FUNCTIONAL OUTCOMES OF PATIENTS FOLLOWING CONCOMITANT ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION AND PARTIAL MENISCECTOMY AT MUHIMBILI ORTHOPAEDIC INSTITUTE

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By

Muhumuza Neville

A dissertation submitted in partial fulfilment of the requirements for the degree of Masters of Medicine in Orthopaedics and Traumatology of the

Muhimbili University of Health and Allied sciences

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CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled, **"Functional outcomes following concomitant anterior cruciate ligament repair and partial meniscectomy at Muhimbili Orthopedic Institute (MOI)",** in (partial) fulfillment of the requirements for the degree of Master of Medicine (Orthopedics and Traumatology) of Muhimbili University of Health and Allied Sciences.

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DECLARATION AND COPYRIGHT

I, Muhumuza Neville, declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for similar or any other degree award.

Signature……..... Date…….....

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ABBREVIATIONS

ACL	:	Anterior Cruciate Ligament
ACLR	:	Anterior Cruciate Ligament Reconstruction
LFKSS	:	Lysholm Function Knee Scoring System
MCID	:	Minimal Clinical Important Difference
MOI	:	Muhimbili Orthopaedic Institute
MUHAS	:	Muhimbili University of Health and Allied Sciences.
PM	:	Partial Meniscectomy
PKFA	:	Peak Knee Flexion Angle
PY	:	Per Year
ROM	:	Range of Motion
SPSS	:	Statistcal Package for Social Sciences.
WHO	:	World Health Organization

DEFINITIONS

Concomitant: means partial meniscectomy and anterior cruciate ligament reconstruction done at the same sitting on the same knee.

Functional outcomes: To mean total Lysholm scores of a participant at 16^{th} week visit.

Partial meniscectomy: is a surgery involving resection of a portion of the meniscus in the knee joint.

Minimal Clinical Important Difference: It is the smallest difference in a patient's condition that is considered to be meaningful by the patient or clinician.(1)

ABSTRACT

Background: Injuries to the anterior cruciate ligament (ACL) are often accompanied by damage to other knee structures, most commonly the meniscus. When performing ACL reconstruction (ACLR), addressing a concomitant meniscal tear is often necessary. In certain cases, partial meniscectomy remains the preferred surgical approach. At Muhimbili Orthopaedic Institute (MOI), combined ACLR and partial meniscectomy are routinely performed.

Objectives: This study aimed to evaluate the functional outcomes of patients undergoing concomitant ACL reconstruction and partial meniscectomy at MOI.

Materials and Methods: A longitudinal study design was employed. Adult patients (aged 18 and above) who met the inclusion criteria and underwent partial meniscectomy alongside ACL reconstruction were recruited (n=34). Participants underwent assessments of knee function (pain, range of motion) pre-surgery and at follow-up intervals (2nd, 6th, 12th, and 16th weeks). Data were collected using a pre-tested questionnaire. The primary outcome measure was the Lysholm score, which was used to assess knee function alongside knee range of motion. Pre-surgical scores served as a baseline for comparison. Statistical analysis was performed using SPSS version 27.

Results: A total of 34 participants were enrolled in the study. Participants were predominantly younger than 40 years old (82.4%) and male (64.7%). Most surgeries (88.2%) were performed more than 3 months after the initial injury, with a wide range observed (minimum: 0.9 months, maximum: 248.4 months, mean: 43.03 months). Sports injuries were the most frequent cause (79.4%), followed by motor vehicle accidents (14.7%).

There was no statistically significant association between sex, age group, or duration of injury and functional outcomes at the 16-week follow-up ($p > 0.05$ for all). All participants achieved good to excellent Functional outcome by Lysholm scores at 16 weeks, with the majority (61.8%) scoring in the excellent category. The mean Lysholm score demonstrated a significant improvement from baseline (63.26 ± 12.27) to 16 weeks (94.21 ± 3.79), with a mean improvement of 30.94 points ($p < 0.05$).

Conclusions: These findings suggest that patients undergoing concomitant anterior cruciate ligament reconstruction and partial meniscectomy at MOI experience good functional outcomes at 16 weeks post-surgery. While sex, age, and time since injury did not significantly impact outcomes at this follow-up point, further research is warranted to investigate longer-term functional recovery and potential factors influencing long-term outcomes.

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CHAPTER ONE

1.0 INTRODUCTION

11.Background

The knee joint is a complex anatomical structure that involves multiple tissues and ligaments, making it susceptible to various types of injuries. The majority of knee injuries involve damage to multiple structures contributing to knee pain. Anterior cruciate ligament and meniscal injuries are some of the commonly encountered injuries. Studies estimate that 34% to 80% of ACL injuries are associated with meniscal injuries (2–4) of these majority are medial meniscal injuries(2,5). Consequently, there has been a gradual rise of concomitant ACL surgery and partial meniscectomy from 27 to more than 35 per 100,000 PY. (4,6)

The anterior cruciate ligament (ACL) is a specialized connective tissue that is situated within the knee joint, connecting the distal femur and proximal tibia. Its principle role is to provide critical knee stability, primarily by limiting anterior tibial translation. Furthermore, the ACL also plays a minor role in preventing excessive internal rotation and other undesirable movements. (7,8). Alternatively, the knee joint comprises two fibrocartilaginous structures known as menisci. These structures are responsible for around half of the load transmission across the knee. Furthermore, they serve to enhance joint congruency and play a vital role in anteroposterior stabilization of the knee joint. (9)

Treatment options lie within meniscectomy or meniscal preservation. Most available literature favors an attempt at meniscal repair in the event of anterior cruciate ligament reconstruction. However, this is not always possible as partial meniscectomy remains the only option in certain instances. (10)

When compared to meniscal repair, partial meniscectomy (PM) done at time of anterior cruciate ligament reconstruction (ACLR) is safe and holds certain advantages that include quicker rehabilitation, low complication and re-operation rates of 5.4% and 0.8%, respectively. Also, short term follow-up has shown good IKDC and Lysholm scores. On the contrary long term follow-up studies show reduced scores at 2, 5 and 10 years. This may be attributed to meniscectomy increasing the long-term risk of osteoarthritis which may be directly related to the amount of resection done. (6,11,12) The osteoarthritis risk is about 2 to 3 times more when compared to meniscal repair. (13) Also partial meniscectomy unlike

meniscal preservation increases knee laxity and risks ACL graft failure.(14) In addition, aberrant biomechanics concentrate a significant degree of forces in the antero-medial tibio-femoral cartilage, which may account for higher rates of osteoarthritis in this group.(15)

Currently, there exists a conflict in management of meniscus tears with concomitant ACL reconstruction. With many authors discouraging the practice because of its negative clinical outcomes.(14,16,17). Despite this, a considerable number of patients are candidates for partial meniscectomy during ACL reconstruction. Studies in developing countries have mainly focused on outcomes of isolated meniscal or anterior cruciate ligament injuries. This study aims to establish clinical outcomes of combined ACL and meniscal surgery done at Muhimbili Orthopedic Institute.

1.2 Problem Statement

Anterior cruciate ligament (ACL) injuries are a common cause of knee functional disability, often requiring surgical intervention. There is increasing incidence of ACL injuries and concomitant meniscal injuries.

When a concomitant meniscal injury is present, treatment options include meniscal repair, partial meniscectomy, or conservative management. However, the effectiveness of ACL reconstruction with partial meniscectomy remains a contentious issue, with conflicting research reports. In spite of this, there has been a rise in combined ACL reconstruction and partial meniscectomy done at Muhimbili Orthopedic Institute (MOI). It is noteworthy, however, that there is a paucity of research on the functional outcomes of this intervention at Muhimbili Orthopaedic Institute.

In light of this, it is imperative to investigate the functional outcomes of ACL reconstruction with partial meniscectomy at MOI. This study intends to evaluate the functional outcomes usfollowing these procedures done at the same time and provide insight into its efficacy in patients with concomitant ACL and meniscal injuries.

1.3 Rationale

This study seeks to understand functional outcomes following combined ACL reconstruction and Partial Meniscectomy. It will also provides a baseline for future research. In addition, it will provide a basis for optimizing patient care and postoperative management.

This study seeks to address the current gap in research regarding the functional outcomes of concomitant ACLR and Partial meniscectomy at MOI.

1.4 Research Question.

What is the functional outcome following ACLR plus partial meniscectomy?

1.5 Objectives of study:

1.5.1 Broad objective

To determine the functional outcomes following concomitant ACL reconstruction and partial meniscectomy at MOI.

1.5.2 Specific objectives

1. To determine the socio-demographic factors of patients who undergo concomitant ACL reconstruction and partial meniscectomy at MOI
2. To determine the functional outcomes following concomitant ACL reconstruction and partial meniscectomy at MOI using the Lysholm score.

1.6 Literature Review

1.6.1 Socio-demographic characteristics.

The impact of socio-demographic factors on functional outcomes after concomitant ACL reconstruction and partial meniscectomy exhibits diversity. Majority of concomitant ACL plus meniscal injuries occur in males a retrospective cross-sectional study showed that majority of patients were male constituting more than 90%. (18) Despite Matthias et al focusing on lateral meniscal injuries when an ACL injury is present, findings were consistent with the former. (19,20) In a retrospective cohort study focused on investigating the relationship between meniscal tears and ACL injuries, it was discovered that men had a higher occurrence of meniscal injuries overall. However, female patients had a greater incidence of injuries in all tear sites of the meniscus, excluding the body and posterior horn.(21) Also, female patients are more likely to undergo meniscal repair than partial meniscectomy.(22) Reasons for this difference in meniscal injury occurrence in ACL deficient knees was predominant in males because there exists a robust correlation between damage to the lateral meniscus and differences in the anteroposterior dimensions of the femoral condyle and the tibial plateau. This difference is linked to an enhanced curvature of the lateral tibial plateau.(23) In one study however, gender role in functional outcomes based on the Lysholm score was statistically insignificant. (24)

A retrospective review was conducted on 412 patients to investigate the anatomical risk factors associated with injuries of the meniscus in conjunction with ACL rupture. It showed mean age of patients with medial meniscal and lateral meniscal injuries was 34 and 31.3, respectively. (23) A retrospective study in Serbia, Novi Sad recruited 185 patients who had undergone ACLR with and those without partial meniscectomy established that the average age for those with meniscal injury was 26.7. Also, female were generally younger than male 23.3 and 26.9. (25) De souza et al compared application of partial meniscectomy during ACL reconstruction to isolated ACL reconstruction. The mean age was 42.41 for those with concurrent surgeries, an average age higher than majority of other studies. (18). Despite the variability of ages groups, younger people are more likely to have simultaneous injuries because they participate in more strenuous activities. Also, age difference is not statistically significant regarding tear types. (5)

1.6.2 **Mechanism of injury**

ACL and meniscal injuries occur due to dynamic loading in various planes.(3) During acute injuries, lateral meniscus is more likely involved well tears to the medial meniscus are more prevalent in chronic ACL injuries. (10,24,26) The reason for this is, the medial meniscus serves as a secondary stabilizer of the knee, preventing the anterior movement of the tibia in knees with ACL damage. Additionally, it is subjected to anteroposterior shear stresses. The more mobile lateral meniscus (LM), however, is less likely to experience these shear forces.(21) Studies do vary in etiology mechanisms of meniscal injuries in ACL deficient knees. considering both medial and lateral meniscal injuries, non-sports injuries account for 71.43%.(24) Non-contact mechanisms contribute 67% of meniscal injuries in ACL deficient knees. (19) One common way in which the ACL gets torn is through a "cut-and-plant" motion, which refers to a sudden change in direction or speed while the foot remains firmly planted on the ground. Furthermore, these injuries have been associated with fast deceleration, such as planting the injured leg to perform sudden changes in direction, landing from a jump, pivoting, twisting, as well as direct contact with the front of the tibia. (27)

When examining mechanisms of ACL plus meniscal injuries, they can be categorized into two broad groups: sports-related and non-sports-related injuries. A retrospective study conducted by Venkataraman et al revealed that a significant proportion (64.9%) of ACL injuries were attributed to non-sports-related causes. These non-sports mechanisms encompassed various events such as road traffic accidents, falls from two-wheelers, falls from heights, as well as incidents involving slipping and tripping. These findings underscore the importance of considering non-sports-related factors when evaluating the etiology of ACL injuries. (24) Another retrospective cohort study divided sports injuries into contact and non-contact mechanisms as defined by the Hunt Valley II meeting. 79% of patients are injured through non-contact mechanisms.(19) According to Sruthi et al., ACL and meniscal injuries frequently arise from contact injuries involving a direct impact to the lateral aspect of the knee, along with valgus stress and internal rotation of the tibia. Among various sports, football exhibits the highest incidence of concurrent injuries. Additionally, it is worth mentioning that the majority of sports-related injuries occur during recreational sports activities rather than professional sports. (25,28) If gender is related to mechanism of injury, one study found that non-contact injuries predominant in females. (26) In contrast to

previous studies, a 2021 study conducted in Tanzania sought to evaluate the diagnostic accuracy of MRI and clinical examination in detecting ACL and meniscal injuries. Intriguingly, this study found that a significant proportion (46%) of tears occurred without a known cause. Furthermore, sports-related activities were identified as the second most prevalent cause of these injuries, underscoring their importance in the etiology of ACL and meniscal tears. (20)

The diversity in levels of activity in varying ages plays a crucial role in how concomitant meniscus and ACL injuries are distributed across age groups. However what is common to all studies is that these injuries are predominant among the third and fourth decade. Mansori et al analysed 362 ACL injured knees and stratified patients in 4 groups according to location of meniscal tear into lateral, medial, both and no meniscus tears. Significant findings were patients with medial meniscus tears were older than patients with lateral tears i.e. 32.9 versus 29.7. (21) Tan et al noted no significant difference in meniscus tear types or site according to age. (5) one retrospective cohort found that women with concomitant injuries were younger than their male counterparts with mean age 20.9 and 27.9, respectively. (28) A much older mean age of 42.41 was found in one study aimed at finding the effect of partial meniscectomy on ACLR. (18) No study has yet analyzed the influence of age on the functional outcomes following partial meniscectomy at time of ACL reconstruction.

1.6.3 Timing from injury to treatment.

When either/or ACL or meniscal injuries occur, they pause a risk to the development of osteoarthritis. However, when ACL tears are accompanied by meniscal injuries, the risk of osteoarthritis increases significantly, reaching a magnitude of 3.54 times higher. Notably, a delay exceeding six months before an ACLR leads to substantial progression of meniscal tears. At one, five-, and ten-years post-injury, the delay in ACL reconstruction results in lesion progression rates of 40%, 60%, and 80%, respectively. (10) In a study that looked at functional outcomes of patients undergoing isolated ACL versus those with ACL reconstruction and partial meniscectomy, noted significant meniscal damage was after more than 3 months. This study further went on to note the average time from injury was 6.5 months and 11.8 months for the isolated ACL and ACL plus partial meniscectomy groups, respectively. (23,25,26) A retrospective study done by Singh et al using a prospectively maintained database recruited 170 patients. The average time from injury was 4.5 months

with no significant difference between ACL only and ACL plus meniscal injury groups.(29) When comparing medial and lateral meniscus in ACL deficient knees, time from injury had a effect on incidence on medial meniscal tears. (21) Bruce et al however noted much shorter periods than other studies with an average time from injury as 13.5 days. (30)

Even in groups of patients with chronic ACL patients, surgeries done under 12 weeks, good outcomes are expected. At least 60% of patients had excellent Lysholm core outcomes. (31) In a systematic review by Seong et al, Lysholm scores were significantly lower in delayed vs early treatment. (32) However depending on morphology of meniscal injury in ACL deficient knees, early repairs within 3 weeks may pose a significant post-operative intervention for stiffness in concomitant bucket-handle tears.(33)

1.6.4 Functional outcomes after concomitant ACLR and partial meniscectomy

There is a growing advocacy for the preservation of the meniscus during ACL reconstruction procedures. However, partial meniscectomy may be inevitable with certain lesions. A metanalysis of 37087 patients spanning USA, China, Europe, Australia, Sweden, South Korea and Turkey was done looking at short term clinical outcomes at 2 years following either partial meniscectomy or meniscal repair at time of ACLR. It found that the mean Lysholm score following partial meniscectomy was good at 80.3, even when compared to meniscal repair and control group (no meniscal lesion) 86.7 and 85.16, respectively.(11). Similar findings were found in a retrospective cohort study that aimed to determine quality of life of patients following concomitant surgeries found acceptable Lysholm scores post operatively with post-operative mean values at 88.7, No statistically significant distinction in the quality of life was observed between the groups undergoing meniscal repair and partial meniscectomy.(25) Lauren et al. conducted a study that demonstrated a reduction in hamstring strength in the leg with a meniscal injury compared to the unaffected leg during a six-month follow-up period.(34) A cross-sectional study that analysed functional outcomes of 75 patients who had undergone ACLR with or without partial meniscectomy at 10 years post operative found no difference in functional outcomes. Also no significant statistical difference was noted in knee range of motion between contralateral normal knee and knee following partial meniscectomy i.e. 127.10 ± 11.06 and 122.80 ± 13, respectively. (18). However, overall participants with partial meniscectomy walked with smaller PKFA (Peak Knee Flexion Angle). (15) Akada et al analysed data from 426 patients undergoing primary

ACLR. Patients were died into 2 groups A and B, without and without meniscal lesion, respectively. These participants were followed up to 24 months. Rate of returning to sport phase was 80.8% in group A and 70.6% in group B. Mean time of return to sports was 10.9 and 11.4 months, respectively. Also, Lysholm scores improved significantly post-operatively with good to excellent scores.(35) For all studies, there is a significant improvement in Tegner scores, Lysholm scores and range of motion from baseline allowing pre-injury functional levels.

CHAPTER TWO

2.0 MATERIALS AND METHODOLOGY

2.1 Design of study

A prospective hospital based longitudinal study.

2.2 Duration of study

November 2023 to May 2024

2.3 Area of study

The research was done at the Muhimbili Orthopedic Institute (MOI), which is a specialized healthcare facility providing tertiary care services. A large number of arthroscopic surgeries are performed in MOI by trained arthroscopic orthopedic surgeons. The institution boasts of a high volume of patients undergoing arthroscopic surgeries averaging 8 patients per week. The institution also houses a proficient physiotherapy department staffed with skilled physiotherapists who attend to over a hundred patients daily.

2.4 Study population

Patients admitted who undergo ACL reconstruction with suspected meniscal injury.

2.4.1 Criteria for inclusion

All patients aged 18 and above who had concomitant ACL reconstruction and partial meniscectomy at time of surgery.

2.4.2 Criteria for exclusion

- Infections in/around the knee.
- Patients unable to ambulate prior to surgery
- Limb deformities. (namely: contractures, valgus knee, varus knee deformity)
- History of knee surgery to the ipsilateral or contralateral knee .
- Tibial plateau and distal femur intra-articular fractures
- Other multi ligamentous knee injuries

2.5 Sample size Estimation and Sampling technique.

The sample size was estimated based on a change in Lysholm score pre-operatively to post-operative. With a Minimal Clinical Important Difference (MCID) and an Effect size (Cohen's d) of 0.70. (1)

$$n = \left(\frac{z_{1-\alpha/2} + z_{1-B}}{d}\right)^2$$

Where:

n: is the estimated sample size

$z_{1-\alpha/2}$: is the z-score for the significance level α/2 (1.96 for 95% confidence level)

z_{1-B}: is the z-score for the power β (chosen power of study 1.28 for 90% power)

d: Cohen's d/ effect size (0.70)

substituting: $n = \left(\frac{1.96+1.28}{0.70}\right)^2$ = 22

Due to an anticipated 10% loss to follow up;

Adjusted sample size= $\frac{N}{1-loss\ to\ follow\ up\ \%}$ = $\frac{22}{1-0.10}$ = 25 participants

A minimum of 25 participants is required using an effect size of 0.7, setting statistical significance at 5% level at a power of 90%.

All available patients who undergo concomitant ACL reconstruction and partial meniscectomy will be approached.

2.6 Instruments

A pre-test of the data collection tools (case report form/questionnaire) was conducted by the principal investigator to ascertain its completeness. Necessary changes were incorporated. A specially created case report form using the LKFSS was utilized to collect data. The knee range of motion was measured using a goniometer and documented in the case report form.

2.7 Participant Recruitment and Data Collection

2.7.1 Participant Pre-treatment

Case report forms were populated with information on socio-demographic characteristics, mechanisms of injury, and participants' functional outcomes. The principal investigator

provided a comprehensive explanation of the study to potential participants and acquired their informed consent. The investigator interviewed participants using a pre-tested case report form. Knee Range of Motion (ROM) was measured preoperatively using a goniometer and recorded in the case report form. The Lysholm knee scoring scale was utilized for the evaluation of the functional status of the knee in both pre-operative and post-operative settings, aiming to compare the obtained results. For knee injuries, including meniscus and cruciate ligament injuries, the Lysholm knee score, a validated functional score, was used. In addition, it has been used in previous studies on patient functional outcomes at Muhimbili orthopedic institute. This questionnaire allows a response to each of the 8 assessed factors and assigns a score, with the overall score ranging from 0 to 100. Using the Lysholm Functional Knee Scoring Method, four degrees of outcome were identified.

Table 1: Parameters and scores (Lysholm score)

Variables/domains	**Points/scores**
Instability	25
Pain	25
Locking	15
Swelling	10
Stair climbing	10
Limp	5
Support	5
Squatting	5

Before the surgical procedure, the total score was evaluated and categorized into four levels based on the range of scores achieved. Scoring between 95-100 was rated as Excellent (level 1), while scores ranging from 84-94 were considered Good (level 2). If the score fell within the range of 65-83, it was rated as Fair (level 3). Scores below 65 were classified as Poor (level 4). After the surgery, the score was measured again and compared to the previous one to determine the outcome of the surgical intervention. Furthermore, a clinical evaluation of the patient was carried out, and their diagnosis was determined using either MRI or arthroscopy, or a combination of both techniques.(20)

2.7.2 How knee range of motion will be measured.

The healthcare professional positioned the patient supine with the hip secured to prevent abduction and adduction. They then placed the goniometer's axis at the center of the femur's lateral epicondyle, with the proximal stationary arm aligned to the greater trochanter and the distal movable arm aligned to the lateral malleolus. Finally, the angles of extension and flexion were read and documented. (36)

2.8 Treatment and follow up

All enrolled participants underwent concomitant anterior cruciate ligament repair and partial meniscectomy. Prior to surgery, preoperative antibiotics were administered one hour in advance of surgery and tourniquet placement. During the procedure, spinal anesthesia was given and a tourniquet applied. The surgeries were performed by experienced fellowship trained sports medicine surgeons. All ACL reconstructions used quadrupled hamstring (semitendinosus plus gracillis) autograft. Patients underwent partial meniscectomy of the affected meniscus was done and no more than a one third of the meniscus was resected. Details of the intraoperative findings and procedures will be documented in both digital and physical patient files. After surgery, all patients were given a knee brace that locked in extension for 3 weeks post-surgery. This was followed by gradual progression to full range of motion and partial weight bearing. Full weight bearing began at 4 to 5 weeks after surgery. Patients were asked to attend clinic appointments on the 2nd, 6th, 12th, and 16th week post-operation. Analgesics were prescribed for three days, and oral antibiotics were administered.

Patients were instructed and supervised by the physiotherapist on how to perform closed chain alphabet exercises and active knee flexion and extension during each visit and at home.

Second week

The wounds were inspected, and any sutures removed. For individuals experiencing wound infection, appropriate therapy was provided, which typically involved administering oral antibiotics and dressing the wound daily. All patients used crutches and wore a hinged knee brace while walking. To achieve complete extension, patients performed closed chain exercises involving active knee flexion and extension consistently.

Sixth week

The Lysholm score was utilized. The range of motion measured, and the wound evaluated simultaneously. The patient continued with physiotherapy, performing open chain exercises while bearing their full weight and engaging in active knee flexion.

Twelfth week

Patient was assessed with the Lysholm score. Range of motion and wound evaluation was done. Physiotherapy was continued.

Sixteenth week

During the last visit, the patient's outcome was assessed. The participants Lysholm score populated, and their recovery was compared to the baseline. The range of motion and wound healing were evaluated to determine whether the recovery process is progressing as expected. Based on the assessment, the patient's outcome was graded and classified as either excellent (scores between 100 to 95), good (scores between 94 to 84), fair (scores between 83 to 65), or poor (scores less than 64).

2.8.1 Investigation tools (reliability and validity)

The Lysholm score is a reliable and responsive tool used to assess the function of patients with meniscus and cruciate ligament injuries. The original Lysholm score, developed in 1983, included the objective domain of thigh muscle atrophy but omitted it in the reviewed version. A total of 8 domains resulted from this review following the addition of locking.

The domains included are: Instability (twenty-five), Pain (twenty-five), Locking (fifteen), Swelling (ten), Stair climbing (ten), Limp (five), Support (five), and Squatting (five).

The Lysholm Functional Knee Scoring Scale (LFKSS), the most recent version, has demonstrated good psychometric performance as an outcome measure for patients with combined ACL and meniscal injuries.

2.9 Data management (Analysis)

The entry of data, cleaned and prepared, and analysis for this study was performed using SPSS version 27.

For objective one:

Descriptive statistics were used to summarize the characteristics of the study population, including age, gender, and relevant clinical variables. For continuous variables, mean, median, standard deviation, and range will be reported. Categorical variables will be summarized using frequency tables and bar graphs.

For objective two:

For continuous variables i.e. the constant Lysholm scores over time (pre-surgery, post-surgery at different intervals). Descriptive statistics will be used. The mean, median , standard deviation and range will be reported. In addition measures of variability (standard deviations and confidence intervals) was reported. Frequency tables and bar graphs were used to summarize Lysholm scores.

Paired T-test will be used to compare difference of Lysholm scores pre and post-operative. Linear regression will be used to determine how sociodemographic characteristics influence Lysholm scores.

If a variable has a P-value of 0.05 or below, it will be deemed statistically significant.

2.10 Study limitations and mitigation.

Small sample size: A small sample size will impact the statistical power of analysis and may affect generalizability of study findings to a larger population. Findings obtained will require validation with larger cohorts in future research.

Assumption of normality: Lysholm scores may not follow normal distribution which could impact the validity of statistical tests used (T-test). In light of this, a test of normality was perfomed on data collected. Data was found to be normally distributed.

2.11 Ethical Consideration and Clearance

Before enrolling in the study, participants were provided with written informed consent, and the study protocol was reviewed by the MUHAS IRB. Furthermore, the study sought approval from the MOI administration. The participants' voluntary involvement in the study was respected, ensuring their anonymity and the assurance that they could withdraw at any time with no effect the standard of care or follow-up they receive. To ensure anonymity, numerical identifiers were used for the participants.

CHAPTER THREE

3.0 RESULTS

Table 2: Baseline characteristics of patients who underwent concomitant anterior cruciate ligament repair and partial meniscectomy

N=34

		Frequency	percentages
Age groups	<40	28	82.4%
	>40	6	17.6%
Sex	Female	12	35.3%
	Male	22	64.7%
Mechanism of injury	Fall from a height	2	5.9%
	Motor traffic crush	5	14.7%
	Sports injury	27	79.4%
Time from to surgery	< 3 months	4	11.8%
	> 3 months	30	88.2%
Baseline Lysholm score	Excellent	00	0.0%
	Good	00	0.0%
	Fair	16	47.1%
	Poor	18	52.9%
Side of Knee	Right	20	58.%
	Left	14	41.2%
Affected meniscus	Both	5	14.7%
	Lateral	16	47.1%
	medial	13	38.2%

Table 3 Comparison of age, sex and time from injury to surgery on the Lysholm knee score at week 16 post operative.

N=34

			week 16 LKFS GRADE		Total	P-value
			Excellent	Good		
AGE GROUP	<40		17(60.7%)	11(39.3%)	28(100.0%)	0.919
	>40		4(66.7%)	2(33.3%)	6(100%)	
Total			21(61.8%)	13(38.2%)	34(100%)	
Sex	female		9(75%)	3(25%)	12(100%)	0.199
	male		12(54.5%)	10(45.5%)	22(100%)	
Total			21(61.8%)	13(38.2%)	34(100.0%)	

Time to operation	<3months		3(8.8%)	1(2.9%)	4(11.8%)	0.896
	>3months		18(52.9%)	12(35.3%)	30(88.2%)	
Total			**21(61.8%)**	**13(38.2%)**	**34(100%)**	

Figure 1*:* Trend of Mean Lysholm scores at baseline, week 2, week 6, week 12 and week 16

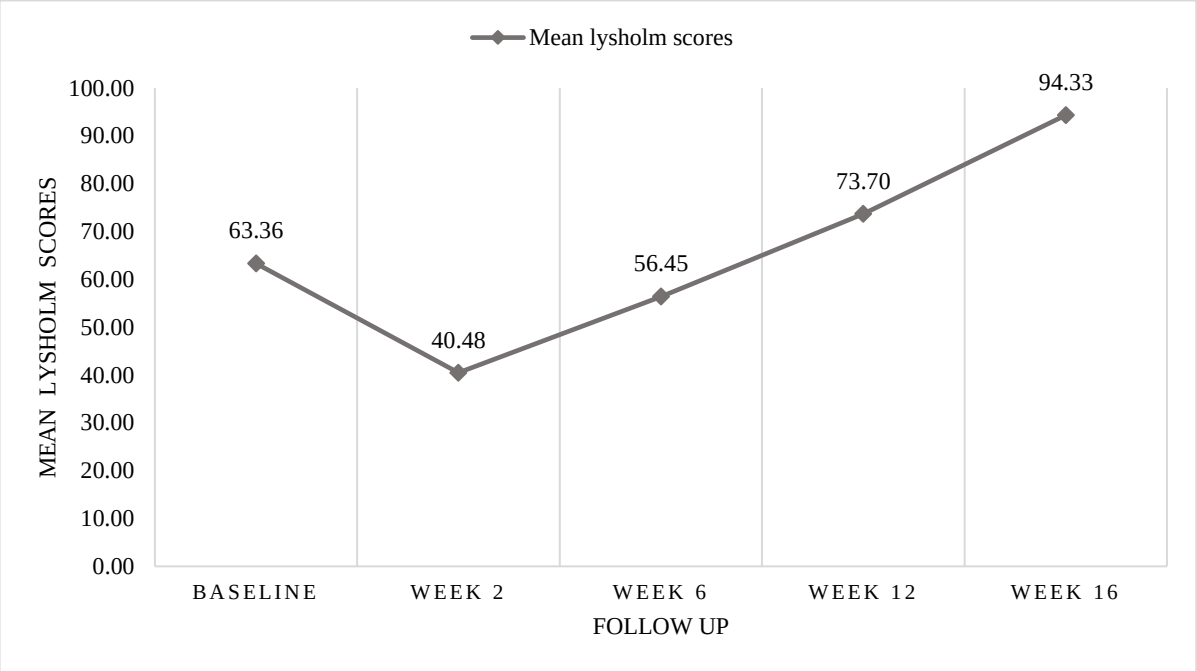
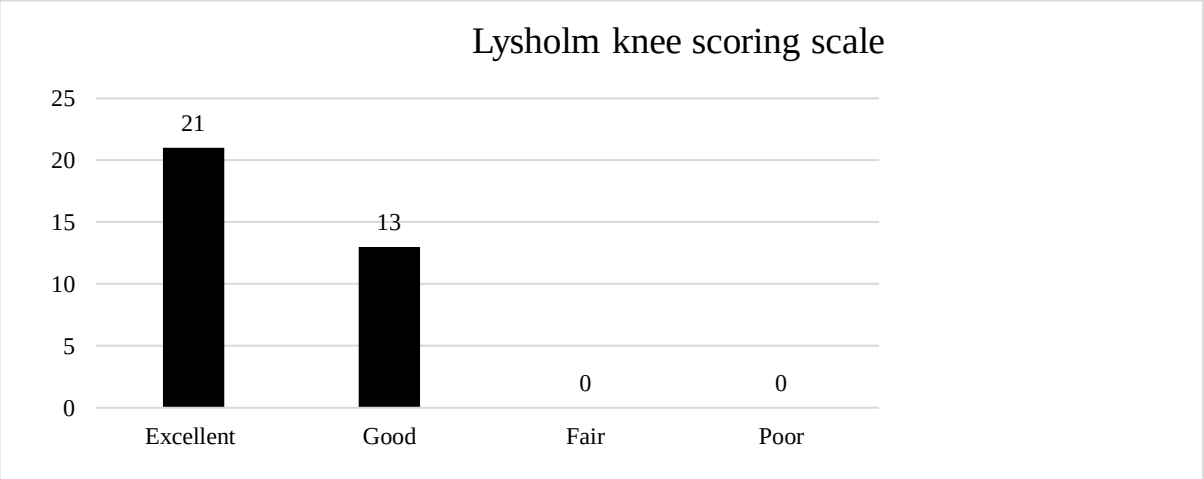


Figure 2 *:* Lysholm knee scoring scale functional outcome at 16 weeks post operative.



Lysholm scores at 16 weeks were Good to Excellent in all the participants, with majority 21(61.8%) having an excellent Lysholm score.

Table 4 *:* Comparing difference between baseline Lysholm scores and scores at week 16.

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	baseline LKFS	63.36	34	12.266	2.104
	week 16 LKFS	94.33	34	3.788	.650

Comparing pre and post-operative Lysholm scores						
	Paired Differences			t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean			
Baseline - week 16 LKFS	30.941	13.500	2.315	13.365	33	.000

CHAPTER FOUR

4.0 DISCUSSION

The majority of participants were male, with 22 men (64.7%) and a male-to-female ratio of 2:1. These results align with a retrospective cross-sectional study that reported a male-to-female ratio of 10:1.(1) Feucht et al found 71.2% of those with meniscal tears and an ACL tear were male.(2) This pattern could be due to less resilient meniscal tissue and contraction differences in quadriceps and or hamstring muscles in males. One of the reasons could be due to lateral tibial incongruence in males and a higher activity level and higher energy trauma, findings with weak association in females (3,4) This differs from findings in a study by Tomohiro et al highlighting that male sex was not a risk factor for meniscal injury. (4) Further in this study, almost all participants 28/34 (82.4%) were below the age of 40. Majority of studies do not stratify age groups however findings are consistent with this study. Harhaji et al found the mean age was 26.7(±8 SD) , while another study had a mean age of 32.31 years. The main explanation to this was that younger people take up more extreme physical activities.(5,6) Age and gender have not been found to be statistically significant. (5)

Despite a high degree of variability amongst patients with a mean time to surgery of 43 months (±70 SD), more than two thirds 30(88.2%) of the participants had surgery more than three months post injury. Authors however differ in stratification of time from injury. Brooke et al found the mean time to surgery was 19 weeks (±32 SD)(7) Singh et al found the mean time interval between injuty to surgery as 4.5 months.(8) Basal et al however reported much shorter time to surgery of 10.5±4.4 weeks(9)

Regarding mechanism of injury, majority had a sports related injury 27 (79.4%) and 5(17.4%) were due to motor traffic crush. These findings were similar to a retrospective review of patients that underwent ACLR and had meniscal injuries, which found the injury mechanism was sports-related in 93% of patients well as motor vehicle accidents contributed only (1%). (5) Another study classified injuries into : high impact sports, low impact sports and not sports related, with findings leaning towards sports injuries as a predominant cause in patients with both ACL and meniscal injuries. (2) Contrary to these findings, a study done in India non-sports injuries accounting for 31 (64.59%) of the patients. Machagge et al

however found that most injuries 46% were due to an unknown mechanism. (10) - The prevalence of injuries in patients receiving ACL reconstruction and partial meniscectomy may be attributed to the high rate of sports participation among the subjects.

Regarding functional outcomes by Lysholm scores, The mean Lysholm score at baseline was 63.36 (±12.266 SD) and 94.33 (±3.788 SD) at 16 weeks. A mean improvement of 30.941(±13.5 SD) Showing a statistically significant improvement of week 16 Lysholm scores. Similar results have been reported in various studies highlighting the significant improvement of post-operative Lysholm scores.(6,8,11,12) Excellent to Good Lysholm scores were attained for all patients (100%). This finding differs from a systematic review done by Sarraj et al where lower post-operative mean Lysholm scores were reported 80.3(±8.8SD) (12)

Regarding the effect of age, all patients in the study attained Excellent and Good Lysholm scores. Age showed no effect on postoperative Lysholm scores at 16 weeks post-operative, the effect of age was not statistically significant with a p=0.919. Also, the effect of sex on Lysholm scores was not statiscally significant p=0.199. Venkataraman et al found no statistical significance with age and gender on functional outcomes. (5) In addition, time to operation stratified by more than or less than 3 months did not influence week 16 Lysholm scores. However, a systematic review demonstrated that delayed surgery resulted into lower Lysholm scores. (13) Raviraj's study on 105 patients showed that surgery timing did not affect the Lysholm score, with a p-value of 0.86 indicating no statistical significance.(14) The study by Niederer et al. provides a comprehensive analysis of the multifactorial nature of recovery after anterior cruciate ligament (ACL) reconstruction. It highlights the interconnectedness of various factors such as the timing of surgery, patient demographics, pain levels, graft types, and additional injuries, which do not act in isolation but rather influence each other in determining rehabilitation outcomes. The findings contribute significantly to the understanding of ACL recovery, emphasizing the importance of considering a broad range of factors when evaluating functional outcomes.(15)

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The results of this study enhance the comprehension of combined Anterior cruciate reconstruction and partial meniscectomy for treating combined ACL and meniscal injuries. The emphasis on a young, active demographic corresponds with the recognized prevalence of these injuries among individuals engaged in high-demand physical activities, especially sports.

This study further provides valuable insight into the application of concomitant ACLR and partial meniscectomy, offering data on a patient population typically affected by these injuries. The results suggest that this surgical treatment is a viable option for achieving good functional outcomes, warranting further investigation to optimize treatment protocols and patient recovery.

5.2 Study Limitation

1. This is a hospital based study and therefore results may not reflect the burden of disease in the general population.
2. A small sample size was used and this impacts on generalizability of the study results.
3. **S**hort-Term Follow-Up**:** If the follow-up period is short, the study might not capture long-term functional outcomes.

5.3 Recommendation

1. This study's findings suggest that combined ACLR and partial meniscectomy holds promise for treating specific knee injuries in Tanzania. However, wider adoption among surgeons might require advocacy efforts. Highlighting the observed benefits (e.g., good functional outcomes) alongside educational workshops could address potential concerns and promote its use.
2. Furthermore, the study suggests surgery may remain viable for qualifying patients even with delayed arrival at healthcare facilities. Defining "delayed" based on existing literature and emphasizing careful patient selection based on established criteria (joint stability, meniscal tear severity) are crucial. This approach could improve treatment decisions in resource-limited settings.

3. Finally, conducting a larger prospective study with a well-defined patient population and outcome measures is recommended. This could involve a statistically significant sample size, inclusion criteria considering age and activity level, and detailed outcome assessments. Building upon these findings would strengthen the evidence base for utilizing combined ACLR and partial meniscectomy in Tanzania.

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APPENDIX

INVESTIGATION TOOLS

Appendix I: Case Report Form

TITLE*:* FUNCTIONAL OUTCOMES OF PATIENTS FOLLOWING CONCOMITANT ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION AND PARTIAL MENISECTOMY AT MUHIMBILI ORTHOPAEDIC INSTITUTE

SECTION I : EVALUATION:

<table>
<tr><td colspan="10">1. Case Report Identification Number:</td></tr>
<tr><td colspan="10">2. Admission number:</td></tr>
<tr><td colspan="2">3. Cellphone contact:</td><td colspan="3">1.</td><td colspan="2">2.</td><td colspan="2">3.</td></tr>
<tr><td colspan="10">4. Residence:</td></tr>
<tr><td colspan="10">5. Age:</td></tr>
<tr><td colspan="2" rowspan="2">6. Sex 1. M:
2. F:</td><td colspan="2">Injured Knee</td><td rowspan="2"></td><td colspan="4">Meniscus injured</td><td rowspan="2"></td></tr>
<tr><td>Right</td><td>Left</td><td>medial</td><td>lateral</td><td>Both</td></tr>
<tr><td colspan="10">7. Date of injury:</td></tr>
<tr><td colspan="10">8. Date of surgery:</td></tr>
</table>

MODE OF INJURY

i)	Related to sports	
ii)	Road traffic injury	
iii)	Fell from a height	
iv)	Others, specify:	

VISIT				
BASELINE	WEEK 2	WEEK 6	WEEK 12	WEEK 16

Lysholm knee Scoring Scale		
I. LIMPING		
a) Never	5	
b) Mild or sometimes	3	
c) All the time and constant	0	
II. SUPPORT		
a) None	5	
b) I use a walking stick/ cruthces	2	
c) Impossible	0	
III. PAIN		
a) None	25	
b) During high-intensity physical activities, my knee experiences occasional or mild pain.	20	
c) I experience significant or noticeable pain in my knee when engaging in intense physical activities.	15	

d) I suffer from considerable or noticeable knee pain either during or after walking a distance greater than one mile.	10	
e) I suffer from considerable or noticeable knee pain either during or after walking a distance less than one mile	5	
f) All the time	0	
IV. INSTABILITY		
a) Never	25	
b) Seldomly, only experienced when I engage in athletics/ other strenuous activities	20	
c) I'm unable to participate in these activities as a result.	15	
d) Sometimes during activities of daily living	10	
e) Often, during activities of daily living	5	
f) During every step taken.	0	
1. LOCKING		
a) None	15	
b) Feeling present however no locking	10	
c) Occasionally locks	6	
d) Often locks	2	
e) Currently knee feels locked	0	

15. SWELLING		
a) None	10	
b) Only happens when I perform strenuous activities	6	
c) Happens even when I perform usual activities	2	
d) All the time	0	
16. SQUATTING		
a) No difficulty	5	
b) Experience minor difficulty	4	
c) Never exceeds 90 degrees	2	
d) Not possible	0	
17. CLIMBING STAIRS		
a) No difficulty experienced	10	
b) Experience minor difficulty	6	
c) Only able to climb one stair at a time	2	
d) Not possible	0	
TOTAL SCORE	=	

Knee range of motion (In degrees)

Passive	
Active	

Appendix II: Informed Consent Form - English Version

Consent to participate in the study: "**Functional Outcomes Of Patients Following Concomitant Arthroscopic Anterior Cruciate Ligament Reconstruction And Partial Menisectomy At Muhimbili Orthopaedic Institute"**

Greetings, my name is Dr. Muhumuza Neville, and I am a resident in Orthopedics and Traumatology. I am planning to conduct a study on the "**Functional Outcomes Of Patients following Concomitant Anterior Cruciate Ligament Reconstruction And Partial Meniscectomy At Muhimbili Orthopaedic Institute**.*"*

The study aims: to determine the functional outcomes of patients who have undergone combined ACL reconstruction and partial meniscectomy at Muhimbili Orthopaedic Institute.

PARTICIPATION IN THIS STUDY ENTAILS: answering questions and undergoing a physical examination, should you choose to participate.

YOUR CONFIDENTIALITY IS ASSURED: we will not disclose any of the information you provide to us. We will use an identification number to store your data in our computer system; your name will not be indicated.

IS THERE ANY RISK: Our study is designed to avoid any harm to the participants.

DO I HAVE A RIGHT TO WITHDRAW? This study is conducted on a purely voluntary basis, and declining to participate or withdrawing from the study will not result in any form of penalty or deprivation of entitled benefits. Patients who undergo combined arthroscopic ACL reconstruction and partial meniscectomy at the Institute will receive the standard treatment protocol, and those who choose to participate will be duly monitored and followed up.

ARE THERE ANY BENEFITS? Should you choose to participate in this study, the investigating physician will assess your condition's progress. It is our aspiration that the information gathered from this study will prove valuable to science.

HOW TO CONTACT: For any questions or concerns, please contact Dr. Muhumuza Neville, the investigator of this study. Dr. Muhumuza can be reached at Muhimbili University of Health and Allied Sciences, P.O. Box 65474, Dar es Salaam, or via telephone at 0768344801.

Do you agree to participate: Yes ☐ No ☐

I, …… have read the consent form and my questions have been answered and I agree to participate in this study.

Participant's signature ……..

Investigator's signature …….

Date signed: …….

Appendix III: Informed consent Form- Swahili Version

Ridhia kushiriki katika utafiti: " ***Kuangalia Matokeo ya wagonjwa wanaofanyiwa upasuaji kutumia video maalum ya kurekebisha Anterior Cruciate Ligament (ACL) na upasuaji wa kuondoa sehemu ya meniscus katika Taasisi ya Mifupa ya Muhimbili***."

Salaam, mimi naitwa Dkt. Muhumuza Neville, ni mwanafunzi wa uzamili chuo kikuu cha tiba Muhimbili. Nina mpango wa kufanya utafiti kuhusu: "***Kuangalia Matokeo za wagonjwa wanaofanyiwa upasuaji kutumia video maalum ya kurekebisha Anterior Cruciate Ligament (ACL) na upasuaji wa kuondoa sehemu ya meniscus katika Taasisi ya Mifupa ya Muhimbili***."

Lengo la utafiti huu ni: Ni kubaini matokeo ya kiutendaji ya wagonjwa waliofanyiwa upasuaji wa kurekebisha ACL na kuondoa meniscus katika Taasisi ya Mifupa ya Muhimbili.

USHIRIKI WAKO KATIKA UTAFITI HUU UNAJUMUISHA: Kujibu maswali na kufanyiwa uchunguzi wa kimwili, ikiwa utachagua kushiriki.

USIRI WAKO UNAHAKIKISHWA: Hatutafichua taarifa yoyote utakayotupatia. Tutatumia namba ya utambulisho kuweka data yako katika mfumo wetu wa kompyuta; jina lako halitatajwa.

Kuna madhara yoyote yanayohusiana na utafiti huu: Utafiti wetu hauna madhara yoyote kwa washiriki wetu.

Je, ninayo haki ya kujiondoa? - Ndiyo. Kwani utafiti huu unafanyika kwa msingi wa hiari pekee, na kukataa kushiriki au kujiondoa katika utafiti hautasababisha adhabu yoyote au upungufu wa faida zinazostahiki. Wagonjwa wanaofanyiwa upasuaji kutumia video maalum kwa ajili ya kurekebisha ACL na upasuaji wa kuondoa meniscus katika Taasisi ya MOI watapokea matibabu ya kawaida sawa na wagonjwa watakaochagua kushiriki isipokuwa tu, watakaochagua kushiriki watafuatiliwa zaidi.

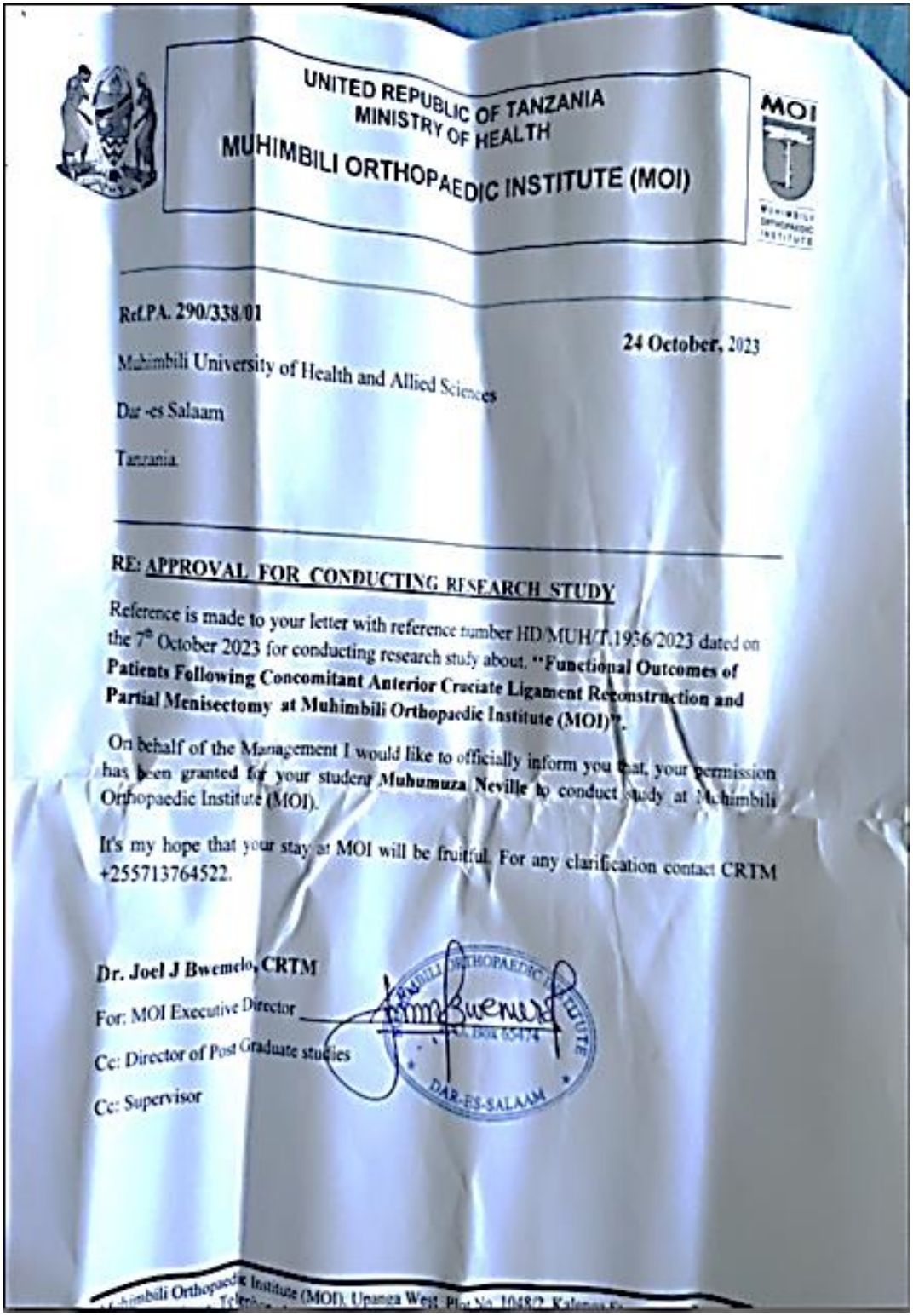
Je, kuna faida zozote? Ikiwa utachagua kushiriki katika utafiti huu, daktari anayekuchunguza atakagua maendeleo ya hali yako. Pia tumekusudia kwamba taarifa zitakazokusanywa katika utafiti huu zitakuwa na thamani kwa sayansi.

JINSI YA KUWASILIANA: Ikiwa una maswali au wasiwasi wowote, tafadhali wasiliana na Dkt. Muhumuza Neville, mchunguzi wa utafiti huu. Dkt. Muhumuza anapatikana katika Taasisi ya Mifupa na ubongo Muhimbili (Muhimibili Orthopaedic Institute)., P.O. Box 65474, Dar es Salaam, au kupitia njia ya simu kwa namba 0768344801.

Je, unaafiki kushiriki? Ndio ☐ Hapana ☐

Mimi, …… nimesoma fomu ya idhini na maswali yangu yameshajibiwa, naafiki kushiriki katika utafiti huu.
Sahihi ya Mshiriki ……..
Sahihi ya Mtafiti …….
Tarehe ya kusaini: ……

Appendix II: Ethical Clearance



UNITED REPUBLIC OF TANZANIA
MINISTRY OF HEALTH
MUHIMBILI ORTHOPAEDIC INSTITUTE (MOI)

MOI

Ref.PA. 290/338/01

24 October, 2023

Muhimbili University of Health and Allied Sciences
Dar -es Salaam
Tanzania

RE: APPROVAL FOR CONDUCTING RESEARCH STUDY

Reference is made to your letter with reference number HD/MUH/T.1936/2023 dated on the 7th October 2023 for conducting research study about, **"Functional Outcomes of Patients Following Concomitant Anterior Cruciate Ligament Reconstruction and Partial Menisectomy at Muhimbili Orthopaedic Institute (MOI)".**

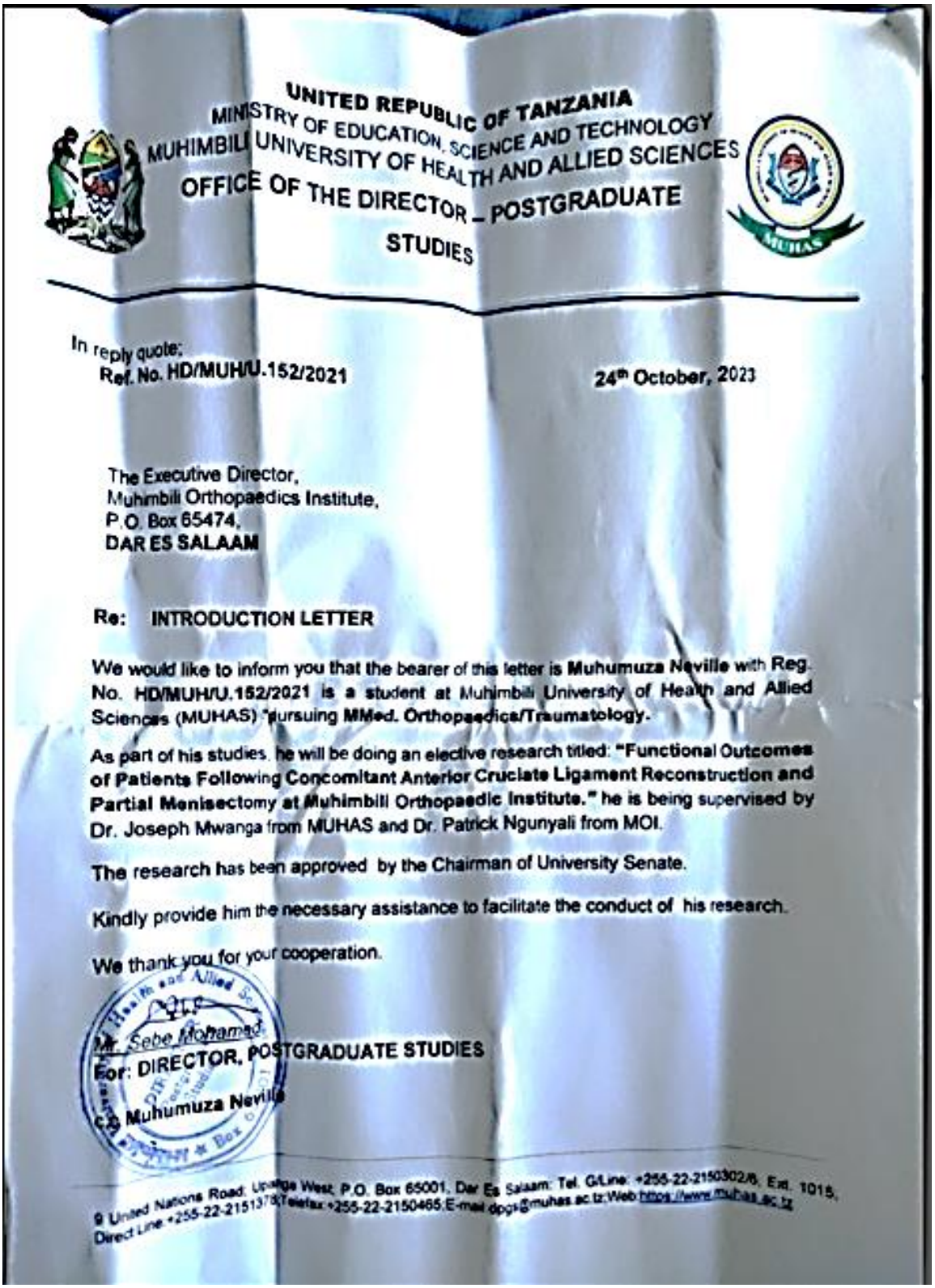
On behalf of the Management I would like to officially inform you that, your permission has been granted for your student **Muhumuza Neville** to conduct study at Muhimbili Orthopaedic Institute (MOI).

It's my hope that your stay at MOI will be fruitful. For any clarification contact CRTM +255713764522.

Dr. Joel J Bwemelo, CRTM
For: MOI Executive Director
Cc: Director of Post Graduate studies
Cc: Supervisor

DAR-ES-SALAAM

Muhimbili Orthopaedic Institute (MOI), Upanga West, Plot No. 1048/2, Kalenga St



UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote:
Ref. No. HD/MUH/U.152/2021

24th October, 2023

The Executive Director,
Muhimbili Orthopaedics Institute,
P.O. Box 65474,
DAR ES SALAAM

Re: INTRODUCTION LETTER

We would like to inform you that the bearer of this letter is **Muhumuza Neville** with Reg. No. **HD/MUH/U.152/2021** is a student at Muhimbili University of Health and Allied Sciences (MUHAS) **"pursuing MMed. Orthopaedics/Traumatology.**

As part of his studies, he will be doing an elective research titled: **"Functional Outcomes of Patients Following Concomitant Anterior Cruciate Ligament Reconstruction and Partial Menisectomy at Muhimbili Orthopaedic Institute."** he is being supervised by Dr. Joseph Mwanga from MUHAS and Dr. Patrick Ngunyali from MOI.

The research has been approved by the Chairman of University Senate.

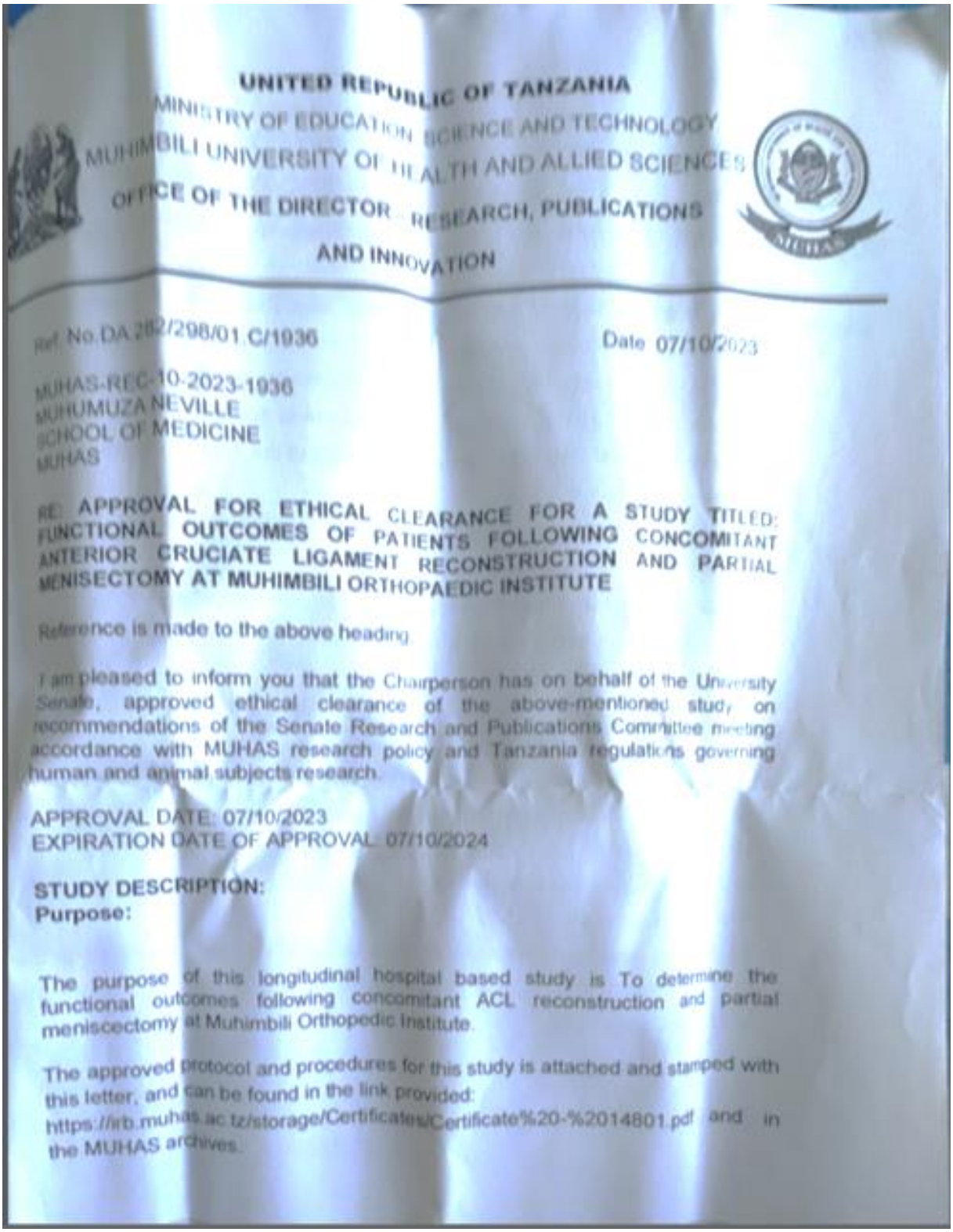
Kindly provide him the necessary assistance to facilitate the conduct of his research.

We thank you for your cooperation.

Mr. Sebe Mohamed
For: DIRECTOR, POSTGRADUATE STUDIES

c.c. Muhumuza Neville

9 United Nations Road, Upanga West, P.O. Box 65001, Dar Es Salaam. Tel. G/Line: +255-22-2150302/6, Ext. 1015, Direct Line +255-22-2151373,Telefax:+255-22-2150465,E-mail dpgs@muhas.ac.tz,Web https://www.muhas.ac.tz



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/1936

Date 07/10/2023

MUHAS-REC-10-2023-1936
MUHUMUZA NEVILLE
SCHOOL OF MEDICINE
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: FUNCTIONAL OUTCOMES OF PATIENTS FOLLOWING CONCOMITANT ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION AND PARTIAL MENISECTOMY AT MUHIMBILI ORTHOPAEDIC INSTITUTE

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: 07/10/2023
EXPIRATION DATE OF APPROVAL: 07/10/2024

STUDY DESCRIPTION:
Purpose:

The purpose of this longitudinal hospital based study is To determine the functional outcomes following concomitant ACL reconstruction and partial meniscectomy at Muhimbili Orthopedic Institute.

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.