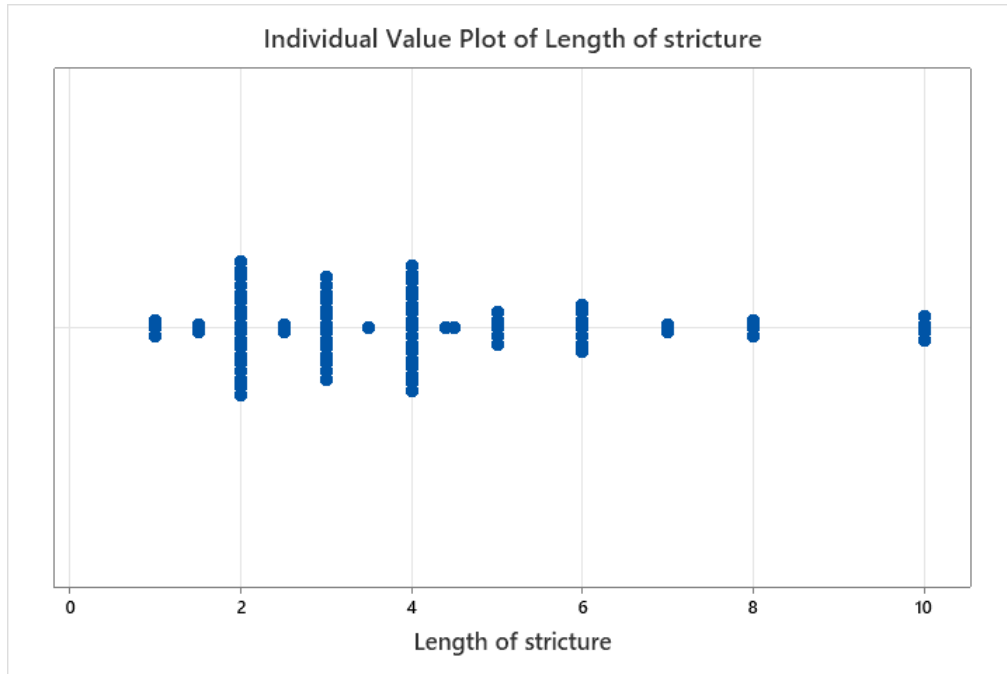
Penile urethral strictures were the most common strictures at 20% (Table 2).

**Table 2: Location of strictures**

<b>Location</b>	<b>Specific location</b>	<b>Counts</b>	<b>Percent</b>
Membranous	membranous	4	5.0
Bulbo-membranous	Bulbo-membranous	12	15.0
Bulbar	Proximal	8	10
	Mid	3	3.8
	Distal	1	1.3
Penile	Penile shaft	16	20
	Fossa navicularis	1	1.3
Multifocal / pan urethra	Penile urethra, Bulbo-membranous urethra	1	1.3
	Penile urethra, Bulbous urethra	13	16.3
	Penile urethra, Distal bulbous urethra	1	1.3
	Penile urethra, Fossa navicularis, Bulbous urethra	1	1.3
	Penile urethra, Mid bulbous urethra	1	1.3
	Penile urethra, Proximal bulbous urethra	6	7.5
	<b>Total</b>	<b>80</b>	<b>100</b>

#### 4.2.3 Length of stricture

The mean length of stricture was 3.93cm, SD 2.2 cm, median 3.8, Range (1 – 10 cm).



**Figure 3: Value plot of length of stricture**

#### **4.2.4 Type of substitution urethroplasty**

Dorsal on-lay was the most common type of urethroplasty performed compared to ventral on-lay (Table 3).

**Table 3: Type of substitution urethroplasty**

<b>Type of substitution urethroplasty</b>	<b>Count</b>	<b>Percent</b>
Dorsal on-lay	57	71.3
Ventral on-lay	23	28.8
N=	80	100%

#### **4.2.5 Number of prior urethroplasties performed**

Majority of patients (38.5%) were primary urethroplasty patients having undergone no procedure prior. Twenty two percent had undergone a primary procedure and were currently on their secondary procedure while 32.1% of patients were on a tertiary procedure (Table 4).



**Table 4: Number of prior urethroplasties**

Number of prior urethroplasty	Count	Percent
0	32	38.5
1	17	21.8
2	25	32.1
3	5	6.4
4	1	1.3
N=	78	

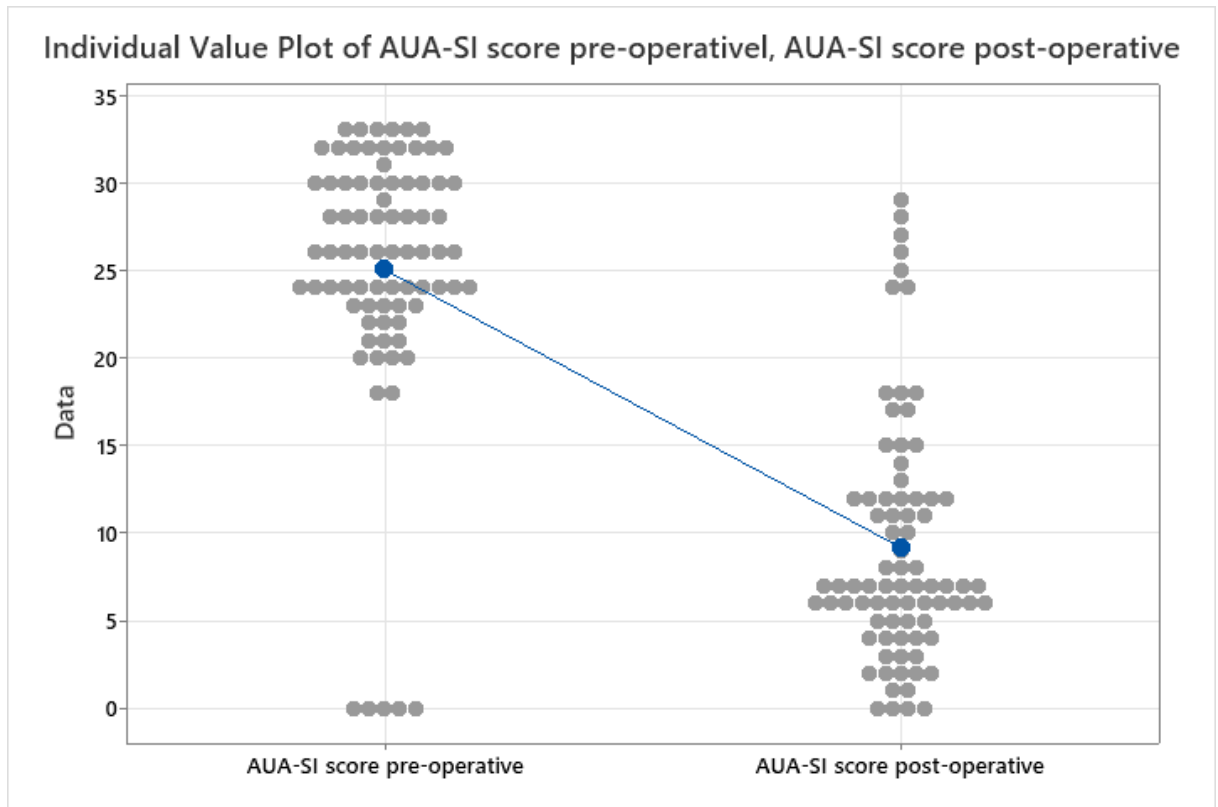
**4.3 Objective 1 & 2: Determine the AUA-SI score pre-operatively and post-operatively in patients who underwent substitution urethroplasty**

There was a significant change ( $p < 0.001$ ) in the AUA-SI score before and after surgery (Table 5).

**Table 5: Pre & post -operative AUA SI scores**

AUA-SI	N	Mean	SD	SE	Median	Range	Student T test P value
Pre-operatively	80	25.1	7.71	0.86	26.0	0.0 – 33.0	<0.001
Post-operatively	80	9.2	6.96	0.76	7.0	0.0 – 29.0	

The mean change in the AUA SI score significantly changes from 25.1 to 9.2 as indicated in the figure 4.



**Figure 4: Change in AUA SI score pre and post operatively**

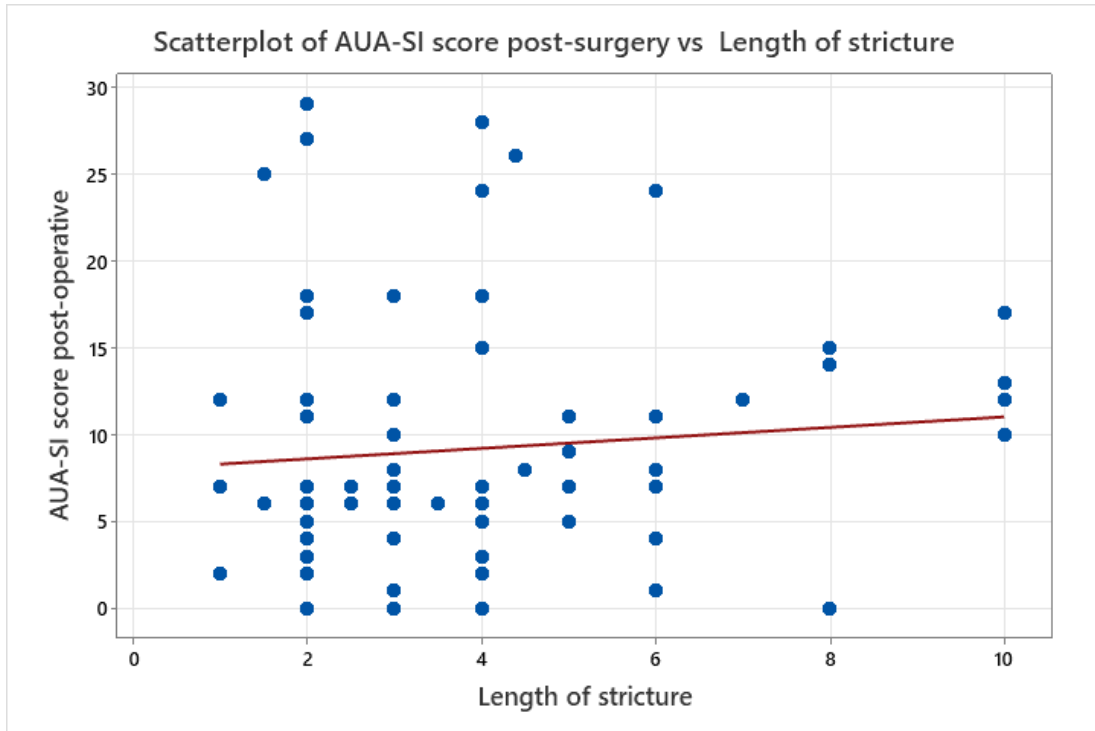
#### **4.4 Objective 3: the determinants of the AUA SI score post substitutional urethroplasty**

The length of stricture and the number of prior urethroplasties were the most significant determinants of post substitutional urethroplasty AUA SI scores with p values of 0.007 and 0.001 respectively (Table 6).

**Table 6: Correlation between post-operative AUA-SI score and length of stricture**

Variable / Categories	AUA SI category			P value
	0 – 7	8 – 19	20 – 35	
Age				0.980 <sup>a</sup>
18 – 44	20/36 (55.6)	12/36 (33.3)	4/36 (11.1)	
45 – 65	18/31 (58.1)	11 (35.5)	2 (6.5)	
>66	8 (57.5)	4 (30.8)	1 (7.7)	
Location of stricture				0.234 <sup>a</sup>
Bulbar	14/24 (58.3)	8/24 (33.3)	2/24 (8.3)	
Bulbomembranous	8/12 (66.7)	3/12 (25)	1/12 (8.3)	
Fosa navicularis	1/1 (100)	0 (0)	0 (0)	
Membranous	2/4 (50)	0 (0)	2/4 (50)	
Penile	7/16 (43.8)	8/16 (50)	1/16 (6.3)	
Peno-bulbar	14/23 (60.9)	8/23 (34.8)	1/23 (4.4)	
Length of stricture				0.007 <sup>b</sup>
Mean	3.4	4.9	3.4	
SD	1.5	2.9	1.6	
Frequency	46	27	7	
Time since surgery				0.337 <sup>b</sup>
Mean	23.7	24.8	41.6	
SD	27.4	25.7	54.7	
Frequency	46	27	7	
Type of surgery				0.804 <sup>a</sup>
Ventral on-lay	12/23 (52.2)	9/23 (39.1)	2/23 (8.7)	
Dorsal on-lay	34/57 (59.7)	18/57 (31.6)	5/57 (8.8)	
Number of prior urethroplasties				0.001 <sup>a</sup>
0	15/30 (50)	13/30 (43.3)	2/30 (6.7)	
1	13/17 (76.5)	1/17 (5.9)	3/17 (17.7)	
2	16/25 (64)	9/25 (36)	0/25 (0)	
3	0/5 (0)	3/5 (60)	2/5 (40)	
4	1/1 (100)	0/1 (0)	0/1 (0)	
<sup>a</sup> Fisher's Exact test; <sup>b</sup> Analysis of variance (ANOVA)				

As the length of stricture increases, the post urethroplasty AUA-SI score increases (Figure 5).



**Figure 5: Association between AUA SI score post-surgery and length of stricture**

Generally, according to the USS PROM questionnaire, majority of the patients reported satisfactory outcomes with the procedure. Further comments are outlined in Table 7. Notably 81.3% of patients reported either no or minimal interference of their urination towards their lives. Two thirds (67.5%) of patients reported overall satisfaction with the outcomes of surgery.

**Table 7: Assessment of micturating related quality of life using the USS PROM questionnaire**

No.	Question	Counts (%), N = 80				
		Never	Occasionally	Sometimes	Most of the time	All of the time
1.	Is there a delay before you start to urinate?	36 (45)	16 (20)	18 (22.5)	9 (11.3)	1 (1.3)
		<b>Normal</b>	<b>Occasionally reduced</b>	<b>Sometimes reduced</b>	<b>Reduced Most of the time</b>	<b>Reduced All of the time</b>
2.	Would you say that the strength of your urinary stream is...	31 (38.8)	22 (27.5)	16 (20)	9 (11.3)	2 (2.5)
		<b>Never</b>	<b>Occasionally</b>	<b>Sometimes</b>	<b>Most of the time</b>	<b>All of the time</b>
3.	Do you have to strain to continue urinating?	37 (46.3)	19 (23.8)	15 (18.8)	8 (10)	1 (1.3)
4.	Do you stop and start more than once while you urinate?	50 (62.5)	9 (11.3)	17 (21.3)	4 (5)	0 (0)
5.	How often do you feel your bladder has not emptied properly after you have urinated?	51 (63.8)	4 (5)	17 (21.3)	7 (8.8)	1 (1.3)
6.	How often have you had a slight wetting of your pants a few minutes after you had finished urinating and had dressed yourself?	45 (56.3)	12 (15)	19 (23.8)	4 (5)	0 (0)
		<b>Not at all</b>	<b>A little</b>	<b>Somewhat</b>	<b>Alot</b>	
7.	Overall how much does your urinary symptoms interfere with your life?	41 (51.3)	16 (20)	8 (10)	15 (18.8)	
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	
8	Please ring the number that corresponds with the strength of your urinary stream over <u>the past month</u> .					
		<b>Yes, very satisfied</b>	<b>Yes, satisfied</b>	<b>No, unsatisfied</b>	<b>No, very unsatisfied</b>	
9.	Are you satisfied with the outcome of your operation?	26 (32.5)	28 (35)	21 (26.3)	5 (6.3)	

	<b>Question</b>	<b>Responses</b>	<b>Counts (%)</b>
10.	If you were unsatisfied or very unsatisfied is that because:	Ignore if satisfied	35 (43.8)
		The urinary condition improved but there was some other problem	34 (42.5)
		The urinary condition did not improve and there was some other problem as well.	6 (7.5)
		The urinary condition did not improve	5 (6.3)

**Objective 4: Occurrence of post-micturating incontinence post substitution urethroplasty**

Over half of patients did not experience any form of urine leak (Table 8) with minimal interference in their lives.

**Table 8: Assessment of incontinence using the ICIQ SF questionnaire**

Question	Responses	Counts (%) (N = 80)
How often does urine leak?	Never About once a week or less often Two or three times a week About once a day Several times a day All the time	43 (53.8) 17 (21.3) 9 (11.3) 6 (7.5) 5 (6.3) 0 (0)
How much urine do you <u>usually</u> leak (whether you wear protection or not)?	None A small amount Moderate amount Very large amount	42 (52.5) 28 (35) 9 (11.3) 1 (1.3)
Overall, how much does leaking urine interfere with your everyday life?	0 1 2 3 4 5 6 7 8	30 (37.5) 13 (16.3) 3 (3.8) 8 (10) 6 (7.5) 8 (10) 3 (3.8) 6 (7.5) 2 (2.5)

	10	1 (1.3)
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Question	Responses	Counts (%) (N = 80)
When does urine leak?	never – urine does not leak leaks before you can get to the toilet leaks before you can get to the toilet, leaks for no obvious reason leaks before you can get to the toilet, leaks when you are asleep leaks before you can get to the toilet, leaks when you are asleep, leaks for no obvious reason leaks before you can get to the toilet, leaks when you are asleep, leaks when you are asleep leaks before you can get to the toilet, leaks when you are physically active/exercising leaks when you are physically active/exercising, leaks when you have finished urination leaks when you cough or sneeze, leaks when you have finished urinating and are dressed leaks when you have finished urinating and are dressed never – urine does not leak, leaks when you have finished urinating and are dressed	44 (55.0) 10 (12.5) 1 (1.3) 6 (7.5) 3 (3.8) 2 (2.5) 2 (2.5) 3 (3.8) 1 (1.3) 7 (8.8) 1 (1.3)
	N=	80



## **CHAPTER FIVE**

### **5.0 DISCUSSION**

#### **5.1 Background**

Urethral strictures are a fairly common occurrence with an incidence of 200 – 600 per 100,000 males. Substitution urethroplasty is more commonly preferred as a method of treatment for long (>2.5cm) bulbar and any penile stricture as well as some of the proximal urethral strictures. The quality-of-life following substitution urethroplasty has not been well investigated at the KNH. This study sought to investigate the micturition related quality of life following substitution urethroplasty.

#### **5.2 Demographic and clinical characteristics**

The mean age of the study participants was 48.3 years with a range of 18 – 82 years. Globally, urethral strictures were thought to be a disease of mostly older people with a incidence of 9 per 100, 000 males in persons aged over 65 years and 5.8 years in persons aged under 65 years (12). However, recent data indicates that younger people are increasingly being affected by the urethral strictures. A study conducted in KNH by Sheikh et al, 2020 involving 64 patients treated for urethral strictures had a mean age of 39 years (9). Another study by Otele WH et al., 2020, conducted in KNH, Nairobi, Kenya and investigating success rates in fresh versus revision urethroplasty cases had patients with a mean age of 41 years for fresh cases and 38.6 years for revision cases (26). Further studies by Mugalo et al, 2013 in Moi Teaching and Referral Hospital, Eldoret Kenya have indicated the mean age of urethral stricture disease as 42.7 years (45). However, this study recruited patients under the age of 18. The study by Qureshi et al., 2013 conducted among patients in KNH and Plaza Imaging Centers, Nairobi had a mean age of 45 years (46). The possible explanations for reduction in age of urethral stricture disease could lie in the etiology. While previously infectious causes were deemed to be more

common, the road traffic accidents especially motor cycle accidents are prevalence in Kenya and mostly involve the younger populations.

Majority (28.6%) of the strictures in this study were multifocal/panurethra and largely involved the bulbar and penile urethra. Similarly as indicated in the study by Otele et al, 2020 (26), bulbar strictures were the most common occurring in 60.1% of fresh cases and 53.7% of the revision cases. This was followed by membranous in 22.6% of fresh cases and 25.4% of the revision cases. Penile strictures involved 13.7% in fresh urethroplasty cases and 14.9% in revision cases. Finally, panurethra strictures were least common, with 3.6% and 6% in fresh and revision cases respectively (26). Similar findings were also elaborated in the study by Sheikh et al., 2020, where bulbar strictures were most common at 56.2%, followed by membranous (17.2%), penile (15.6%), prostatic (9.4%) and finally bladder neck (1.6%) (9). Similar picture is reflected in studies outside Africa where a study by Ivan et al investigating 57 patients long urethral strictures treated by BMG, penile strictures were 21%, bulbar strictures were majority at 56.1% while pan-urethral strictures were 22.8% (47).

The mean stricture length in this study was 3.9 cm, ranging from 1 – 10 cm. A study conducted in India to investigate the success of dorsal on-lay urethroplasty in management of AUS had a mean length of stricture of 4.8cm ranging from 3 – 9cm in 43 patients whose mean age was 31 years (range 21 – 43 years) (48).

In terms of placement of the graft, ventral on-lay cases were 28.8% compared to dorsal on-lay in 71.2%. Evidently, the procedure of choice in the department is the dorsal on-lay. In a meta-analysis of 49 studies with 1263 strictures treated with augmentation urethroplasty and aimed to investigate the success rate of ventral versus dorsal on-lay, ventral on-lay cases were 750 (59.4%) while dorsal onlay cases were 513 (40.6%). In this meta-analysis, dorsal on-lay had a success rate of 86.9% compared to 82.5% for ventral on-lay (49). The urethral ventral

pendulous soft tissue is not a robust physical graft bed for sustaining the free graft, and the ventral onlay may result in a pendulous skin wound near the urethral lesion. These two drawbacks could raise the risk of urethral diverticulum, urethral fistula, and graft necrosis, which could result in surgical failure or post-void dribbling and ejaculatory dysfunction. The risk of graft failure could be a decreased blood flow to the graft bed, which would result in lower take rates in ventral onlay grafts, cavernous nerve injury and surgical effects on the corpus cavernosum happen less frequently.

### **5.3 Determinants of the AUA SI score post substitutional urethroplasty**

One of the key objectives of this study was to assess the determinants of AUA SI score post substitution urethroplasty. Following the procedure, there was significant improvement in the AUA SI score with a magnitude of over 15 points, p value <0.001. This demonstrates the effectiveness of the BMG urethroplasty in managing the urethral stricture disease (USD). In a study involving 97 patients and investigating the PROM following BMG urethroplasty for bulbar urethral strictures indicated that there was significant improvement in the IPSS & QOL following the procedure with a p value of <0.001 (10). The mean AUA symptom score following dorsal on-lay urethroplasty for AUS was 22.4 before urethroplasty and 4.8 after urethroplasty, an improvement of greater than 17 points, p value <0.001. Thus, there is significant improvement in LUTs following the substitution urethroplasty. The findings of this study are comparable to our study since in terms of magnitude of improvement of the AUA SI symptom score at 16 points.

Evaluation of determinants of post urethroplasty AUA SI scores, revealed that the length of stricture and the number of prior urethroplasties were the statistically significant parameters of AUA SI scores. Stricture length continued to be the primary factor in determining the

treatments' success. Outcome was impacted by operation choice, length of the stricture, and number of previous surgeries.

After doing univariate analysis on potential preoperative predictors of stricture recurrence, it was discovered that stricture length and previous procedures were substantially linked to stricture recurrence. They both showed statistical significance when subjected to multivariate analysis. Other variables including age of patient, location of stricture, time since surgery and type of surgery (dorsal versus ventral on-lay) did not have any impact on AUA SI scores post-surgery. In a study of 187 patients who underwent BMG urethroplasty, Soave et al., 2018 did not elicit any significant associations between the AUA SI scores and length of stricture and the age of the patient (50). The findings on the length of stricture do not correlate with our study which demonstrate significant correlation between length and AUA SI score. However, for age and its association with AUA SI score, there was no association in both studies.

However, a significant number of studies have shown that dorsal on-lay has better success rates than ventral on-lay (49).

#### **5.4 Micturating related quality of life post substitutional urethroplasty**

The USS PROM questionnaire was used to assess the micturition related quality of life post substitutional urethroplasty. Overall, 67.5% of the patients were satisfied with the outcome of the operation with 26.3 unsatisfied and 6.3 very unsatisfied. In a study of 83 patients who underwent BMG urethroplasty and were assessed for level of satisfaction with the procedure, post-operative improvement in quality of life was reported in 67 (80.7%) of the participants and satisfaction in 68 (81.9%) which was a similar finding to our study (50). Seventy seven percent of 48 patients who underwent BMG urethroplasty reported that they were satisfied with the procedure using the USS PROM questionnaire in a study that compared quality of life following either BMG or penile skin graft procedure (11). In a study in Nigeria, by Aghaji et al., 2001,

satisfaction at 1 year following substitution urethroplasty was noted in 86% of the 46 patients who underwent the procedure. This indicates that the overall satisfaction rates in our center are slightly lower compared to other centers indicated in these studies, the time lapse post substitutional urethroplasty which was 10 years might be an influencing factor compared to Nigerian study which had looked satisfaction of 1 year following substitutional urethroplasty. In this study, 51.3% of patients responded that the urinary symptoms did not interfere their day-to-day life and 20% reported little interference. However, as many as 18.8% were very affected while 10% were somewhat affected.

#### **5.5 Post micturation incontinence after substitution urethroplasty**

Forty six percent of patients in this study reported having some degree of incontinence with 35% reporting a small amount, 11.3% a moderate amount and only 1(1.3%) patient reporting very large amounts of urine leakage. Post micturition incontinence has been reported in upto 40% of patients who underwent urethroplasty. This indicates that patients in our center had a slightly higher rates of incontinence compared to other centers. However, the incontinence has been observed to improve with time (51). Among the 19 patients who underwent BMG substitution urethroplasty, urine leak was noted in only 2 (5%) of the patients and this was a late complication (51).

#### **5.6 Conclusion**

Buccal Mucosal Graft urethroplasty is a commonly performed procedure at the KNH like in many in many urology hospitals. The findings of this study indicate that the procedure is effective in improving the AUA SI score and satisfaction among patients. Notable is that the satisfaction compared to other centers is lesser at the KNH. Similarly, the rates of urinary incontinence though comparably high in our center do not interfere with degree of overall

patient satisfaction and quality of life compared to other centers. Furthermore, urinary incontinence tended to improve with time.

The findings of this study could be limited by the retrospective nature of the study where assessment of baseline AUA SI scores was based on patient records. Similarly, the patients having undergone surgery at different times ranging from 0 to 156 months, could impact the occurrence of satisfaction levels and symptomatology such as incontinence which is noted to improve with time. A prospective study analyzing the impact of various parameters on micturition related quality of life would be imperative,

### **5.7 Recommendations**

Auditing with an aim to improve the BMG urethroplasty techniques in the hospital is recommended with a goal to improve patient satisfaction and match up with other facilities globally. This would also help reduce the incontinence levels.

Further research is needed to evaluate the health system determinants of outcomes in urethroplasty. This would help improve outcomes in the management of urethroplasty patients undergoing BMG.

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**ANNEXES**

**Appendix 1: Study Questionnaire**

**Research Title: Micturition Related Quality Of Life In Substitutional Urethroplasties As Seen In KNH.**

Serial Number: .....

1. Age: ..... years (current)
2. Date of surgery .....
  - i. Time from surgery to current (months): .....
3. Location of stricture: .....
4. Length of stricture: .....
5. Type of substitution urethroplasty:

Dorsal onlay vs Ventral onlay
6. Number of prior urethroplasty procedures before the final one: .....
7. List the prior procedures conducted in No (6)
  - i. ....
  - ii. ....
  - iii. ....
8. AUA-SI score. ....

	Not at all	Less than 1 time in 5	Less than half the time	About half the time	More than half the time	Almost always	Your Score
<b>Incomplete emptying</b> – It does not feel like I empty my bladder all the way.	0	1	2	3	4	5	
<b>Frequency</b> – I have to go again less than two hours after I finish urinating.	0	1	2	3	4	5	
<b>Intermittency</b> – I stop and start again several times when I urinate.	0	1	2	3	4	5	
<b>Urgency</b> – It is hard to wait when I have to urinate.	0	1	2	3	4	5	
<b>Weak stream</b> – I have a weak urinary stream.	0	1	2	3	4	5	
<b>Straining</b> – I have to push or strain to begin urination.	0	1	2	3	4	5	
	None	1 time	2 times	3 times	4 times	5 times or more	Your Score
<b>Nocturia</b> – I get up to urinate after I go to bed until the time I get up in the morning.	0	1	2	3	4	5	
<b>Total AUA Symptom Score</b>							
<i>Total score: 0-7 mild symptoms; 8-19 moderate symptoms; 20-35 severe symptoms</i>							
<b>Quality of life due to urinary symptoms</b>							
If you were to spend the rest of your life with your urinary condition the way it is now, how would you feel about that?	Delighted	Pleased	Mostly satisfied	Mixed: about equally satisfied and dissatisfied	Mostly dissatisfied	Unhappy	Terrible

## Appendix 1

Thank you for completing this questionnaire. The following questions are designed to measure the effect that urethral strictures have on patients' lives.

Some questions may look the same but each one is different. Please take time to read and answer each question carefully, and tick the box that best describes your symptoms over the past 4 weeks.

**1** Was there a delay before you start to urinate?

Never

Occasionally

Sometimes

Most of the time

All of the time

**2** Would you say that the strength of your urinary stream is...

Normal

Occasionally reduced

Sometimes reduced

Reduced most of the time

Reduced all of the time

**3** Do you have to strain to continue urinating?

Never

Occasionally

Sometimes

Most of the time

All of the time

**4** Do you stop and start more than once while you urinate?

Never

Occasionally

Sometimes

Most of the time

All of the time

**5** How often do you feel your bladder has not emptied properly after you have urinated?

Never

- Occasionally
- Sometimes
- Most of the time
- All of the time

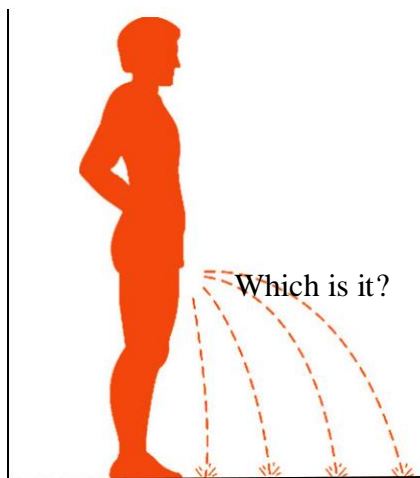
**6** How often have you had a slight wetting of your pants a few minutes after you had finished urinating and had dressed yourself?

- Never
- Occasionally
- Sometimes
- Most of the time
- All of the time

7 Overall, how much do your urinary symptoms interfere with your life?

- Not at all
- A little
- Somewhat
- A lot

8 Please ring the number that corresponds with the strength of your urinary stream over the past month.



4 3 2 1

(From Peeling 1989)

9 Are you satisfied with the outcome of your operation?

- Yes, very satisfied
- Yes, satisfied
- No, unsatisfied
- No, very unsatisfied

10 If you were unsatisfied or very unsatisfied is that because:

The urinary condition did not improve

The urinary condition improved but there was some other problem

The urinary condition did not improve and there was some other problem as well.

11. By placing a tick in one box in each group below, please indicate which statements best describe your own health state today.

**Mobility**

I have no problems in walking about

I have some problems in walking about

I am confined to bed

**Self-Care**

I have no problems with self-care

I have some problems washing or dressing myself

I am unable to wash or dress myself

**Usual Activities** (*e.g. work, study, housework, family or leisure activities*)

I have no problems with performing my usual activities

I have some problems with performing my usual activities I am unable to perform my usual activities

**Pain/Discomfort**

I have no pain or discomfort

I have moderate pain or discomfort

I have extreme pain or discomfort

**Anxiety/Depression**

I am not anxious or depressed

I am moderately anxious or depressed



I am extremely anxious or depressed



**12. How often do you leak urine? (Tick one box)**

Never	<input type="checkbox"/>	0
about once a week or less often	<input type="checkbox"/>	1
two or three times a week	<input type="checkbox"/>	2
about once a day	<input type="checkbox"/>	3
several times a day	<input type="checkbox"/>	4
all the time	<input type="checkbox"/>	5

**13. We would like to know how much urine you think leaks.**

**How much urine do you usually leak (whether you wear protection or not)? (Tick one box)**

None	<input type="checkbox"/>	0
a small amount	<input type="checkbox"/>	2
a moderate amount	<input type="checkbox"/>	4
a large amount	<input type="checkbox"/>	6

**14. Overall, how much does leaking urine interfere with your everyday life? Please ring a number between 0 (not at all) and 10 (a great deal)**

**0    1    2    3    4    5    6    7    8    9    10**  
 not at all a great deal

ICIQ score: sum scores 3+4+5

**15. When does urine leak? (Please tick all that apply to you)**

- never – urine does not leak
- leaks before you can get to the toilet
- leaks when you cough or sneeze
- leaks when you are asleep
- leaks when you are physically active/exercising
- leaks when you have finished urinating and are dressed
- leaks for no obvious reason
- leaks all the time

## Appendix 2: Plagiarism report

### MICTURITION RELATED QUALITY OF LIFE IN SUBSTITUTIONAL URETHROPLASTIES AS SEEN IN KNH

#### ORIGINALITY REPORT

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