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Prof Everisto Opondo
Orthopaedic Surgeon

Prof Everisto Opondo is an Orthopaedic Surgeon with subspecialty training in Sports Medicine and Arthroscopy. He earned her Medical Degree and Master of Medicine in Surgery from the University of Nairobi and is a Fellow of the College of Surgeons of East, Central and Southern Africa (COSECSA).

He subsequently completed fellowship training in arthroscopy and arthroplasty form Ahmedabad in India. Prof Opondo also hold a PhD in Public health from Jomo Kenyatta University of Agriculture and Technology (JKUAT).

Prof Opondo has an extensive academic portfolio, having authored peer-reviewed publications and delivered presentations and served as a key trainer in multiple scientific meetings. Prof Opondo has served on the ILRI IREC for the last ten years where he reviews many research protocols annually.

Prof Opondo is a founding member of the East African Arthroscopy Association in 2012. Alongside his academic engagements, Prof Opondo serves as the Chair of the Scientific committee and Secretary General of the East African Arthroscopy Association (EAAA). He is also in Private practice as well and he focuses on trauma, arthroplasty and arthroscopy. He is an associate member of ISAKOS and ISHA.

He served as the founding chair of the department of Surgery at the JKUAT Medical School and is the current Dean.

Dr. S. O. Owinga

Orthopaedic & Arthroscopic Surgeon

Dr. Owinga is a distinguished Orthopedic and Arthroscopic Surgeon practicing privately in Nairobi, Kenya. He holds a Master of Medicine from the University of Nairobi and completed an attachment at the University of Basel, Switzerland in 1997. That same year, he became member no. 1600 of ESSKA and has since remained actively engaged, regularly attending meetings and workshops. In 2013, Dr. Owinga joined ISAKOS and has consistently participated in its biannual events and educational programs.

His commitment to advancing the field is evident through his involvement with numerous instructional arthroscopy workshops, including sessions in Courmayeur, Italy; several South African workshops on arthroscopy and sports medicine; and select AANA instructional courses in Illinois, Chicago.

In partnership with local colleagues, Dr. Owinga co-founded the East African Arthroscopy Association (EAAA) in 2013, initially focusing on knee procedures before expanding to shoulder and, more recently, hip arthroscopy—supported by collaboration with ISHA. The EAAA maintains an official working relationship with ISHA.

Dr. Owinga has held leadership positions, serving as Past Chairman of the ISAKOS Development and Communications Committee, and is a current member of the ISAKOS Communications Committee (2025–2027). He also serves as Chairman of the East African Arthroscopy Association and is an associate member of ISHA.

Currently, Dr. Owinga consults at the Aga Khan University Hospital Private Doctors Plaza, The Mater Misericordiae Hospital, and The Nairobi Hospital.

He remains dedicated to furthering the study and dissemination of knowledge in arthroscopy and sports medicine.

Dr Kitugi Samwel Nungu
Consultant Orthopaedic and Trauma Surgeon

Dr Kitugi Samwel Nungu is a Consultant Orthopaedic and Trauma Surgeon at Muhimbili Orthopaedic Institute (MOI) and Lecturer at Muhimbili University of Health and Allied Sciences (MUHAS), Dar es Salaam, Tanzania.

He holds an MD and Diploma in Tropical Medicine from the University of Havana, Cuba, and completed specialist Orthopaedic training at Uppsala Academic Hospital, Sweden, where he also obtained a PhD by publications from Uppsala University and a Diploma in Epidemiology & Biostatistics from the Nordic School of Hygiene, Gothenburg. Visiting Fellow in Arthroscopy- Secundarbad, India

Dr. Nungu has over 40 years of clinical, academic, and leadership experience. He has supervised more than 45 MMed Orthopaedics residents and organized numerous national and international training courses in musculoskeletal trauma and arthroscopy. He has published widely in peer-reviewed journals, including contributions to the landmark CRASH-2 trial, which introduced Tranexamic Acid for trauma care in Tanzania.

He is a founding member and Past President of both the Tanzania Orthopaedic Association and the Tanzania Surgical Association. A founding Fellow of COSECSA, he has served as Head of the Orthopaedic Panel, Chief Examiner, and currently as Treasurer and therewith member of the Executive Committee. His work has significantly advanced orthopaedic care, surgical training, and health systems in East, Central, and Southern Africa. A founding member of the East Africa Arthroscopy Association.

Dr Mordicai Atinga
Consultant Orthopaedic surgeon

Mr Atinga is a consultant orthopaedic surgeon who has a specialist interest in shoulder and knee surgery. He studied medicine at The University of Sheffield and completed his basic surgical training rotation in The Sheffield Teaching Hospitals training program, gaining membership to the royal college of surgeons (MRCS).

He was selected to the trauma and orthopaedic specialist training scheme in the South West London rotation obtaining experience in trauma management and orthopaedic elective surgery. He successfully sat the intercollegiate speciality training exam in 2015 becoming a Fellow of the Royal College of Surgeons of England (FRCS Tr &Orth. Eng.). He attained the Certificate of Completion of Training (CCT) the following year.

He is dual fellowship trained in arthroscopic/ sports surgery and joint reconstruction. He was awarded and completed a 9-month shoulder and elbow fellowship at the Waikato Hospital, New Zealand in 2017. He followed this with a one-year fellowship in Australia at the Perth Orthopaedic Sports Medicine Centre (POSMC). He helped manage injured members of 2 major Western Australian Football League teams.

He is passionate about postgraduate teaching and continues to pursue research interests in shoulder and knee conditions. He has published extensively and presented work at national and international meetings. He completed a master's degree in sports and exercise medicine.

Dr Oyoo Were
Orthopaedic Surgeon

Dr Oyoo Were is an Orthopaedic Surgeon with 12 years' experience currently practising at Defence Forces Memorial Hospital(DFMH), in Nairobi as the Chief of Orthopaedics and Traumatology Department. His practice mainly encompasses trauma and sports orthopaedics where he handles acute trauma and performs both emergency and scheduled surgeries.

He is also an IOC certified sports physician and has taken care of various sports teams including various military sports teams, teams to the East African Secondary School games, and Kenyan teams to the Commonwealth and Paralympic games. He is also an avid sportsman having served as the outdoor games captain and treasurer of the sports council in his undergraduate years. Currently, he does mainly recrerational running.

At DFMH, he also serves as the coordinator for the COSECSA training program for General and Orthopaedic surgeons while also serving in the institution's Ethics Review Committee.

He was one of the recipients of the Isakos 2021 global travelling fellowship that visited various centres of excellence in the United States and Canada.

Dr. Lutomia Mark
Assistant professor -Orthopedic Surgery

Current Position: Assistant professor Orthopedic Surgery, Aga Khan University Hospital Nairobi

Immediate former position: Senior Lecturer of Orthopedics, Egerton University Medical School.

Interests

Arthroplasty: Hip, Knee, Shoulder

Arthroscopy; Shoulder and Knee

Spine surgery

Associations:

Scientific Committee Chair: Kenya Orthopedic Association

V/Chair of East African Arthroscopy Association

Dr. Shamshuddin Mohammedali

Orthopaedic Surgeon

Dr. Shamshuddin Mohammedali is an orthopaedic surgeon with expertise in upper limb, knee and sports injuries. He also performs joint replacement surgery and orthopaedic trauma care.

With over two decades of experience, Dr. Mohammedali has consistently demonstrated a commitment to excellence in patient care and surgical outcomes. He is known for his compassionate approach towards his patients and his dedication to advancing orthopaedic medicine through research and innovation.

Dr. Mohammedali, being one of the first recipients of the Aga Khan Education Scholarship Programme, completed his medical education at University of Nairobi. He then specialized as a General Surgeon at the Aga Khan University and went on to sub-specialize in Orthopaedic Surgery from the Colleges of Medicine, South Africa and was a fellow of the Australian Orthopaedic Association, focusing on upper-limb, knee, sports injuries and minimally invasive techniques. He has also been Certified as an Independent Medical Examiner from the American Board of Independent Medical Examiners.

Throughout his career, he has held various positions of leadership in the orthopaedic section and has been actively involved in teaching and mentoring young surgeons. He is currently a Consultant Orthopaedic Surgeon and assistant Professor at the Aga Khan University Hospital, Nairobi, Kenya.

Professional Associations include: EAAA, KOA, ISAKOS and KMPDB

Apart from his clinical practice, Dr. Mohammedali has contributed significantly to the field through publications in peer-reviewed journals and presentations at national and international conferences. His research interests include improving surgical techniques, patient outcomes, and quality of life post-surgery.

His current area of research focuses on Patient Related Outcome Scores PROMs in Orthopaedic care in our region and is in the process of initiating a clinical trial of rolling out the PROMs APP, which his team developed under his supervision.

In addition to his professional achievements, Dr. Mohammedali is known for his commitment to community health initiatives and charitable medical missions, where he provides orthopaedic care to underserved populations.

Dr. Makena Mbogori

Orthopaedic Surgeon

Dr. Makena Mbogori is an Orthopaedic Surgeon with subspecialty training in Joint Preservation, Sports Medicine, Arthroscopy, and Upper Extremity surgery. She earned her Medical Degree and Master of Medicine in Orthopaedic Surgery from the University of Nairobi and is a Fellow of the College of Surgeons of East, Central and Southern Africa (COSECSA). She subsequently completed fellowships at Dalhousie University in Halifax and the University of Alberta in Edmonton, Canada.

Dr. Mbogori has an extensive academic portfolio, having authored peer-reviewed publications and delivered presentations at multiple international scientific meetings. Her research has addressed topics such as degenerative knee disease among professional athletes, current concepts in complex shoulder and elbow pathology, surgical techniques and innovations, and advancements in surgical education.

Alongside her academic contributions, Dr. Mbogori serves on the Canadian Orthopaedic Association Global Surgery (COAGS) Committee. She has also served as Secretary of the Kenya Association of Women in Surgery (KAWS) and as a regional representative for the International Orthopaedic Diversity Alliance (IODA), reflecting her strong commitment to advancing global surgical care and promoting equity and diversity in orthopaedics.

Billy Ogwel

Data Scientist

Billy Ogwel is a public health researcher and data scientist with over 13 years of experience at the Kenya Medical Research Institute–Center for Global Health Research (KEMRI-CGHR).

He brings expertise at the intersection of data science, epidemiology, and global health, with a focus on infectious diseases and clinical decision support. His work involves advanced statistical analysis, machine learning model development, and managing complex datasets from large-scale, multi-country studies, including VIDA, EFGH Shigella, and rotavirus surveillance projects.

Billy holds a BSc in Computer Science from Egerton University and an MSc in Health Systems and Informatics from Rongo University. He is currently completing his PhD in Health Information Systems at the University of South Africa. As an EFGH Rising Star awardee through the University of Washington's Global WACh program, he implemented a funded project on predictive modeling for pediatric diarrhea.

He has authored over 30 peer-reviewed publications, and his research interests include enteric diseases, child health, and the application of artificial intelligence in low-resource settings.

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THE JOURNEY OF ARTHROSCOPIC SURGERY IN TANZANIA

Kitugi Samuel Nungu

Correspondence:Dr Kitugi Samuel Nungu, Consultant Orthopaedic and trauma surgeon at Muhimbili Orthopaedic Institute (MOI), Dar es Salaam, Tanzania.

The Muhimbili Orthopedic Institute (MOI), located in Dar es Salaam, is the largest and most advanced orthopedic hospital in Tanzania. It provides specialized, high-quality care for patients with musculoskeletal conditions.

In early 2005, through personal contacts, we were invited to attend a meeting of surgeons from the region who shared an interest in arthroscopy. The meeting, held at the Silver Springs Hotel in Nairobi, Kenya, brought together pioneers of the field. Three of us attended, and one colleague had already privately acquired a basic arthroscopy set, including a monitor. Several meetings and continued correspondence followed, culminating in the formation and launch of the East Africa Arthroscopy Association (EAAA) in 2010. From that meeting, we resolved to expand the knowledge, skills, and practice of arthroscopic surgery across East Africa. At that time, the practice was almost non-existent, with knee ligament surgery being performed mainly through open procedures at a few select centers.

In collaboration with committed EAAA colleagues from Kenya, and with the support of MOI, we organized the first arthroscopy workshop at MOI in June 2012. This event coincided with the Ministry of Health's capacity-building project for endoscopic surgery, which facilitated the provision of toolkits and monitors. The three-day program, consisting of lectures and live surgeries, was a great success. Surgeons were highly motivated, and as a result, MOI selected two orthopedic surgeons for six-month training fellowships in Egypt (2014 and 2015).Upon their return, they expanded the scope of knee and shoulder arthroscopy, trained more local surgeons, and significantly increased the number of specialists. Consequently, arthroscopic surgery began to spread to hospitals both within Dar es Salaam and beyond.

In 2023, we were introduced to the St Roch Society, a group of surgeons from London, UK. They visited MOI for five days of lectures and live surgeries. The following year, in November 2024, four of our surgeons visited their clinics and hospitals in London, gaining valuable exposure to advanced practices at the Smith & Nephew Centre of Excellence.

In July 2024, together with our EAAA colleagues from Kenya, we hosted a second hands-on workshop at MOI (Fig 1,2 & 3). A guest lecturer from the St Roch Society joined via Zoom. This workshop included both wet and dry laboratory stations and attracted participants from Malawi and Uganda. Cow knees were used for practical demonstrations, and the workshop was a great success.

Fig 1: EAAA group photo at the opening of the workshop at Muhimbili Orthopedic Institute.

Fig 2: Author (Dr Nungu) with participants during a practical session.

Fig 3; Dr Mutiso from Kenya with participants demonstrating knee arthroscopy on a cow knee specimen.

As active members of the EAAA, we continue to regularly attend and participate in workshops organized across other East African countries.

MENISCUS SURGICAL ANATOMY AND BIOMECHANICS

Prof Everisto Opondo, Mmed, FCS (Cosecsa), PhD*

Associate Professor, Department of surgery, Jomo Kenyatta University of Agriculture and Technology.

Correspondence: Prof Everisto Opondo Mmed, FCS (Cosecsa), PhD. Department of surgery, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya, P. o Box 105, 002, 02, Tel +254 722475767 Email: opondodr@gmail.com

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ABSTRACT

Meniscal injuries are recognized as a cause of significant musculoskeletal morbidity and are responsible for increase in knee surgery globally. The menisci play a vital role in the normal function and long-term health of the knee joint. The purpose of this review is to provide current knowledge regarding the surgical anatomy and biomechanical functions of the menisci.

Keywords: Meniscus, Anatomy, Biomechanics

INTRODUCTION

Originally described as a vestigial structure the menisci are now known to be vital for the normal functioning and prevention of degenerative changes of the articular surface cartilages. The understanding of meniscus anatomy and functions has evolved over the years due to a better understanding of the embryology, physiology and biomechanics of the meniscus. The knowledge on biomechanics has largely been due to the various anatomical and cadaveric studies especially on load transmission. The primary function of the meniscus is to transmit load across the tibiofemoral joint by increasing congruency, thereby decreasing the resultant stress placed on the articular cartilage hence preventing early degenerative changes. The menisci also play a secondary role in shock absorption, stability, lubrication, nutrition, and proprioception to the knee joint.

Due to its complex anatomical, biomechanical, and functional characteristics, the menisci are prone to damage and injury, particularly in contact and pivoting sports activities in young and active patients. Degenerative meniscus tears are seen in the sedentary young or elderly patients. The current orthopaedic research and practice trends are focussed on development of ideal treatment option aimed at restoration and preservation of normal meniscus functions (1-21).

ANATOMY

Historical perspective

The Latin word meniscus comes from the Greek word meniskos, meaning “crescent,” diminutive of men, meaning “moon” (13). Knee anatomy can be traced to more than 300 years ago to the pelvic appendages of the sarcopterygian lobe finned fish. Tetrapods including amphibians, reptiles, birds and mammals share knee anatomy morphology similar to the human knee anatomy. In the primate linage leading to humans the homitids evolved to bipedal stance approximately 3 to 4 million years ago and by 1.3 million years ago the modern patellofemoral joint was established. Evolutionary studies confirm that the fibula articulated with the femur 360 million years ago but in the course of its distal migration the popliteus tendon acquired a new femoral attachment while retaining its fibula attachment. This led to the development of the popliteal hiatus.

EMBRYOLOGY

The menisci arise from a condensation of the intermediate layer of mesenchymal tissue surrounding the joint capsule. The characteristic shape of the lateral and medial menisci is achieved between by the 8th week of prenatal development. The developing menisci are highly cellular and vascular, with a blood supply extending the entire width and length of the menisci. During fetal development there is an increase in collagen content in a circumferential arrangement with a concomitant decrease in cellularity. Weight-bearing and joint motion during development are important factors in determining the orientation of the collagen fibers. Vascularity decreases after birth and by adulthood, only the peripheral 10% to 30% are vascularised. The ratio of collagenous to non-collagenous proteins decrease with age hence the increased fragility with age and increase in degenerative tears with age (13).

Despite these histological changes, the proportion of tibial plateau covered by the corresponding meniscus is relatively constant throughout fetal development, with the medial and lateral menisci covering approximately 51–74% and 75–93% of the surface areas, respectively.

HISTOLOGY AND CELLULAR ULTRASTRUCTURE OF THE MENISCUS

The meniscus is composed of a dense extracellular matrix (ECM) composed of primarily of water (72%) and collagen (22%), interposed with cells. Other constituents include glycosaminoglycans (17%), Deoxyribonucleic acids (DNA) (2%), adhesion glycoproteins (<1%), and elastin (<1%) (2,3,4). These proportions vary depending on age, injury, or pathological condition.

Collagen is the main fibrillar component of the meniscus and varies in amount depending on the zone of the meniscus. Collagens are primarily responsible for the tensile strength of the meniscus, contributing up to 75% of the dry weight of the ECM. In the red zone, type I collagen is predominant (80% composition by dry weight), with other collagen variants (e.g., type II, III, IV, VI, and XVIII) present in less than 1%. Type 1 collagen fibers are oriented circumferentially, in the deeper layers of the meniscus, parallel to the peripheral border. In the most superficial region of the menisci, type 1 fibers are oriented in a more radial orientation. The radially oriented fibers are also present in the deep zone and woven between the circumferential fibers to provide structural integrity. The white zone whose dry weight is 70% collagen is composed of two collagen types namely, types II (60%) and type I (40%). The collagen Fibers are heavily cross-linked and are ideal for transferring vertical compressive load into “hoop stresses”.

Besides collagen another fibrillar element is elastin. Another part of the extracellular matrix is proteoglycans with a core element being gylcosaminoglycans (GAGs). The predominant GAGs in the human meniscus are chondroitin sulphate (60%), dermatan sulphate (20-30%), and keratan sulphate (15%). Fibronectin, thrombospondin, and collagen VI are the main adhesion glycoproteins within the meniscus. Recently 4 meniscal cell types have been described i.e fibrochondrocytes, fibroblast-like cells, superficial zone cells and cells of intermediate morphology between fibrochondrocytes, fibroblast-like cells.

The vascularised zone (zone I) has a high proportion of stem cells hence the better regenerative potential after injury and repair of the meniscus. The viscoelastic property of the meniscus is dependent on the concentration of GAGs in the different zones hence the regional variation of this property.

GROSS ANATOMY

The menisci are crescent shaped wedges of fibro-cartilage located on the medial and lateral aspects of the knee. The menisci are roughly triangular in cross section, covering one-half to two-thirds of the articular surface of the corresponding tibial plateau. Meniscal horns anchor the menisci to the underlying subchondral bone of the tibial plateau (Fig 1). The medial meniscus has variability in the insertion of the anterior horn with the attachment being either soft tissue of bone or by a firm bony attachment to the flat intercondylar region of the tibial plateau being more common. The posterior horn attaches to the tibia just anterior to the insertion site of the posterior cruciate ligament (PCL). In the lateral meniscus, the anterior horn inserts on the tibia in front of the intercondylar eminence, just posterior and lateral to the anterior cruciate ligament (ACL) insertion. The posterior horn attaches to the tibia in between the insertion sites of the PCL and the posterior horn of the medial meniscus (Fig 1).

The Medial Meniscus

The medial meniscus is C-shaped (semilunar) and occupies 50-60% of the articular contact area of the medial compartment. Its posterior horn is significantly wider than the anterior horn, and the anteroposterior dimension is larger than the mediolateral dimension. The anterior horn is firmly attached to the tibia anterior to the ACL, near the intercondylar fossa. The posterior horn is attached immediately anterior to the attachment of the PCL. The peripheral border of the medial meniscus merges with the knee joint capsule. The coronary ligament attaches to the meniscus to the upper tibia. The medial meniscus is divided into 5 zone from anterior to posterior by Simigeiski (4,5) (Fig 2). Zone I refers to the anterior root and horn, while zone II refers the end of anterior horn upto the anterior edge of the Medial Collateral ligament. Zone 2 is subdivided into IIA and IIB. Zone IIA has no attachments to the surrounding tissues while Zone IIB is attached peripherally to the capsule. Zone III is attached to the capsule adjacent to the MCL and is the most fixed part of the medial meniscus. Zone IV is between end of the MCL and posterior horn and it's attached to the tibia by the coronary ligamnent. Zone IV is the site of lesions referred to as the ramp lesions that are commonly missed on routine arthroscopic examination. Zone V includes the posterior horn and root that attaches it to the tibia.

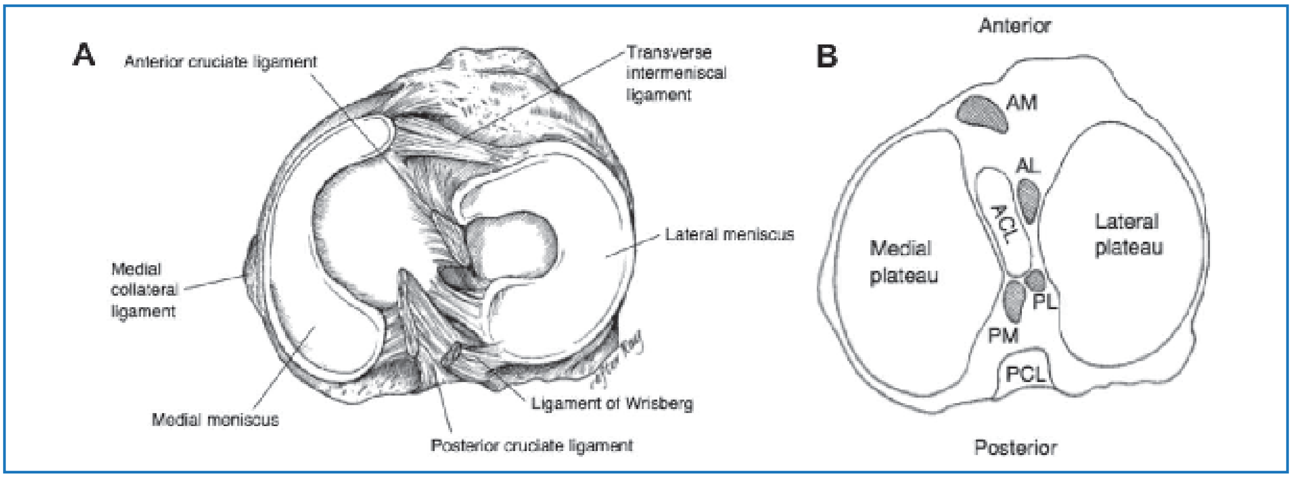

Fig 1: Anatomy of the meniscus as viewed from above.

The Lateral Meniscus

The lateral meniscus is almost uniformly circular and in contrast to the medial meniscus, it is smaller and considerably more mobile with less attachments. It also occupies approximately 75%-80 % of the lateral articular surface. The lateral meniscus is thinner on the anterior third, where it ranges from 3.8 to 4.73 mm in thickness. The thicker middle third and posterior third range from 5.9 to 6.5 mm and 5.3 to 6.2 mm in thickness, respectively.

The lateral meniscus can be classified into six zones based on anteroposterior location (Fig. 2). These include the anterior root (zone 1), the anterolateral zone between the anterior root and the anterior border of the popliteal hiatus (zones 2A and 2B), the popliteal hiatus (zone 3), the posteroinferior popliteomeniscal fascicle (zone 4), the ligamentous zone (zone 5), and the posterior root (zone 6) (4,5,6). The anterior horn of the lateral meniscus is attached to the inter-condylar fossa adjacent to the attachment site of the ACL. The posterior horn is attached to the medial femoral condyle through the meniscofemoral ligaments of Wrisberg (the posterior meniscofemoral ligament) and Humphry (the anterior meniscofemoral ligament) (8,9,10). The posterior horn has variable attachments with three patterns recorded from anatomical studies. In 76 % of cases the posterior root has a dual insertion to the intertubercular area largely and a minor component to the posterior slope of the lateral tibial spine. In the remaining 24 % the root has solitary insertion either to the intertubercular area or the posterior slope of the lateral tibial spine. The meniscofibular ligament runs from the posterolateral portion of the lateral meniscus anterior to the popliteus to attach to the fibular.

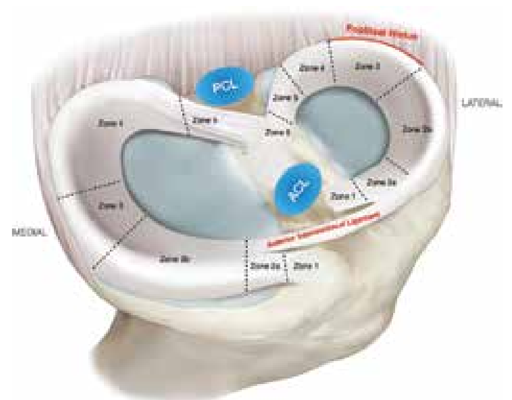

Fig 2: Anatomy of the meniscus outlining the zones.

VASCULARITY AND INNERVATION

The meniscus is a relatively avascular structure with a limited peripheral blood supply at maturity. Branches of the popliteal artery (medial and lateral inferior and middle geniculate arteries) are the major blood vessels that nourish each meniscus. Radial branches from a peri- meniscal plexus enter the meniscus at intervals, with a richer supply to the anterior and posterior horns (4-7). Vascularization is limited to the peripheral 10–25% for the lateral meniscus and 10–30% for the medial meniscus, which has important implications for healing after repair or natural healing of a torn meniscus. Endoligamentous vessels from the anterior and posterior horns travel a short distance into the substance of the menisci to form terminal loops, providing a direct route for nourishment (Fig 2). The remainder of the meniscus receives nourishment via synovial diffusion or mechanical motion.

The meniscus receives innervation via the recurrent peroneal branch of the common peroneal nerve. These fibres follow the blood supply and are found primarily in the peripheral vascular zone covering the outer third of the meniscus. Three distinct mechanoreceptors, the Ruffini endings (type 1), Pacinian (type II) and Golgi tendon organs (type III) are located within the meniscus. These neural elements are found in greater concentration in the meniscal horns (particularly the posterior horn), and are important in joint deformation and pressure, tension changes, and neuromuscular inhibition, respectively.

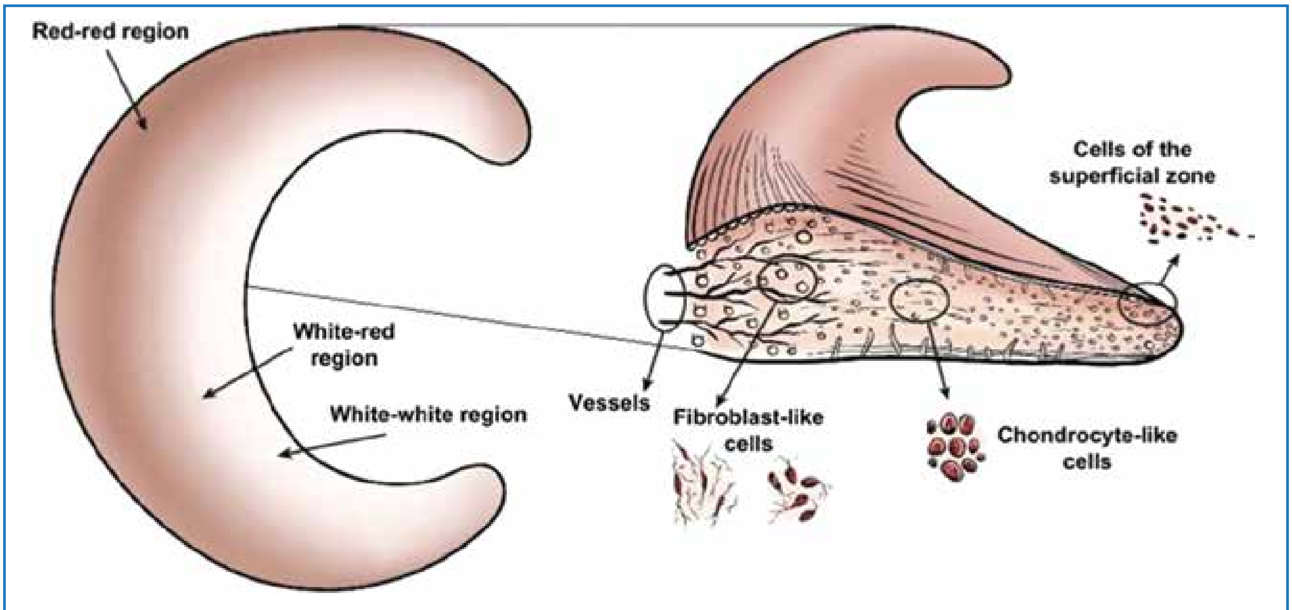

Fig 2: Anatomical variation in vascularization of the meniscus across the three zones.

MENISCUS FUNCTIONS AND BIOMECHANICS

The complex functions of the meniscus are intricately related to their composition, structure, and morphology.

The medial and lateral menisci perform many important biomechanical functions. These functions include load transmission.

Weight/Load Transmission

Biomechanical studies have demonstrated that approximately 40–60% of load acting on the extended knee joint is transmitted to the meniscus (65–70% lateral and 40–50% medial). In flexion, this increases significantly upto 90%. During weight bearing, axial forces compress the menisci, resulting in "hoop" (circumferential) stresses (Fig 3). Hoop stresses rely on the conversion of axial force into tensile strain through the circumferential collagen fibres of the meniscus. The lateral meniscus is displaced more than the medial meniscus during compression, but because of the semilunar anatomy, load is transmitted away from the center of the femoral condyles resulting in tensile stress toward the tibial plateau.

When standing, the meniscus absorbs most of the load; however, when the knee is in gait or stair climbing, variations in contact stresses occur.

During stair climb, peak contact stresses of the medial meniscus were located in the posterior aspect of the plateau, under the meniscus. While in the lateral meniscus, during the late phase of stair climb, peak contact stresses were reported in the zone of cartilage contact.

Several studies have demonstrated that load is well distributed when the meniscus is intact, however, its removal results in a significant reduction in femoral condyle contact area and a significant increase in contact stress. Several studies have reported that total lateral meniscectomy results in a 40–50% decrease in contact area and an increase in contact stress in the lateral component (200–300%) of what is considered normal, which significantly increases the load per unit area and may contribute to accelerated articular cartilage damage and degeneration hence osteoarthritis. Studies with long-term follow-up of meniscectomized knees have shown the importance of the meniscus in the functioning of the knee. Fairbank was first to describe the direct load-bearing function of the meniscus by describing the degenerative changes in meniscectomized knees (1). Fairbank described narrowing of the joint space, flattening of the femoral condyle, and the formation of osteophytes (1).

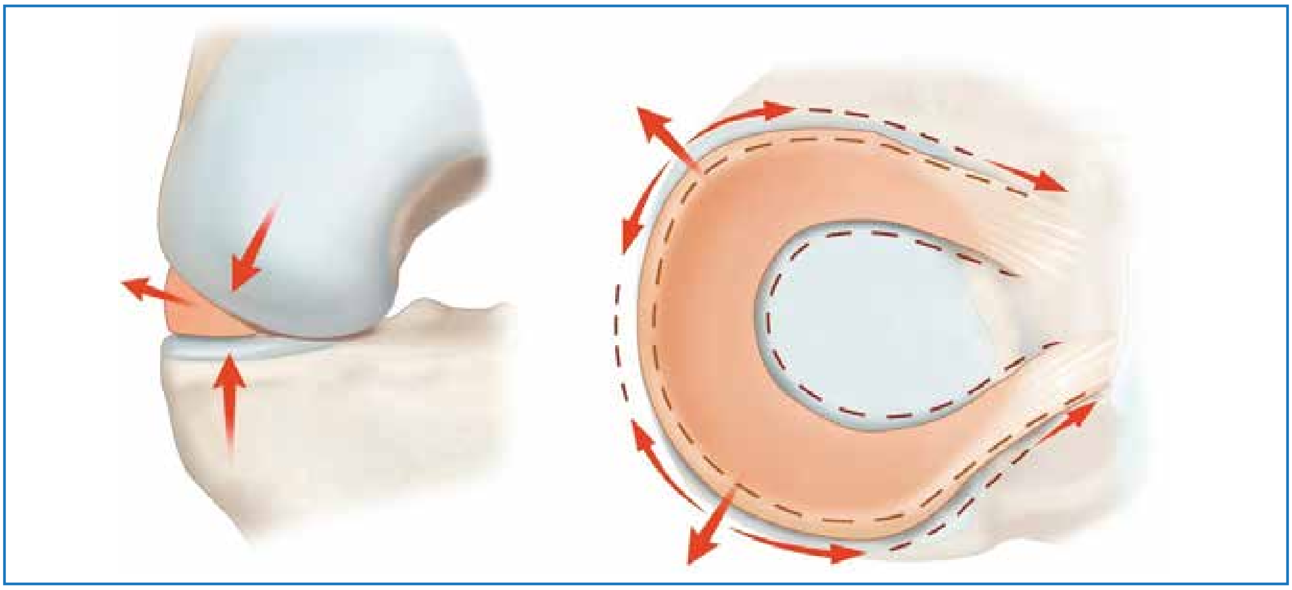

Fig 3: Weight transmission and creation of meniscus hoop forces.

Shock Absorption

The shock absorption property of the meniscus is made possible by its unique composition and structure. It's composed of a fluid phase accounting for more than 70% of its tissue mass with the remainder being solid. The solid phase consists of porous matric made up of collagen and proteoglycans. The collagen fibers are aligned radially and circumferentially to provide tensile stiffness while the proteoglycans imbibe the tissue with water to increase stiffness. During mechanical loading the porus matrix deforms, forcing the interstitial fluid to move through the pores and generate a frictional drug. The shock absorbing capacity of the menisci has been demonstrated by biomechanical studies measuring the vibrations in the proximal tibia resulting from weight bearing. It has been shown that shock absorption is approximately 20% less in knees without menisci. Therefore, on impact, shock is absorbed by frictional drag forces, which occur as the fluid escapes the tissue.

Knee Stability

The menisci are important secondary stabilisers in the ACL-intact knee. Much of their function as a stabilising structure is a result of the increased congruency they provide at the tibiofemoral articulation. The intact meniscus provides multidirectional stability when the knee experiences axial load, preventing excess motion in all directions. Nevertheless, the medial and lateral menisci differ in their primary stabilising function. The main role of the medial meniscus is to prevent anterior translation of the tibia. This is largely accomplished by the posterior horn of the medial meniscus, which undergoes compression during loading and is essentially 'trapped' by the tibiofemoral articulation preventing anterior translation of the tibia. The robust peripheral capsular attachments and the meniscotibial attachment of the medial meniscus enhance its role as a secondary stabiliser, most notably in preventing anteroposterior motion. The lateral meniscus is significantly more mobile than the medial meniscus, causing many to question its role as a stabiliser in the knee. However, the role of the lateral meniscus as a secondary stabiliser, most notably in limiting anterior tibial translation during pivot shift manoeuvres, has been identified. Biomechanical studies have quantified the increased forces experienced by the medial meniscus in ACL deficient knees, offering a rationale for the frequent occurrence of meniscal root and posterior horn tears in both subacute and chronic ACL injuries (17).

In an ACL-deficient knee, the stabilising role of the menisci is heightened and they function as primary stabilisers. It has further been reported that medial meniscectomy in the loaded ACL-deficient knee increased anterior tibial translation by 2.2 mm with the knee fully extended and 5.8 mm with the knee at 60 degrees of flexion (20).

The role that the menisci play in joint stability can best be demonstrated in studies investigating laxity in ACL-deficient, meniscectomized or meniscus-torn knees. Findings include greater anterior tibial translation in knees with a sectioned ACL and medial meniscectomy as compared with knees with only ACL sectioning (1, 16). However, ACL sectioning and lateral meniscectomy did not cause an increase in anterior translation in contrast to medial meniscectomy. The posterior horn of the medial meniscus is the most important structure resisting anterior tibial force in the ACL-deficient knee. These significant changes in kinematics in the ACL-deficient knee confirm the important role of the menisci in knee stability.

Joint Lubrication and Nutrition

The menisci may also play a role in the lubrication and nutrition of the knee joint. The precise mechanism(s) by which lubrication occurs remains unknown; however, some authors believe that when the knee is loaded, the menisci compress and circulate synovial fluid into the articular cartilage, reducing the frictional forces during weight-bearing and providing joint nutrition. Bird and Sweet have found a system of microcanals within the meniscus that not only communicates with the synovial cavity but is also located close to the blood vessels (20). These canals have been implicated in fluid transport for nutritional purposes and joint lubrication. The system of microcanals within the meniscus that is located close to the blood vessels communicates with the synovial cavity. It is believed that these may provide fluid transport for lubrication and nutrition.

Proprioception

Proprioception is the perception of joint motion and position in space. This phenomenon is mediated by mechanoreceptors such as Pacinian corpuscles, Ruffini endings and Golgi tendons (21).

Pacinian corpuscles mediate the sensation of joint motion, whereas Ruffini endings and Golgi tendon organs are believed to mediate the sensation of joint position. The menisci may serve a proprioceptive role as suggested by the presence of mechanoreceptors in the anterior and posterior horns of the menisci.

Quick-adapting mechanoreceptors are thought to mediate the sensation of joint motion, while slow-adapting receptors are believed to mediate the sensation of joint position (13).

CONCLUSION

The meniscus plays an essential role in maintaining knee joint function, contributing to load distribution, joint stability, lubrication, and proprioception. Meniscal injuries, whether acute or degenerative, disrupt these critical functions and increase the risk of joint degeneration. Advances in our understanding of meniscal biomechanics, injury mechanisms and repair strategies have led to significant progress in optimizing treatment approaches and improving clinical outcomes.

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MENISCUS TEARS; DIAGNOSIS, MANAGEMENT AND REHABILITATION

Prof Everisto Opondo, Mmed, FCS (Cosecsa), PhD*

Associate Professor, Department of surgery, Jomo Kenyatta University of Agriculture and Technology.

Correspondence: Prof Everisto Opondo Mmed, FCS (Cosecsa), PhD. Department of surgery, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya, P. o Box 105, 002, 02, Tel +254 722475767 Email: opondodr@gmail.com

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ABSTRACT

Meniscus repair has become a more favorable option since several studies have demonstrated a strong correlation between meniscal preservation and restoration of intra-articular contact pressure and decreased progression of arthritis. “Save the Meniscus” is now a prolific theme in the arthroscopy field; however, meniscal repair can be challenging and ineffective in many scenarios. The objectives of this review are to present the current state of surgical management of meniscal injuries and to explore current approaches being developed to enhance meniscal repair.

The management of meniscus tears depends on the tear patterns, time between tear and presentation plus the skills of the surgeon and cost considerations. The options are non-operative and surgical with prolonged rehabilitation that should be directed by the primary surgeon. Rehabilitation plays an important role in managed of meniscus tears especially those managed by surgery.

Keywords: Meniscus tear, Patterns, Imaging, Repair, Rehabilitation.

RISK FACTORS AND INJURY MECHANISMS

Meniscal tears are caused by a combination of axial loading and rotational forces that result in shear load on the meniscus (1-15). Traumatic tears generally occur in younger, active individuals. In young patient’s meniscal tears occur in the setting of sports injuries that involve pivoting sports, mild trauma and high velocity injuries in road traffic accidents. Meniscus tears in the setting of high impact injuries are likely to be associated with anterior cruciate ligament (ACL), posterior cruciate ligament (PCL) or collateral ligament injuries. In older patient the meniscus tears are commonly degenerative.

The mechanism of injury of meniscal tears can be categorized as occurring during a sporting activity (e.g., soccer, rugby football), a nonsporting activity (e.g., squatting). Injury to the meniscus during sporting activities can be further defined as secondary to contact or noncontact mechanisms, with the latter being the most common. In the young athlete, contact related meniscal tears may result from excessive application of force to the meniscus while in older patients, degeneration makes the meniscus particularly susceptible to injury. The mechanism of injury typically involves a twisting or shearing motion, with a varus or valgus force directed to a flexed knee. Contact with another player typically does not occur, nor does lunging or landing awkwardly. Patients typically report taking a single wrong step. In noncontact related injuries, common mechanisms include cutting, decelerating or landing from a jump.

Gender has also been suggested to be a risk factor for meniscal injury. Several studies have reported than men are four times more likely to incur a meniscal injury than women. This may be due to the subtle anatomical and physiological characteristics of the meniscus, differences in normal daily activities, sports participation, prior participation in sports and differences in occupation, which can result in different rates of microtrauma and degeneration of the meniscus (11).

Degenerative tears reflect cumulative stress over time and correlate with the presence of associated chrondromalacia (11,12). Degenerative tears have long standing history of knee dysfunction in patients with other underlying degenerative changes.

Age has been suggested as a risk factor of meniscal injury. After the third decade of life, degenerative changes start to diminish the elasticity of the meniscus and increase the susceptibility of the meniscus to injury. Meniscal tears in children are commonly due to trauma or congenital meniscal variants such as a discoid meniscus or meniscal cysts.

After the third decade meniscal tears are a result of trauma, degenerative disease or a combination of both. Adult meniscal injuries predominantly involve the medial meniscus, and are often associated with concomitant ligament or cartilage lesions. The medial meniscus is more affected due that fact that is more fixed and less mobile in different positions of knee motion. The more complex tear patterns seen in adults occur because the meniscus undergoes significant degeneration with age and repeated loading. There is an increase in the incidence of meniscal tears with increasing age (10,11).

CLASSIFICATION OF MENISCAL TEARS

There is no standard classification system for meniscus tears. However, there are classifications that focus on the zone of meniscus, the part of the meniscus and anatomical pattern. For example, there is a Laprade's classification for the medial meniscus root. The tears are either located in the body or involve the roots.

The zonal classification system devised by Cooper, provides consistent clinical documentation of meniscal tear patterns and tear locations. In this system, the menisci are divided into three radial zones anterior to posterior and four circumferential zones extending from the periphery to the inner aspect of the meniscus (13). Tears are further classified according to their morphology and tear pattern relative to the tibial plateau.

The main categories of tears of the meniscus body include vertical longitudinal, radial (transverse), horizontal (cleavage), complex (degenerative), bucket- handle tears and meniscus root tears.

VERTICAL LONGITUDINAL TEARS

A vertical longitudinal tear occurs between the circumferential collagen fibres, parallel to the long axis of the meniscus, perpendicular to the tibial plateau, with the tear equidistant from the peripheral edge of the meniscus. If extensive they result in a bucket handle tear where the inner segment is dislocated into the intercondylar region.

Vertical longitudinal tears are most commonly traumatic in origin and occur commonly in the younger population. They are noted more frequently medially in isolated cases and laterally in association with ACL tears. Vertical longitudinal tears are commonly repaired because they are amenable to suture fixation (15).

BUCKET-HANDLE TEARS

A bucket-handle tear of the meniscus is a vertical or oblique tear with longitudinal extension toward the anterior horn in which the inner fragment is frequently displaced toward the intercondylar notch. The term bucket-handle is derived from the appearance of the tear, in which the inner displacement fragment of the meniscus resembles a handle, and peripheral nondisplaced portion has the appearance of a bucket.

OBLIQUE AND PARROT BEAK TEARS (FLAP)

Oblique tears are diagonal tears within the meniscus and is often referred to as parrot beak tear. They are caused by twisting or pivoting motion in a weight bearing knee. Parrot beak on the other hand refers to a specific type of meniscus tear characterised by its curved and wedge like appearance resembling a parrot s beak. It usually occurs in the avascular zone of the posterior horn of the medial meniscus. It can present with knee locking and its usually irreparable.

RADIAL TEARS

Radial (transverse) tears are vertical tears, which often occur at the junction of the posterior and middle thirds and extend from the inner free margin toward the periphery, but can occur at other regions. They may also occur in the midbody portion of the lateral meniscus in younger patients. Radial tears that affect 90% the width result in significant increases in peak contact pressure, reduced contact area and a peripheral shift in peak pressure as compared to an intact knee. Repairs of radial tears that extend to the periphery have the potential to heal because of the peripheral bloody supply. Traditionally, radial tears were considered irreparable but recent studies report progressive improvement on outcomes of repair of the posterior horn of the lateral meniscus (16-24).

HORIZONTAL TEARS

Horizontal (cleavage/longitudinal) tears are parallel to the tibial plateau, dividing the meniscus into inferior and superior segments. Tears can not only extend to the articular surface of the meniscus in the region of the free margin (non- vascularized portion of meniscus), but also on the tibial and femoral side of the meniscus. The mechanism of injury is thought to be secondary to shear forces between the superior and inferior surfaces of the meniscus that tend to cause separation of the upper and lower segments of the tear.

These tears occur in all groups but are seen most frequently in older patients, with a peak incidence of 31–50 years in men and 51–60 years of age in women. Horizontal tears occur most commonly in the posterior aspect of the medial meniscus. When this tear pattern is noted in the lateral meniscus, it may be associated with lateral meniscal cysts or osteoarthritis.

RAMP LESIONS

Meniscal ramp lesions can be defined as longitudinal vertical and /or oblique tears affecting the posterior horn of the medial meniscus that lead to meniscocapsular or meniscotibial disruption. The incidence of ramp lesions has been reported as 16–24% in patients undergoing primary ACL reconstruction. Approximately 40% of ramp lesions can be missed by the standard arthroscopic anterior view hence the need to create a posteromedial portal for a complete assessment of the medial meniscus (19,20). The diagnostic accuracy of MRI the Medial Meniscus Root Tear (MMRT) is variable. Other studies have reported encouraging results using musculoskeletal ultrasound to diagnose MMRTs. They are classified from type 1- 5 (Fig 1A & B).

Type 1; This are menisco-capsular lesions. These are peripheral lesions located in the synovial sheath.

Type 2; Partial superior lesions.

Type 3; Partial inferior or hidden lesions.

Type 4; Complete tear in the red zone.

Type 5; Double tear.

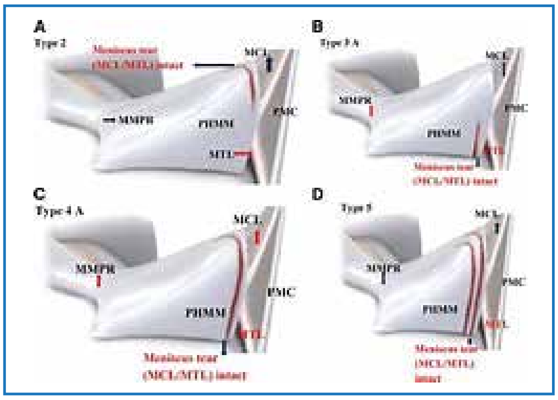

Fig 1A: Ramp lesion classification.

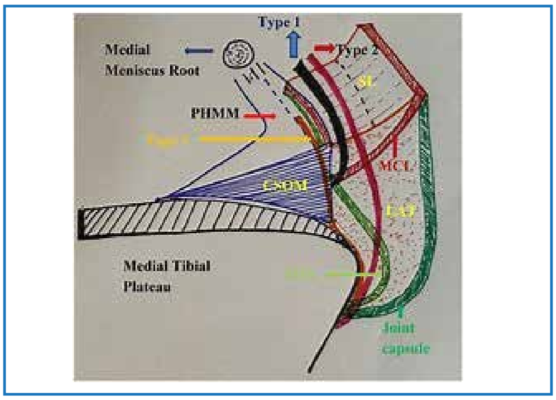

Fig 1B: Ramp lesion classification.

MENISCUS ROOT TEARS

Root tears can affect both the anterior or posterior root with posterior root tears being predominant and clinically relevant (Fig 2). Posterior root tears severely affect load transmission of the knee joint, with disruption of hoop function. The Lateral Meniscus posterior root tear has recently been described as Lateral meniscus oblique radial tears (LMORT and often accompanies torn ACL in traumatic knee injuries.

Medial meniscus root tears (MMPRT) on the other hand often occur in middle-aged and older patients who experience acute pain after minor trauma. MMPRT if not treated is associated with meniscus extrusion and spontaneous osteonecrosis of the femoral condyle if left untreated. Untreated MMPRT is associated with a need for knee arthroplasty in 5 years (16, 20,21,24).

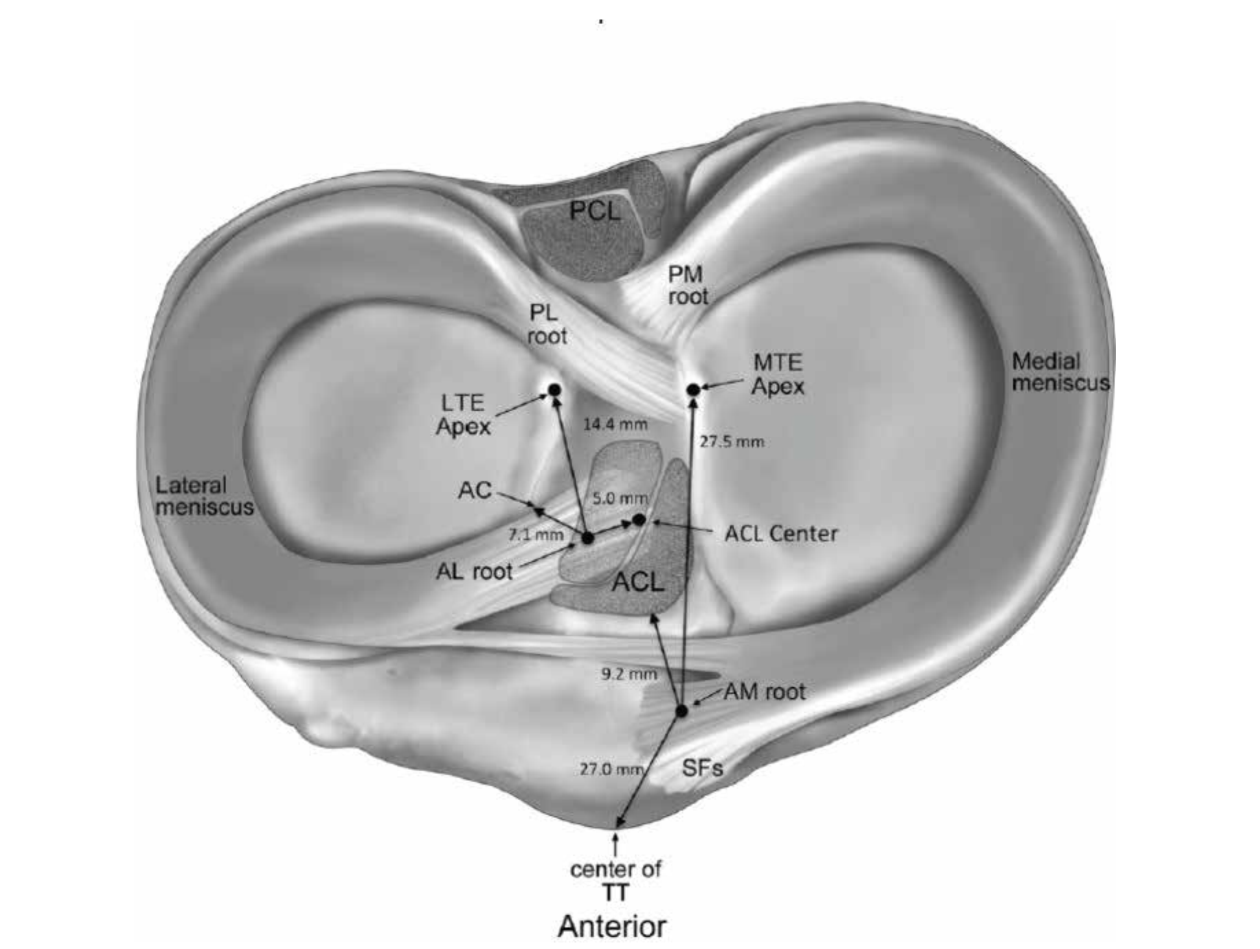

Fig 2: Meniscus root attachments.

MEDIAL MENISCUS ROOT TEARS (MMPRT)

La Prade et al in 2015 classified medial meniscus root tears based on morphology into 5 types (23).

Type 1; An isolated, stable partial tear of the meniscal root (Fig 3).

Type 2; A complete radial tear of the meniscal root and contains 3 subtypes which differ based on their location along the meniscal root relative to the center of the root insertion.

Type 2 A; occurs at less than 3 mm from the center of the root attachment.

Type 2 B; occurs from 3 to 6 mm from the center of the root attachment site.

Type 2 C; occurs from 6 to 9 mm from the center of the root attachment site.

Type 3; MMRT with a concomitant longitudinal/circumferential tear (commonly referred to as a “bucket handle” tear).

Type 4; An oblique tear of the meniscus that extends into the meniscal root resulting in complete root detachment.

Type 5; A complete bony avulsion fracture of the root from its attachment to the tibial plateau.

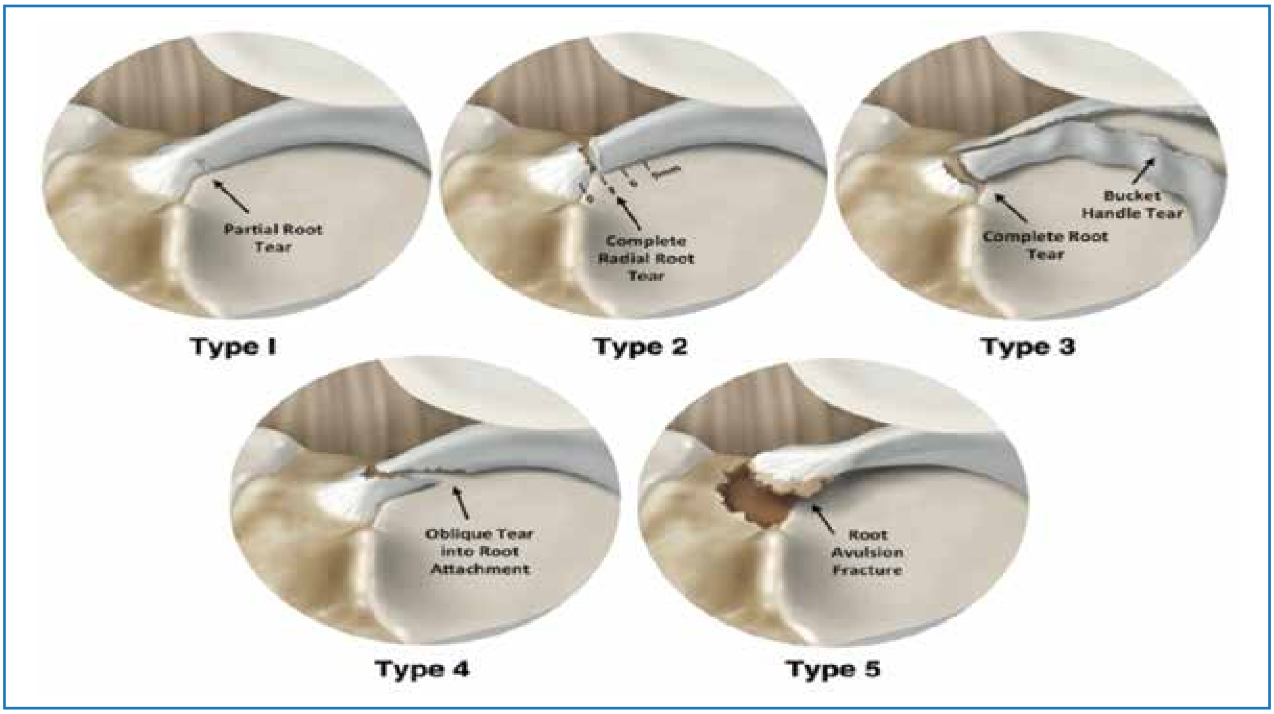

Fig 3: La Prade's classification of MMRT

LATERAL MENISCUS OBLIQUE RADIAL TEARS (LMORT)

Lateral meniscus oblique radial tears (LMORT) are commonly found affecting the lateral meniscus root in patients with ACL tears. LMORT are classified into 4 types with type 3 and 4 being the commonest. LMORT is classified as follows

Type 1; Partial thickness oblique tear that originate < 10 mm from the posterior root attachment and are the least common (upto 10%).

Type 2; Full thickness oblique tear that originate < 10 mm from the posterior root attachment but don't directly affect the root itself (13-14%).

Type 3; Refers to incomplete radial oblique tear that originate > 10 mm from the posterior root and propagate towards the posterior root attachment without extending through the posterior rim to the meniscofemoral ligaments (29%).

Type 4; Complete radial oblique tear that originate >10 mm from the posterior root and extend through the posterior rim reaching the meniscofemoral ligaments. It's the commonest type.

Surgical repair is recommended for type 2-4 LMORTs using al inside devices or transtibial techniques to prevent strain on the ACL and development of arthritis (24).

DEGENERATIVE TEARS

Complex (Degenerative) Tears

Complex tears either have two or more tear configurations or are not easily categorized into a specific type of tear. This is the most common of all meniscal lesions, accounting for nearly 30% of all tears with a peak incidence of 41– 50 years of age in men and 61–70 years of age in women. However, atraumatic degenerative flap tears can be identified on magnetic resonance imaging (MRI) and arthroscopy in patients as younger patients. Unlike acute traumatic injuries, which often result from high-energy events, degenerative tears typically develop insidiously as the structural integrity of the meniscus deteriorates. In addition, complex degenerative tears usually have minimal to no healing potential and generally are not amenable to repair. Degenerative tears are strongly associated with an increased incidence and severity of articular cartilage lesions (21).

Standard Radiography

Although unable to demonstrate pathology of the meniscus, radiographs of the knee are able to exclude bony pathologies and assess the concomitant presence of degenerative changes. Standing weight-bearing radiographs can show a reduction of the joint space width, loose bodies, chondrocalcinosis, osteophytes, subchondral bone cysts, sclerosis, and other degenerative changes. In patients with degenerative tears and suspected meniscus extrusion long leg alignment radiographs are key in the pre operative assessment. X rays may pick meniscus root bony avulsion.

Musculoskeletal ultrasound

Ultrasound can be used to diagnose meniscus tears especially posterior root tears though less acute than MRI.

Magnetic Resonance Imaging (MRI)

Magnetic Resonance Imaging is the most valuable imaging method for diagnosing meniscal tears, with an accuracy ranging from 82–95%. The MRI grading system classifies tears based on their appearance on an MRI scan. Grade 0 represents an intact, normal meniscus. Grade I and Grade II signals do not intersect the superior or inferior articular surface of the meniscus, but may represent meniscal degeneration. A Grade III signal intersects the superior and/or inferior articular surface of the meniscus and represents a tear (5).

Diagnostic Arthroscopy

Diagnostic arthroscopy has become the gold standard for assessing meniscal injuries and determining the feasibility of a successful repair. At diagnostic arthroscopy the surgeon determines the zone of the tear, the width and integrity of the meniscal rim.

MANAGEMENT OF MENISCUS TEARS CONSERVERTIVE/ NON-OPERATIVE

Nonoperative treatment includes Physical therapy, rest and bracing, activity modification, analgesics, and inflammation reduction measures such as icing. Finally nonsteroidal anti-inflammatory medications, and, occasionally, corticosteroid injections. Conservative treatment should be undertaken for 6 weeks and if no improvement in 3 months consider surgery.

SURGERY FOR MENISCUS TEARS

The first meniscus reattachment was in 1883 by a Scottish surgeon Thomas Annadale (1838-1907) documented in his original paper titled "An operation for the displaced semilunar cartilage" 1885. Incidentally he also performed the first orchidopexy. The first arthroscopic repair recorded was by Ikeuchi (1979). In cases of irreparable tears then partial meniscectomy is done.

Most commonly, surgical treatment is indicated for continued pain and symptoms refractory to nonoperative treatment. More acute indications include, persistent mechanical symptoms of the knee joint. A younger, more active patient with a history and exam highly suspicious for an acute and possibly repairable meniscus tear.

The goal of arthroscopic surgery for meniscal tears is to provide pain relief through tear resection or repair while preserving as much of the meniscus as possible. Contraindications to repair include advanced Osteoarthritis, axial malalignment (relative) and certain tear patterns such as degenerative tears.

PRINCIPLES OF REPAIR

The timing of repair is variable and depends on if tear is isolated or associated with other ligament repair procedures. Most repairs done worldwide today are arthroscopic (15-23).

Prior to surgery a careful assessment of MRI findings is important and diagnostic arthroscopy allows the surgeon to made the final decision. There are three main repair techniques used depending on the location of the tear. Inside out technique is the gold standard for ramp lesions and some root tears. All inside arthroscopic techniques are used for tear of the body and posterior third of the meniscus (Fig 4). Various generations of all inside devices have been used over the years with changes in the angles of fixation, sutures types and pullout strengths.

Outside in technique is an old technique that has stood the test of time for anterior on third meniscus tear repairs.

Varius augmentation procedures are done to enhance meniscus repair healing and outcome. The augmentation procedures include rasping (Henning), Synovial abrasion, Vascular channels (arcozky, henning), Notch microfracture (Cole) and Fibrin clot (arcozky, henning). Other options are the use of Bone Marrow Aspirate Concentrate (bMAC) and Platelet Rich Plasma (PRP) injections.

	Radial	Vertical	Horizontal	Ramp	Root	Comment
Inside -Out	Used as hybrid or augment	Gold Standard	Ideal	Gold Standard	Used as hybrid or augment in root repair	Used as hybrid or augment in root repair
All-Inside	Not Suitable	Very Common	Acceptable	Used with Posteromedial portal	Not Suitable	Higher risk of complication
Outside-In	Acceptable	Acceptable	Acceptable	Risk of neurovascular injury	Not Suitable	Useful for Anterior Horn tears
Transtibal Pull-Out	Used as hybrid or augment	Not Suitable	Not Suitable	Not Suitable	Gold Standard	Used with Inside-Out suturing for radial, root tears

Fig 4: Summary of the meniscus repair techniques and the pros and cons of each.

COMPLICATIONS OF REPAIR

The most commonly reported complications include infection, deep vein thrombosis (DVT), vascular injury, and neurologic injury (Peroneal). The rate of infection is 0.23% to 0.42%, with increasing incidence. The all-arthroscopic implant fixators have been reported to be associated with pull-out and pull-through device failure, migration and breakage, cystic hematoma, foreign body reaction, transient soft tissue inflammation, and chondral injury. The long-term complications of meniscus repair include re tear, osteoarthritis and meniscus extrusion for un repaired meniscus root tears (17).

REHABILITATION AFTER REPAIR

Rehabilitation after meniscus repair occurs in three phases. Rehabilitation following meniscal repair is divided into protective, restorative, and preparation to return to activity and sports phases. Criteria for progression to the restorative phase of rehabilitation include full or nearly full passive ROM, no effusion, and neuromuscular control of the quadriceps. Initiation to return to the activity phase of rehabilitation begins once the patient demonstrates full active ROM, strength (larger or equal to 80% of the contralateral leg would be ideal), and adequate single-leg dynamic knee control. Progression of quadriceps strength is recommended to be tested at each phase of rehabilitation.

Repair of peripheral longitudinal vertical lesions is followed by immediate full weight-bearing and immediate passive mobilization, except in case of particular difficulty or repair under strong tension, in which case cast immobilization is prescribed.

Repair of tears (radial, root) breaking the meniscal belt is followed by 4–6 weeks' non-weight-bearing, to limit extrusion forces.

Repair of horizontal cleavage can be followed by full weight-bearing, but with 4 weeks' immobilization.

Meniscal repair associated to ACL reconstruction does not alter the reconstruction rehabilitation program. In all cases, resumption of pivot sport is not allowed before 6 months.

CONCLUSION

Identification of meniscal tears and proper management in ideal for good outcomes. The latest advances in meniscus tears management are due a clear understanding of the meniscus roots and the impact of meniscus extrusion as a complication. Arthroscopic Meniscus repair has evolved greatly with healing potential enhanced by various augmentation procedures. Finally, rehabilitation after meniscus repair plays a key role in patient outcomes and return to sports or normal day to day activities.

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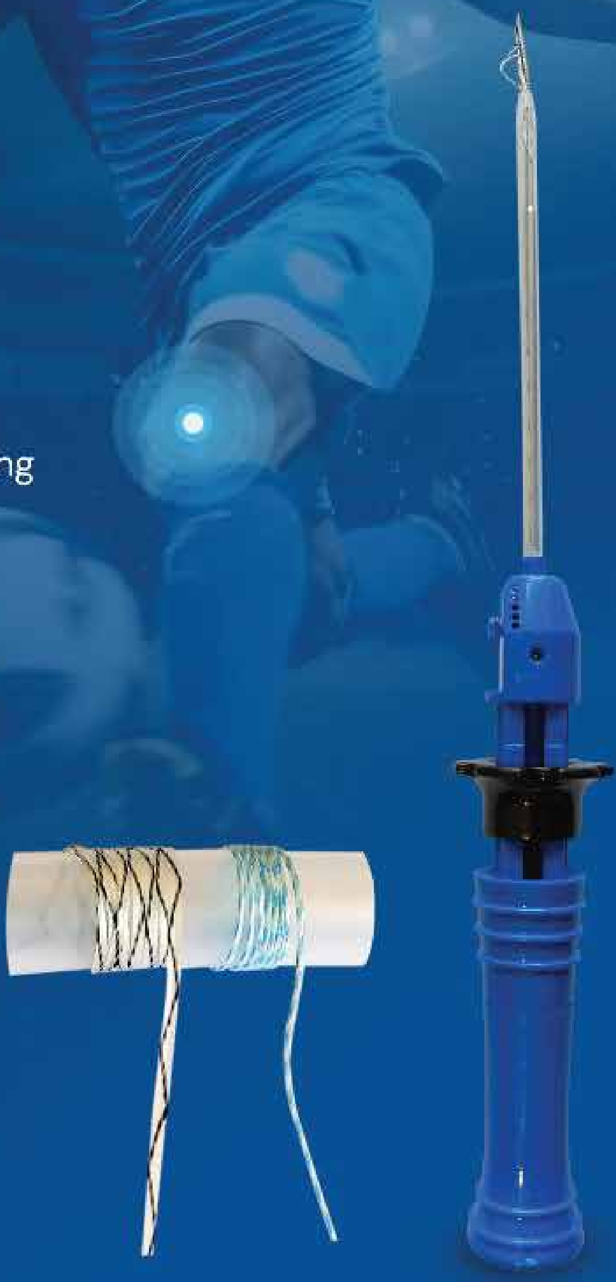

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RISK FACTORS FOR MUSCULOSKELETAL INJURIES IN A YOUTH FOOTBALL ACADEMY IN NAIROBI

Dr. Sumayya Chiragdin[1], Dr. Victor Bargoria [2], Dr. Fred Sitati [1,2], Dr. George Museve [1,2]

[1]Department of Surgery, University of Nairobi [2] Department of Surgery, KNH

*Corresponding Author: Dr. Sumayya Chiragdin, Department of Surgery, University of Nairobi.Telephone: +254722853232 Email: s.g.chiragdin@gmail.com

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ABSTRACT

Background: Football is a globally popular sport associated with a high risk of musculoskeletal injuries, particularly among youth players. Understanding demographic and contextual risk factors for injuries is critical for developing targeted prevention strategies, especially in underrepresented settings like Kenya.

Objective: This study aimed to investigate demographic and environmental correlates of football-related injuries among youth players in a Kenyan football academy, focusing on the role of age, gender, playing experience, training practices, footwear, and playing surfaces.

Methods: A prospective descriptive epidemiological study was conducted at Express Soccer Academy in Nairobi, Kenya, involving 182 players aged 5–20 years. Participants were stratified by age and gender and followed over a three-month football season. Injury data, demographic characteristics, and training variables were collected through structured questionnaires and clinical assessments. Bivariate and multivariate analyses were performed to identify significant predictors of injury.

Results: The study recorded 188 injuries, with an incidence rate of 17.22 injuries per 1000 playing hours. Younger players ($p<0.001p < 0.001p<0.001$) and those with less playing experience ($p=0.019 p = 0.019 p=0.019$) were at a significantly higher risk of injury. Low-top footwear was strongly associated with increased injury rates ($p=0.029 p = 0.029 p=0.029$), while no significant differences were observed across playing surfaces. Collisions with opponents emerged as the leading mechanism of injury, accounting for 46% of cases.

Conclusion: Age, playing experience, and footwear significantly influence injury risk among youth football players. These findings highlight the need for age-specific training regimens, appropriate footwear, and enhanced safety protocols to reduce injuries and promote athlete development.

Keywords: Musculoskeletal injuries, youth football, academy football, Nairobi, injury risk, risk factors

INTRODUCTION

Football is a widely recognised team sport in Kenya and the most widespread youth sport globally. While playing competitive contact sports has numerous wellness benefits, injuries sometimes happen and can endanger an athlete's performance and well-being. Preventing sports-related injuries in children and adolescents provides numerous health and financial advantages for the patient, the family, and the healthcare system overall (1,2). Sports-related injuries also pose a substantial and growing financial strain on the system. Reducing injury risk could lower sporting drop-out rates and encourage lifetime engagement in sports, especially considering the large number of young people engaging in youth football.

Injuries among youth football players are a pressing concern due to their potential to disrupt growth, hinder skill development, and lead to chronic health issues if not managed appropriately (2,3). The physical demands of football, characterized by frequent sprinting, jumping, sudden stops, and tackles, increase the risk of injury, particularly in young athletes whose musculoskeletal systems are still developing (4). Musculoskeletal injuries are the most common injuries in youth football, with reported prevalence rates in Africa about 60% in a South Africa study population and methodology (5).

Competitive match play often carries significantly higher injury risks than training sessions (6). Younger athletes are particularly susceptible to injuries because of rapid growth spurts that temporarily disrupt biomechanical stability, leaving them prone to ligament sprains, muscle strains, and fractures (3,7). Furthermore, environmental and contextual factors, such as inadequate playing surfaces and improper footwear, exacerbate these risks (8,9).

While extensive research has explored football-related injuries in professional and high-income settings, studies focusing on youth players in sub-Saharan Africa remain scarce. This gap is significant, as unique socio-economic and environmental challenges in this region, such as limited access to protective gear and poorly maintained playing fields, likely influence injury patterns and risk factors (10). In Kenya, football is a widely played sport, yet there is limited data on the demographic correlates and risk factors contributing to injuries among youth players. Understanding these variables is critical for informing effective injury prevention strategies tailored to the local context.

The present study seeks to bridge this gap by evaluating the prevalence and risk factors of musculoskeletal injuries in a cohort of youth football players in Kenya. By examining these relationships, the study seeks to identify modifiable determinants of injury and provide evidence-based recommendations for improving player safety and promoting sustainable athlete development. This work contributes to bridging the knowledge gap in football-related injury research in underrepresented settings and supports efforts to make the sport safer for youth athletes globally.

METHODS

This study was a prospective descriptive epidemiologic study designed to investigate the demographic correlates and risk factors for football-related injuries among youth players. The study was conducted over a three-month football season in 2023 at the Express Soccer Academy in Nairobi, Kenya. Injury incidence, demographic characteristics, and risk factors were systematically recorded to determine associations. The research was conducted at the Express Soccer Academy, based at GEMS Cambridge International School, Karen, Nairobi. Established in 2013, the academy provides structured football training programs to youth aged 5–20 years, offering a conducive environment for studying football injuries due to its diverse age groups and competitive engagement.

The study population included all active football players aged 5 to 20 years, with participation in at least four match or training sessions during the study period, enrolled at the academy during the 2023 season. The academy's structured programs ensured consistency in exposure to training and competitive play. Written informed consent was provided by the parents or guardians for all minors under 18 years. Players with pre-existing injuries that limited participation at the start of the season or whose parents or guardians declined to provide consent were excluded.

Data were collected using a structured interviewer-administered questionnaire and verified through clinical assessments. The questionnaire comprised three sections: demographic information such as age, gender, and playing experience; training and environmental variables like the weekly training hours, types of drills, use of protective gear, and quality of playing surfaces and injury data: anatomical site, type, mechanism, and timing of injuries (training vs. match). An injury was defined as any musculoskeletal trauma sustained during football-related activities that required medical attention or restricted participation for at least one session. Two research assistants (a sports medicine nurse and a physiotherapist) were trained to administer questionnaires and assess injuries. Injuries were confirmed through clinical evaluation by the trained professionals.

Data were analyzed using SPSS version 25. Descriptive statistics (means, frequencies, and percentages) were used to summarize participant characteristics and injury patterns. Bivariate analysis, including Chi-square tests and independent t-tests, assessed associations between categorical and continuous variables, respectively. Logistic regression was employed to identify significant predictors of injury, with results reported as odds ratios and 95% confidence intervals. A p-value of <0.05 was considered statistically significant.

Ethical approval was obtained from the Kenyatta National Hospital-University of Nairobi Ethics and Research Committee. Administrative approval was granted by the Express Soccer Academy. Participant anonymity and confidentiality were ensured by de-identifying data and securely storing records. Participants were informed of their right to withdraw at any time without consequences.

RESULTS

A total of 182 youth football players participated in the study, with 92.9% (n = 169) male and 7.1% (n = 13) female. The participants' ages ranged from 5 to 20 years, with a mean age of 10.76 years (SD = 3.6). The majority of players were in the Under-11 age group (21.4%, n = 39). The mean duration of football experience was 43 months (SD = 31), with a median of 36 months.

Most players (97.8%) engaged in two training sessions per week, while a minority (2.2%) trained four times weekly. When accounting for session durations, 96.2% of the respondents trained for four hours weekly, 3.3% trained for two hours weekly, and only 0.5% trained for six hours every week.

The use of basic protective footwear equipment was widespread, with 98.4% of participants utilizing shin pads or guards during matches or training. However, the use of other protective gear, such as finger tapping, padded shorts, and ankle braces, was minimal (0.5% each). Notably, all participants reported performing warm-ups before matches. The majority of players (92.3%, n = 168) wore high-top shoes during matches and training, while 6.6% (n = 12) wore low-top shoes, and only 1.1% (n = 2) alternated between both types.

A total of 108 players sustained injuries during the study period, resulting in an overall prevalence of 59.34%. Some players reported sustaining more than one injury, yielding a total injury count of 188.

Risk factors for injury

More injuries were sustained during competitive match situations (62%) when compared to training situations (38%). Some of the players attained more than one injury during the study period, thus the total number of injuries reported was 188.

Variable	Injured	Not Injured	Correlation Co-efficient	P-Value
Age	9.68(± 3.84)	12.34(± 2.49)	-0.364	<0.001
Duration of playing football	3.36(± 2.71)	3.89(± 2.35)	-0.174	0.019

Table 1: Table showing the correlation between player demographics and injury sustained

Younger players were also significantly more likely to sustain injuries (p<0.001) (Table 1, Figure 1). Players with less football experience were also at a significantly higher risk (p=0.019) of musculoskeletal injuries, suggesting that neuromuscular immaturity and insufficient skill development may contribute to vulnerability (Table 1, Figures 2). There was, however, no significant association between player sex and injury status (Pearson Chi-Square = 0.568, p = 0.451), with injuries observed in 69.2% of female players and 58.6% of male players.

Players wearing low-top shoes experienced significantly higher injury rates compared to those using high-top shoes (p=0.029) (Table 2). No significant differences in injury rates were observed between grass and turf surfaces (p=0.806) (Table 3).

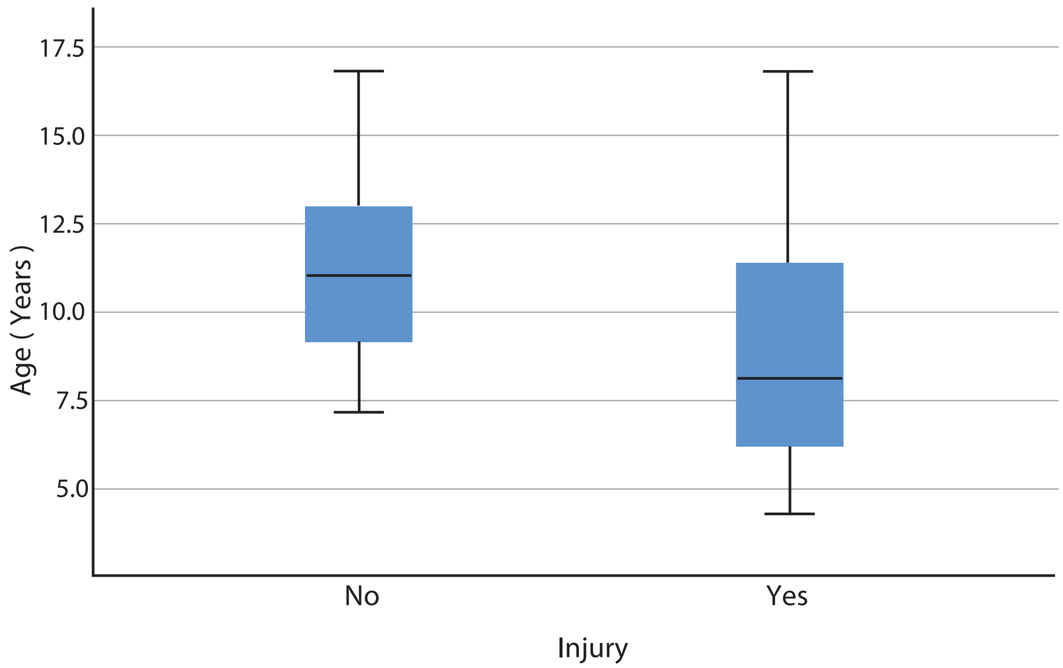

Figure 1: Box-plot showing correlation between age and injury status

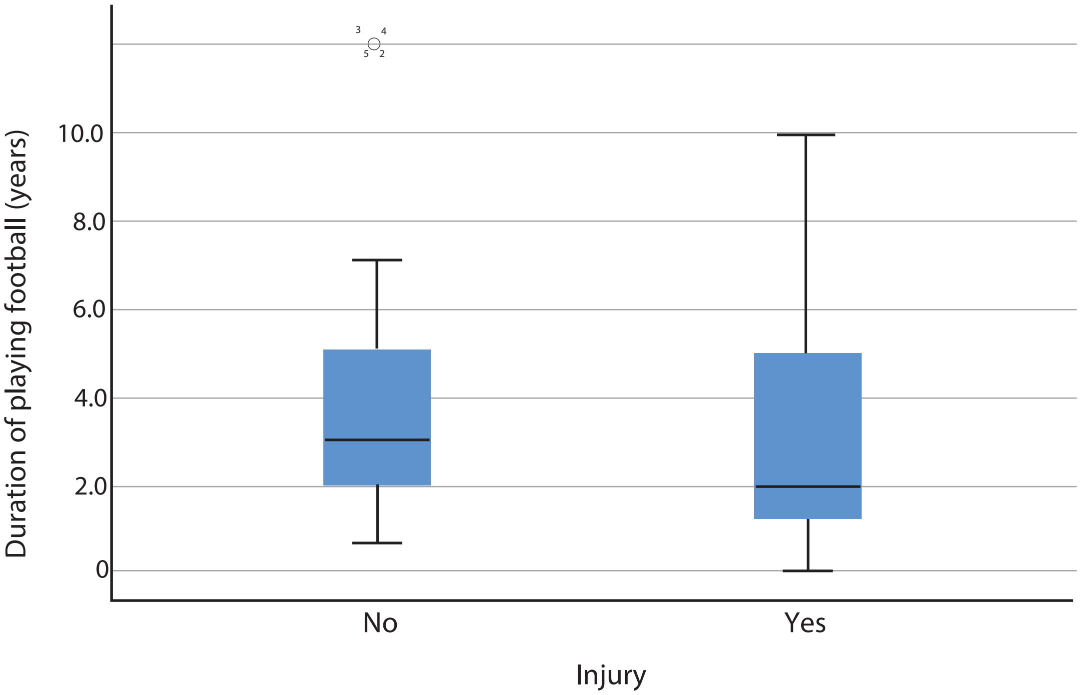

Figure 2: Box-plot showing correlation between playing experience and injury status

Shoe Type	Injured	Not Injured	p-Value
High-Top	95	73	0.029
Low-Top	11	1	

Table 2: Correlation between shoe type and injury rates

Surface Type	Injured	Not Injured	p-Value
Grass	26	19	0.806
Turf	82	55	

Table 3: Correlation between playing surface and injury rates

DISCUSSION

The study provides critical insights into the risk factors and demographic correlates of football-related injuries among youth players in Kenya. The findings align with global trends in football injury epidemiology while highlighting unique contextual factors that influence injury patterns in resource-limited settings. The study population comprised predominantly male participants (92.9%), reflecting the male-dominated nature of youth football (11). The mean age of participants was 10.76 years. Younger players are often exposed to the rigors of competitive sports without sufficient neuromuscular development, potentially increasing their injury risk (12).

Training patterns revealed a relatively low weekly training volume, with most players engaging in two sessions totaling four hours weekly. This aligns with recommendations for youth sports to avoid overtraining, which has been implicated in increased injury rates (4). Training for extended hours could put players at risk of overuse musculoskeletal injuries.

The high adoption of shin pad use (98.4%) reflects adherence to basic safety standards, likely contributing to the prevention of severe lower-limb injuries. However, the minimal use of other protective equipment, such as ankle braces, highlights areas for improvement in injury prevention practices. Ensuring access to high-quality, properly fitted protective gear, including high-top shoes and shin guards, is essential (13). Policymakers and sports organizations should consider subsidizing costs to make such equipment accessible to all players. Additionally, the universal practice of warm-ups aligns with evidence supporting their role in reducing injury risk by enhancing muscle flexibility and joint stability (14).

The injury prevalence of 59.34% highlights the high susceptibility of youth players to musculoskeletal injuries, consistent with rates reported in other football studies (5). Matches accounted for a significantly higher proportion of injuries (62%) compared to training sessions (38%), reflecting the higher intensity and unpredictability of match play (15). The elevated match-specific risk reflects the increased intensity, physical contact, and competitive nature of gameplay, which predispose players to both contact and non-contact injuries (16).

Younger players were significantly more likely to sustain injuries ($p<0.001$), a finding consistent with (17), who identified increased injury risks during periods of rapid physical growth. Adolescents undergoing growth spurts experience temporary imbalances in strength and coordination, which can compromise their ability to avoid injurious situations (18). Additionally, players with less football experience were at greater risk ($p=0.019$), likely due to lower levels of skill and situational awareness. These findings underscore the importance of tailoring training regimens to developmental stages, as advocated by (3). Age-specific and skill-based training regimens should be implemented to address the unique vulnerabilities of younger players. Neuromuscular training programs, including proprioceptive exercises and balance drills, have been shown to reduce lower extremity injuries (19).

The association between low-top shoes and higher injury rates ($p=0.029$) is consistent with research by (6), who emphasized that appropriate footwear is critical for injury prevention. Low-top shoes may provide insufficient ankle support, increasing the likelihood of sprains during rapid directional changes (13,20). This highlights the need for access to properly fitted, sport-specific footwear, particularly in resource-limited settings where cost constraints may limit availability.

The lack of significant differences in injury rates between grass and turf surfaces ($p = 0.806$) aligns with previous research suggesting that modern artificial turf surfaces do not inherently increase injury risk compared to natural grass (8). This finding shifts the focus to other modifiable factors, such as footwear and training intensity. Nonetheless, improving the quality and consistency of playing surfaces can mitigate non-contact injuries, as suggested by Dragoo and Braun (21). Academy administrators should also prioritize regular inspections and maintenance of fields.

In the Kenyan context, factors such as inconsistent adherence to safety protocols, limited availability of protective gear, and variable quality of playing surfaces may exacerbate injury risks. Dragoo and Braun (21) emphasized that uneven or poorly maintained playing fields are associated with higher rates of lower extremity injuries, a finding that resonates with anecdotal evidence in Kenyan youth football settings. The absence of significant differences in injury rates between grass and turf in this study just suggests that factors such as footwear and intensity of play may be more critical determinants.

CONCLUSION

This study underscores the high prevalence of musculoskeletal injuries in youth football and identifies key demographic and contextual risk factors, including age, playing experience, and footwear, for these injuries. Addressing these factors through targeted interventions can enhance player safety and promote sustainable athlete development. These findings contribute to the growing body of literature on football-related injuries and highlight the importance of tailoring prevention strategies to the unique challenges of youth football in resource-limited settings.

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THE PRACTICE OF ARTHROSCOPY AND SPORTS MEDICINE IN KENYA

Oyoo Were, Mmed, IOC Dip Sp Phy

Chief of Orthopaedics and Traumatology at the Defence Forces Memorial Hospital, Nairobi.

Correspondence:Dr Oyoo Were, MMed, P. O, Box 261-00202, Nairobi, Kenya.

Tel +254 721365521 Email: oloyoo@gmail.com

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ABSTRACT

Sports participation in Kenya is widespread across several disciplines, both amateur and professional. At the time of writing this article, the country is jointly hosting the 2024 African Nations Championship (CHAN) in football. In terms of Orthopaedic and general medical care in sports, it can be considered an emerging country with rapid development and increase in training of relevant professionals. This care is however concentrated in major urban centers. The same applies for radiology support. There is good uptake of emerging technologies but there is a dearth of research and publications in this field.

INTRODUCTION

Kenya is known for sports exploits especially in middle- and long-distance athletics, sevens rugby and disability sports. There is growing interest in both competitive and recreational sports in the country and worldwide including extreme sports in Kenya. This has led to increase in sports injuries with a likelihood of further increase as participation increases meaning that injury prevention programs are also needed (1). As is currently stands, there are 25 sports federations in Kenya mostly under National Olympic Committee of Kenya (NOCK). 12 of these serve integrated sports with an additional 3 federations exclusively serving disability sports. Most of the federations do not have association doctors.

Orthopaedic Sports Medicine is the branch that deals with pathological conditions arising from sports participation (2). It is important to acknowledge that these conditions don't only occur in athletes and can be part of everyday life. They can also be part of degenerative diseases and result from overuse of specific areas of the body as occupational hazards or domestic chores/ activities.

TRAINING AND PRACTICE OF ARTHROSCOPY IN KENYA

Currently, there are 215 registered orthopaedic surgeons in Kenya against a population of 53 million in 2023(3) (Currently estimated at 57.5 million). Most have general orthopaedic training and are able to handle most musculoskeletal sports injuries. Arthroscopy practice is also growing in the country and most are exposed through observation, assisting, or performing surgeries and through wet labs. Comprehensive coverage of sports teams requires additional clinical skills to handle conditions like concussion, cardiovascular emergencies and mental health. Low numbers of orthopedic surgeons and healthcare workers result in delayed/ no access to specialist care. This will be mitigated by the increased training of orthopaedic surgeons and sports medicine specialists. Currently, there are 2 Master of Medicine (MMed) programs and 8 hospitals accredited to provide FCS Orthopaedic Surgery under the College of Surgeons of East, Central and Southern Africa (COSECSA). Currently, there are 14 member countries in the sub-Saharan region. Some postgraduate diploma and certificate courses in sports medicine are available online for doctors. These include:

1.FIFA Football Medicine.

2.IOC Diploma in Sports Medicine.

3.Sports Medicine courses by various universities.

4.There are also online Master of Science degrees in Sports and exercise medicine offered by various universities internationally.

In addition to requiring expertise and ancillary services, orthopaedic care requires orthotics, prosthetics and implants to help with pain, motion and protection of joints/ bones during healing. In the entire East African region, most implants are imported and therefore costly. These may therefore be out of reach of upcoming and many amateur sportspeople. In secondary schools, first aid and primary care is provided during major tournaments. In the event of serious injury requiring hospitalization or surgery, the burden usually shifts to the parents. Mbarak et al reported overtraining, use of medicated ointments and initiation of physiotherapy without adequate prior evaluation (4). They also recommended establishing of sports care centers run by sports physicians to help manage running-related musculoskeletal injuries.

Currently, there are 7 major (mostly in former regional headquarters and some mission hospitals) and 42 minor orthopaedic workshops (mostly in county hospitals) in the country. Most are able to prepare thermoplastic splints, cosmetic prostheses and calipers. A private institution, Ottobok, has recently set up in Kenya and are able to prepare these and myoelectric prostheses. There is therefore capacity for growth in this area. This may also help in training and participation for disability sports.

Establishing Sustainable Arthroscopy Capacity in Low- and Middle-Income Countries (LMICs) should therefore be a priority for Kenya and the entire region. East Africa Arthroscopy Association was founded in 2012 and currently has members from Kenya, Uganda, Tanzania and Ethiopia. It has striven to improve Arthroscopy capacity by providing training through workshops, wet lab training and live surgery demonstrations at least twice every year (Fig 1). This has also enabled networking among Orthopaedic Surgeons within the region. Partnership with the International Society of Arthroscopy Knee Surgery and Orthopaedic Sports Medicine will go a long way in establishing High Income Country/LMIC Partnerships. This has been proposed as a way of a way of achieving greater equity in musculoskeletal care globally. According to Ericka P et al, developing successful partnerships between HICs and LMICs to support arthroscopic surgery requires sustained relationships that address local needs (4).

Fig 1: A series of pictures taken from lectures during an EAAA workshop.

Currently, the capacity for knee, shoulder and ankle arthroscopy is well established in Kenya with at least the counties serving as former regional (provincial) headquarters able to perform these. There is ongoing skill acquisition and cooperation for hip and other small joint arthroscopies.

Most ligament reconstruction and meniscal repair procedures can be comfortably done within the country. Some of the procedures that can successfully be performed in the region include:

1.Knee ligament reconstructions

2.Meniscal repairs

3.Cartilage restoration procedures (Fig 2)

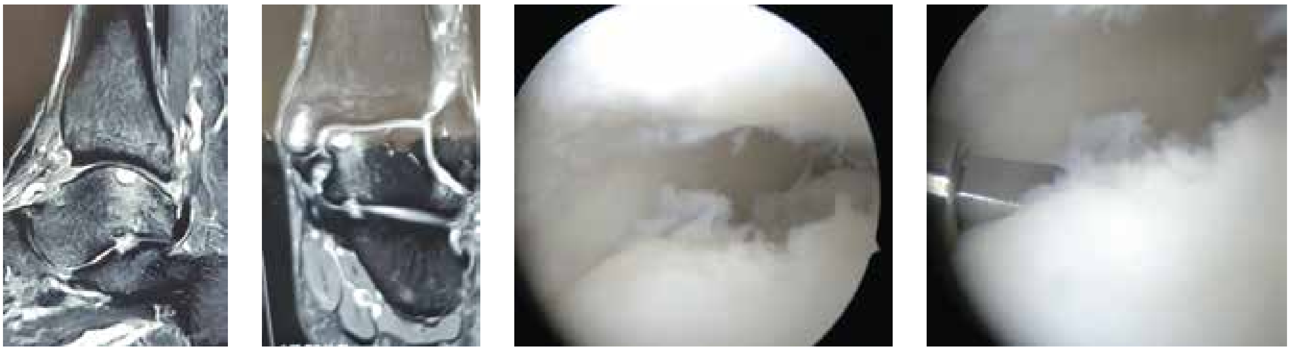

Fig 2: MRI and arthroscopic images of a 31-year-old footballer who was treated by microfracture and returned to play after 9 months.

4.Reconstruction for multiligament knee injuries (Fig 3)

5.Rotator cuff repairs

6.Open and arthroscopic shoulder instability surgeries

Fig 3: MRI images of a patient with ACL tear and image of successfully reconstructed ACL using all inside repair with hamstring graft.

Graft choices are mostly autografts as allografts and synthetic grafts are not available in the country. Cartilage restoration/ replacement procedures are mainly microfracture and osteochondral autograft transfer. This is an area that needs further exploration and would benefit from cooperation between LMICs and high-income countries.

In the area of research, few studies have looked at the incidence of sports injuries and morbidity in the region. Mbarak et al reported dearth of data on running-related musculoskeletal injuries locally and regionally (5).

There is therefore a need to promote research and encourage publications in the fields of orthopaedics and sports medicine in the region.

In terms of radiology support, most imaging studies are available in the big cities. Xray services are available in most level 4 hospitals countrywide. Ultrasound services, though operator dependent, are widely available and are provided by both radiologists and trained sonographers. One centre around Nairobi has begun the use of laser therapy for tendon pathology. This is new in the country and will require follow up to see the outcomes.

USE OF ORTHOBIOLOGICS

There is a growing increase of use of orthobiologics worldwide with PRP most commonly used and arthritis being the most likely indication (5). Locally, there are no studies on the frequency of use and results thereof.

This needs to be explored as interest will be generated from both Scientific literature and online posts. Bone marrow aspirate concentrate use is reported but there are no publications to support this (Fig 4).

Fig 4: The author performing bone marrow aspiration from the iliac crest to perform concentrate injection to the hip of an elite athlete with early osteoarthritis. Subsequent hip injection was under ultrasound guidance with the help of a radiologist.

CONCLUSION

There is a progressive increase in the scope and practice of arthroscopic surgery in Kenya.

Initially limited to the knee more surgeons are now performing shoulder, elbow, hip and ankle arthroscopy.

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USING BOVINE KNEE(COW) FOR KNEE ARTHROSCSOPY TRAINING IN KENYA

Everisto Opondo, Mmed, FCS (Cosecsa), PhD*

Associate Professor, Department of surgery, Jomo Kenyatta University of Agriculture and Technology.

Correspondence: Prof Everisto Opondo Mmed, FCS (Cosecsa), PhD. Department of surgery, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya, P. o Box 105, 002, 02, Tel +254 722475767 Email: opondodr@gmail.com

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ABSTRACT

Background: The East African Arthroscopy Association (EAAA) has run 3 wet lab arthroscopic training courses aimed at equipping surgeons in the East African region with the requisite skills to practice knee arthroscopy. The author was the course director and technical person in charge of the training on behalf of the East African Arthroscopy Association (EAAA) for the third course held on 1-2 may, 2025.

Objectives: To report on the use of cow knee for arthroscopic training in Kenya.

Methods: This paper is based on basic knee arthroscopy course held at the Nairobi Surgical Skills Centre (NSSC) based at Chiromo Campus, department of human anatomy at the University of Nairobi. Twenty-two cow knee specimens were prepared and used for arthroscopy training with a focus on triangulation and meniscus surgery.

Results: The training involved a wet lab training for 34 surgeons and residents based in Kenya. The wet lab session was rated the most preferred part of the course by 77.8% of the participants and 100% reported having achieved their expectations.

Conclusions: Triangulation using arthroscopy instruments and different aspects of meniscus surgery can be done with excellent outcomes using a well-prepared cow knee specimen.

Keywords: Bovine(cow) knee, Arthroscopy, Triangulation, Meniscus.

INTRODUCTION

The ideal training to improve the arthroscopic skills of trained surgeons and specialist surgeons is on human cadaver knee. However, there are several difficulties in obtaining human anatomical parts, such as their high cost, storage requirements, and ethical issues due to the lack of a clear policy about use of human tissues for training in Kenya. Alternatives to the use of human cadavers are training with artificial models, 3-dimensional simulators, and animal anatomical models, such as porcine and bovine knee as in this study. Simulators and artificial models have the advantage of easy repetition of training but they do not replicate the exact reality of the procedure, such as contact with the texture and resistance offered by human and animal tissue.

The pictures used were filmed in the NSSC laboratory the human anatomy department of the University of Nairobi. Several studies have already shown that some anatomical animal models are very close to humans and therefore apply well for training of open and arthroscopic surgical skills (1-14).

The bovine model has already been used in several studies and shown itself to be an adequate model for arthroscopic training, especially for arthroscopic triangulation training (1-6).

In this study, we describe, step by step, how to set up an arthroscopy laboratory station with a cow knee model and then practice arthroscopic triangulation and meniscus surgical procedures. The bovine knees were obtained from slaughterhouses and butcher shops in Burma market in Nairobi.

The aim of this study was to investigate the value of using a cow knee model for arthroscopic training in Kenya given the difficulty and challenges of obtaining human cadaveric specimens.

MATERIALS AND METHODS

Study design: this was a cross sectional, observational study.

Study site: the Nairobi Surgical Skills Centre (NSSC) based at Chiromo Campus, department of human anatomy at the University of Nairobi.

Study population: all registered participants for the third East African advanced knee arthroscopy course.

Sample size: Purposive sampling was used where all the participants in the third EAAA course were selected.

Ethical considerations: not done due the fact than no risk was anticipated and the specimens used were cow knees from the slaughter houses in Nairobi.

Data collection and analysis: The pictures used were filmed in the NSSC laboratory the human anatomy department of the University of Nairobi. An exist questionnaire was administered to all the participants including the faculty to rate the different aspects of the course. The data was summarized in the form of pie chart, bars and tables.

SPECIMEN PREPARATION

The specimens were delivered on the morning of the training (1st may 2025). The specimens had the meat dissected off leaving about 15 cm of the femur and knee while preserving the knee joint (Fig 1). The specimen was mounted and then dissected via an anterior arthrotomy to remove the large fat pad and osteotomise the prominent tibial spine in the cow knee. The intra articular tibialis anterior tendon was removed (Fig 1). The medial and lateral collaterals were released to allow for ease of mobilization of the knee. The arthrotomy incision was then closed using number 5 ethibond sutures then covered with foil to minimize water leakage during the arthroscopy. Basic surgical instruments with straight and curved duckbill arthroscopy forceps, scalpel with blade, Kelly forceps, and Metzenbaum scissors were used. We used a vice to attach the specimen to the fixed laboratory tables .

Fig 1:Cow knee specimen after arthrotomy and excision of the fat pad.

Fig 2: Cow knee specimen mounted at the laboratory table for the training.

We tested the knee flexion and extension. We then identified the patella and patellar tendon (Fig 3) and created standard anteromedial and anterolateral portals.

ARTHROSCOPIC TRAINING

We introduced the arthroscopic trochar through the anteromedial portal allowing us to view the interior of the joint while the knee is irrigated. Once inside the joint and with clear visualization, we introduced the shaver blade through the opposite portal and begun debridement and cleaning of the synovial and "Hoffa" fat, that is usually hyper trophied in the cow knee. This was followed by demonstration and probing of the meniscus, and repair using the all inside technique.

Physical Aspects of the Arthroscopy Laboratory

Fig 3: The author demonstrating portal entry to participants.

Fig 4: Meniscus probing and tear repair demonstration.

The room was equipped with a tap with running water, a drain in the ground, adequate lighting, and plugs for 110 and 220 volts (Fig 2 and 3). The water was mounted onto drip stands and run from 2-liter containers.

The arthroscopy towers with monitor (Arthrex, smith $ nephew, and Biotec), camera controller, light source, and shaver console were used for the procedure (Fig 4).

RESULTS

The course had a total of 34 participants including 16 faculty members (fig 9). A confidential online survey was conducted in which both participants and faculty participated to rate the value of using a cow knee specimen for arthroscopic training. The participants expectations were met by all the respondents and all would recommend the training to a colleague (fig 5 & 6).

WOULD YOU RECOMMEND EAAA WORKSHOP TO A COLLEAGUE?

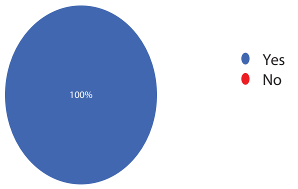


Fig 5: The likelihood of participant recommending the courses to a colleague. The practical arthroscopy (wet lab) was the most preffered part of the training by 77.8% (fig 5).

WHICH ASPECTS DID YOU ENJOY THE MOST?

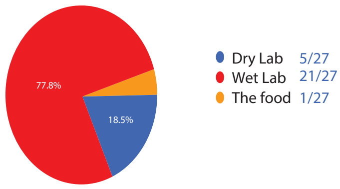


Fig 6: Most preferred part of the training.

WERE YOUR EXPECTATIONS MET?

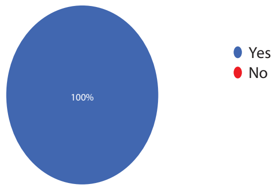


Fig 7: Expectations of training met

On a scale of 1-5 81.5% of the participants rated the course as appropriate for training on knee arthroscopy triangulation and meniscus surgery (Fig 8).

RATE THE APPROPRIATENESS OF THE WORKSHOP. SCALE 1-5

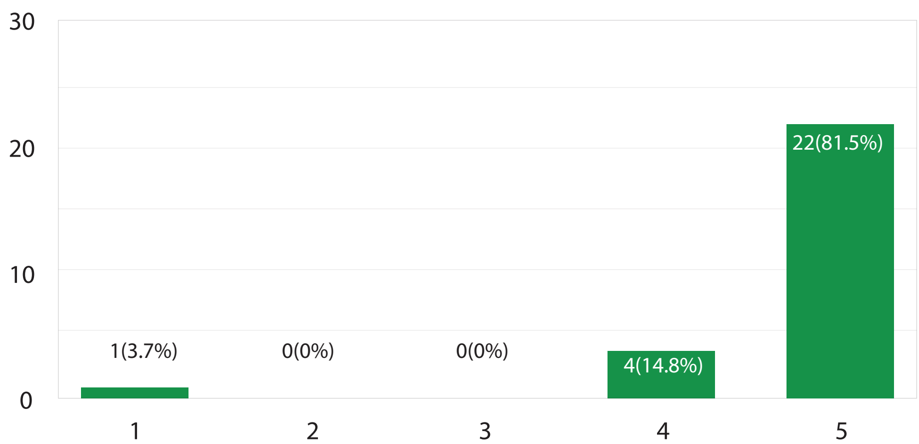
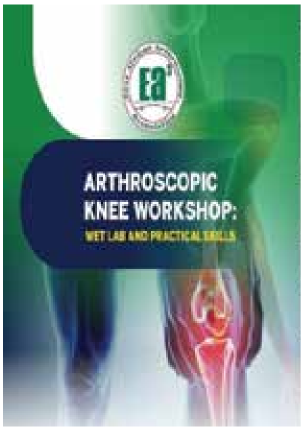


Fig 8: Appropriateness of the course



3RD EDITION
EAAA
ADVANCED KNEE
ARTHROSCOPY
COURSE
WORKSHOP
1ST & 2ND MAY 2025

Fig 9: Poster of the advance knee arthroscopy workshop held on 1st and 2nd may 2025.

DISCUSSION

Hands on training is essential for the development of surgical skills, especially for arthroscopic procedures, both for doctors in training and for the advancement of new surgical techniques among more experienced surgeons (1, 2, 3, 6, 8). This course had a mixture of residents at various levels of training to experienced surgeons with upto 30 years of practice. The sets and the cow knee specimens were able to adequately train on primary portal placement, arthroscopic triangulation and meniscus surgery techniques especially the all inside technique. Included in this article is a detailed description of how to set up a laboratory of arthroscopy to facilitate orthopaedic training centres around the world in poor resource settings.

The alternative would have been to use simulators. The drawback of using simulators for arthroscopic training unlike a cow knee specimen as in this study is that it fails to teach the learn about the procedure and the technical challenges faced in real life (1-5). This study has demonstrated the value of using cow knee for basic and advanced arthroscopy training in limited resources setting where there is difficulty in procuring human cadaveric models. Further this is replicable since it has been using in other trainings in Kenya and Tanzania.

CONCLUSION

We recommend the use of cow knee (bovine) for arthroscopic training in settings where its difficult to get human cadaveric knee specimens.

ACKNOWLEDGEMENT

The EAAA is grateful to the NSSC for hosting the course. We thank Arthrex, Smith and Nephew and Biotec for supporting the course and study through provision of the arthroscopy instruments and suture anchors.

Conflict of interest: none to declare.

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PERIPROSTHETIC DISTAL FEMUR FRACTURE POST TOTAL KNEE REPLACEMENT ARTHROPLASTY (TKA): CASE REPORT

Everisto Opondo, Mmed, FCS (Cosecsa), PhD*

Associate Professor, Department of surgery, Jomo Kenyatta University of Agriculture and Technology.

Correspondence: Prof Everisto Opondo Mmed, FCS (Cosecsa), PhD. Department of surgery, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya, P. o Box 105, 002, 02, Tel +254 722475767 Email: opondodr@gmail.com

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ABSTRACT

A 61-year-old male presented with 2-day history of fall, pain and deformity of the thigh one year post total knee replacement. On clinical examination he had deformity and inability to bear weight. Pre operative radiographs revealed a type II periprosthetic fracture (Rorabeck and Taylor) of the distal femur above the femoral component of the knee replacement.

Keywords: Total Knee Replacement, Periprosthetic fracture, Classification

INTRODUCTION

Periprosthetic fractures are debilitating and costly to treat with attendant complications. Timely assessment and proper care are essential for an ideal outcome. The treatment options include plate osteosynthesis, retrograde nailing, revision TKA and conservative methods using casting (1-4). Total Knee Arthroplasty (TKA) is widely regarded as a safe, effective and rewarding procedure, with patients consistently reporting excellent satisfaction rates ranging from 77% to 94% (5,6,7). Periprosthetic fractures however, are a devastating complication for both the patients and surgeons. The femoral or tibial periprosthetic fractures can potentially render patients immobile and resulting in multiple surgical procedures, increased duration of hospital stay as well as additional hospital expense.

CASE SUMMARY

A 61-year-old male retired civil servant presented with a 2-day history of pain and deformity of the thigh one year post total knee replacement after a fall at home. On clinical examination he had deformity and inability to bear weight.The pre operative X rays revealed a periprosthetic fracture of the distal femur above the femoral component of the knee replacement. His x rays revealed type 2 fracture with intact femoral component of the prosthesis (Fig 1). He was prepared and optimized for surgery. He consented to Open reduction and internal fixation using a distal femur locking plate under image intensifier which was done within 12 hours post admission.

The fracture site was grafted using autologous iliac crest bone graft. Post operatively the limb was immobilized in extension using a locking knee splint (Fig 6) and mobilized non weight bearing. He saws discharged on the third post operative day for outpatient follow up.

Fig 1: knee X ray (Lateral view)

Fig 2: Knee X ray (Anteroposterior view)

Fig 3; Post operative X ray with knee in a locking knee splint.

Postoperatively the patient was in locking knee brace for 6 weeks and progressive weight bearing with support of crutches. He achieved full flexion and weight bearing at three months (Fig 4 & 5).

Fig 4: Post op at 3 months

Fig 5: Post op at 3 months with callus formation

Fig 5: Patient in a locking knee split post operative.

DISCUSSION

Periprosthetic fractures after knee replacement usually affect either the femur or knee and the prothesis may also be displaced. Advanced age is a major risk factor regarded as an individual risk factor within itself and hence the older the patient is at the time of primary surgery the more the associated risk of peri prosthetic fracture. Associated with advancing age is the increased risk of osteoporosis and recurrent falls as risk factors for periprosthetic fractures. Other known risk factors documented include long term steroid usage, inflammatory arthropathy such as rheumatoid arthritis, and patients with neurological diseases such as epilepsy, Parkinson's disease, poliomyelitis, and myasthenia gravis which increase the risk of periprosthetic fractures. Various publications report obesity to be associated with poor functional and mechanical outcomes following TKR (6, 8).

Revision TKR is a major risk factor for the development of periprosthetic fractures. In a large population-based study conducted by Meek et al. (9) from 2011, 44,511 primary TKA and 3222 revision TKA procedures were performed. The authors reported that the risk of fracture after primary TKA was 0.6% versus 1.7% after revision postoperative. Preoperative risk factors that have been reported in the literature thus far include, previous revision TKA,prolonged steroid use, rheumatoid arthritis, advanced age, female gender, neurologic disorders and, controversially, the presence of anterior femoral notching.

The role of mechanical alignment as a risk factor is clearly demonstrated. However mechanical factors such as coronal leg alignment (pre-operative varus or valgus deformity) and leg side dominance are potential risk factors that need further exploration. Some studies have suggested that varus malalignment is associated with periprosthetic fractures.

Numerous classifications of supracondylar femoral fractures after total knee arthroplasty have been described. The most commonly used classification for distal femur periprosthetic fractures was developed by Rorabeck and Taylor (7). This classification takes into account fracture displacement and prosthesis condition (well fixed or loose).

•Type I: Undisplaced fracture and prosthesis is well fixed.

•Type II: Displaced fracture and prosthesis is well fixed.

•Type III: Prosthesis is loose, fracture may be displaced or undisplaced.

Based on the Rorabeck and Tylor treatment algorithm the non-displaced, stable fractures with well-fixed implants are best treated non-operatively. Displaced periprosthetic fractures with well-fixed implants on the other hand should be treated by internal fixation. The options of internal fixation are retrograde nailing or distal femur locking plates. Unstable prosthesis, with good or poor bone quality are best addressed by revision of the previous prosthesis, with or without bone grafting. Bone grafting like in this case enhances healing after internal fixation.

CONCLUSION

This case outlines the process of decision making and the options of management of periprosthetic femur fractures after total knee replacement. This is key considering that there has been a considerable increase in the number of primary Total Knee Replacement procedures in Kenya.

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Vol.1 Issue No. 1

RARE EXTRA SYNOVIAL CHONDROMATOSIS OF THE SUBACROMIAL BURSA: CASE REPORT AND REVIEW OF LITERATURE

S.O. OWINGA*

Correspondence:Dr. S.O. Owinga, MBChB, MMed (Surg), Consultant Orthopedic Surgeon, Nairobi Kenya. P. O. Box 35175-00200, Nairobi

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PATIENT PRESENTATION

The patient was a 32-year-old woman with no co-morbidities. She presented with a three-month history of right shoulder pain of insidious onset, which gradually worsened over time. Recently, she had developed a reduced range of motion, and her symptoms were progressively worsening.

EXAMINATION AND INVESTIGATIONS

Physical examination was largely unremarkable, except for slight tenderness in the subdeltoid region. The joint range of motion above 90 degrees was painful. X-rays revealed multiple subacromial calcified loose bodies (Fig 1). MRI scans confirmed the presence of these bodies and established that they were extraarticular (Fig2,3). Arthroscopy confirmed that the lesions were present only outside the joint.

Fig 1: Extra synovial chondromatosis Pre op

Fig 2: MRI Scan pre-op extrasynovial chondromatosis

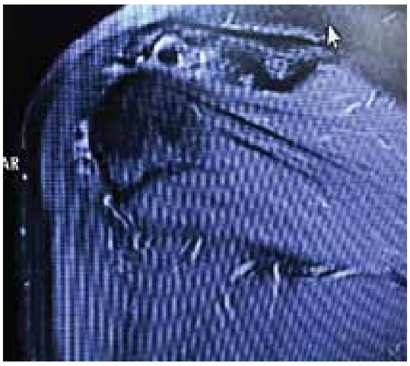

Fig 3: MRI Scan Extrasynovial chondromatosis

TREATMENT

Arthroscopy confirmed that the lesions were present only outside the joint. An extensive arthroscopic bursectomy and extraarticular scoping were performed, successfully retrieving all the lesions, as confirmed by a postoperative X-ray (Fig 4).

Fig 4: Post operative X rays showing no lesion

Follow-Up

The patient's subsequent follow-up was uneventful. After three years, she was discharged from routine care and advised to return if necessary.

LITERATURE REVIEW

Synovial chondromatosis is rare in the shoulders and extraarticular variety is the rarest variety. In this region there are no other cases reported.

Synovial chondromatosis refers to metaplastic change in the synovium membrane that results in formation of multiple cartilage nodules by the membrane (1-11). They may calcify and normally will dislodge into the joint. Normally in descending order it occurs in the knee, hip, elbow, wrist and ankle joint (2,3,4). The actual etiology is unknown. There has been some postulation that microtrauma could be a triggering factor (13). Buddingh EP et al have reported Clonal Karyotypic abnormalities in Chromosome 6 postulating a neoplastic element.It can be said that it has 3 stages. Stage I presents with early, synovial disease and no loose bodies, Stage II, transitional, active synovial disease and loose bodies. Stage III is late and presents with Loose bodies but no active synovial disease (6).

In this case it can be assumed it is metaplastic change of the mesenchymal cell.

It is important to differentiate this primary chondromatosis with secondary chondromatosis include Degenerative joint disease, Osteochondral fractures, Tuberculous arthritis, Osteochondritis dissecans and neurotrophic arthritis.

Finally, in recent years, arthroscopy is proving to be the gold standard. Vision is extensive and unrivalled (1,4,5,7). Post operative X-rays in this case showed complete removal.

CONCLUSION

This case demonstrates the value of arthroscopic resection with excellent functional outcomes in cases of extrasynovial chondromatosis.

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HISTORY OF ARTHROSCOPY; THE ROLE OF DR. MASAKI WATANABE (1911-1914) AS EAAA LAUNCHES THE EAJASM

Sam Owinga[1], Kitugi Samuel Nungu[2], Everisto Opondo[3*]

1.Dr Sam Owinga, Consultant Orthopaedic and trauma surgeon at the Aga Khan University Hospital Doctors Plaza

2.Dr Kitugi Samuel Nungu, Consultant Orthopaedic and trauma surgeon at Muhimbili Orthopaedic Institute (MOI), Dar es Salaam, Tanzania.

3.Prof Everisto opondo, Associate Professor, Department of surgery, Jomo Kenyatta University of Agriculture and Technology.

Correspondence: Prof Everisto Opondo Mmed, FCS (Cosecsa), PhD. Department of surgery, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya, P. o Box 105, 002, 02, Tel +254 722475767 Email: opondodr@gmail.com

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INTRODUCTION

The East African Arthroscopy Association (EAAA) was founded in the year 2012 after are realization by the founding members of the unique needs of arthroscopic surgery that were no addressed by the existing Country Level Orthopedic associations in the East African region. Orthopedic surgeons with an interest in arthroscopy were invited and EAAA started various training activities in the region. The key members of the original group were Dr. Samuel Owinga, Dr. Samuel Nungu. Dr. Mark Lutomia, Dr. Ronald Kaale and Prof Everisto Opondo.

The association was registered and has run several basic and advanced knee, shoulder and hip arthroscopy courses.

Currently the association has membership from Kenya, Uganda, Tanzania and Ethiopia. This association and journal launch has largely leveraged on the legacy of the fore fathers and inventors who immensely contributed to the development of arthroscopic instruments and formation of regional and global associations. The most significant innovations and developments in the field of arthroscopy during the twentieth century have been contributed by Dr Watanabe. Launching of this journal is a culmination of various efforts by the association to improve knowledge and create a channel for exchange of relevant information globally. On a historical note, publications in arthroscopy have tremendous grown worldwide.

HISTORY

Nitze in the late 1880s, in collaboration with instrument makers in Berlin and Vienna, had developed a fully functioning cystoscope, with a miniature Edison incandescent lamp at the tip (1). Urologists embraced the cystoscope immediately and hailed Nitze as the father of their specialty. Within 10–20 years, many competitors in Europe and USA had developed and were advertising and selling cystoscopes of similar design.

However, the stubborn orthopaedic surgeons kept asking: "Why bother to peek through the keyhole, when you can open the door?" This attitude was based on the innovations in the mid-1800s of anaesthesia (1846) and antiseptics (1867), which paved the way for large surgical incisions with good visibility and low mortality. This absurd notion (of opening doors) held ground well into the 1970–80s because many orthopaedic surgeons at the time had not mastered the art of arthroscopy. This was besides the obvious truth that endoscopy, including arthroscopy, generally offers a much better view of the body cavities including joints. This is due to the great manoeuvrability in tight spaces and the magnification offered by modern arthroscopes and the inclusion of video cameras and monitors, today in HD or 4K.

In 1910 a Swedish physician named Christian Jacobaeus designed and endoscopic instrument with an incandescent light for diagnosis of abdominal pathology that was later used in the thoracic cavity to trat pleural adhesions due to Tuberculosis hence in became a "laparo-thoracoscope". Later significant development included the development of fiber or Cold light in 195 to provide illumination and in 1960, the rod lens optical system for viewing. A major breakthrough in imaging was with the development of the television (3).

Professor Kenji Takagi (1888-1963) from Tokyo is credited with, in 1918, using a cystoscope on patients to examine tuberculous knees, which was a very prevalent problem in Japan (3). He believed that an early diagnosis of knee joint tuberculosis might lead to better treatment and prevention of the common long-term complication of ankylosis which would interfere significantly with the Japanese culture of kneeling. His first arthroscope was completed in 1920, but the optical cannula with a diameter of 7.3 mm made it unsuitable for practical use. Over the next few years, he developed and tested several modifications of his original arthroscope during arthroscopic knee procedures. By 1938, he was on his 12th design, with the notable change being advancement from small to large trocar diameters, both with and without lenses. Undoubtedly, he was the first true innovator and developer of the arthroscope.

In 1921, Eugen Bircher a famous Swiss surgeon and politician, published his experience with the use of an arthroscope in an attempt to diagnose meniscal pathology of the knee joint. He used a modified Jacobaeus scope (a combined laparo-thoracoscope) made by the Wolf Company of Berlin and called the technique "arthroendoscopy." His publication on the first 60 patients was the first to describe the use role of arthroscopy in diagnosis and treatment of actual patients. He would follow the diagnostic arthroscopy by an arthrotomy and perform pen surgical procedures (2). In 1925 Kreuscher a pioneer American arthroscopic published an article entitled "Semilunar Cartilage Disease-A Plea for the Early Recognition by Means of the Arthroscope" and thus became the American pioneer of arthroscopic surgery (Fig 1).

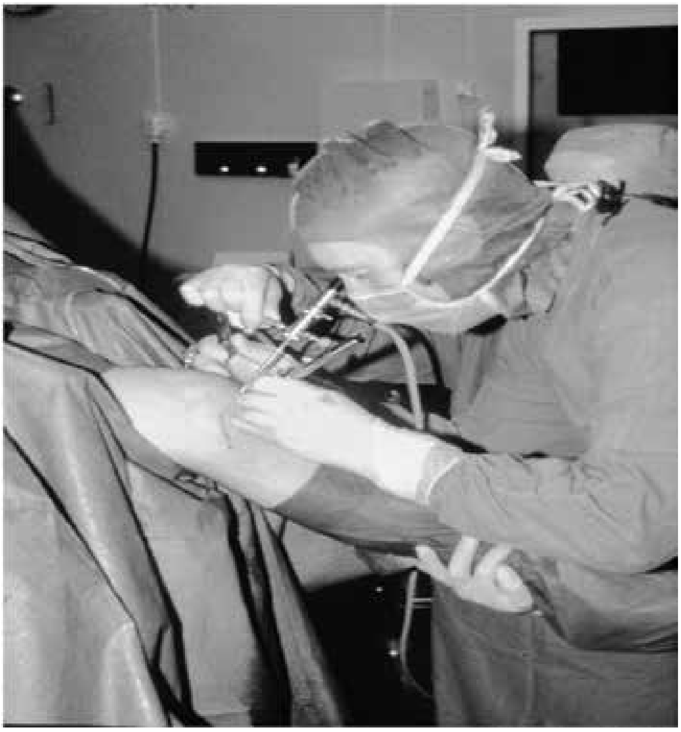

Fig 1: Knee arthroscopy in the formative years.

After the Second World War, Dr. Masaki Watanabe on return from military service as an intelligence officer of the Japanese arm, resumed his medical career at the University of Tokyo (5). He decided to pursue further development of arthroscopy from the point reached by his professor and mentor, Prof. Takagi (Fig 2 & 3), who had previously worked on 12 different designs and generations of arthroscopes in his search for a perfect instrument (2-6). Watanabe moved from Tokyo University to become Chief at the Tokyo Teishin Hospital and, in 1954, with the help of the emerging optics and electronics industries in Japan, developed the 13th and 14th generations of arthroscopes. With the number 14 arthroscope plus a supplemental light source introduced through a separate portal, he was able to obtain the first color photographs of the interior of a knee joint. In 1957 he presented a color movie at the SICOT Congress in Barcelona, which attracted very little interest during the meeting. He was however, not deterred by the lack of interest in his presentation at the SICOT meeting.

He continued with his inventions and in 1967 Watanabe introduced the number 22 arthroscope, which incorporated fiber light (or "cold light") for illumination, and in 1970 he introduced number 25, the first ultrathin fiberoptic endoscope, which had a 2-mm-diameter sheath and a single "selfoc" fiber (1.7 mm in diameter) to transmit the image to the eye (Fig 1).

Watanabe also was the first to develop the concept of "triangulation," which involved bringing instruments into the knee from different portals to treat the pathology. In 1955 he performed the first recorded operative procedure using arthroscopic to remove a solitary giant cell tumor from a knee joint. In 1961 he removed a loose body, and in 1962 he performed the first partial meniscectomy using arthroscopy. In this work and innovations, he was ably assisted by Hiroshi Ikeuchi, M.D., and Sakae Takeda, M.D.

Watanabe wrote the first Atlas of Arthroscopy, which was published in English in 1957 and was beautifully illustrated by an artist named Fujihashi. His second Atlas of Arthroscopy was published in 1969 and was illustrated with color photographs of the interior of the knee joint. Watanabe was a true scientist and a great teacher (7).

Fig 2: Prof Kenji Takaji

Fig 3: Dr Masaki Watanabe

In north America Dr Dick O'Connor, who frequently went barefoot into the operating room, because there was no easy way to control the spillage of normal saline solution used in arthroscopic cases and leather shoes were soon ruined by constant soaking in saline solution visited Watanabe in 1971 to learn about arthroscopy for a year. He performed several partial meniscectomies including on his colleagues. He was indeed the pioneer in North America of partial meniscectomy and, with the collaboration of the Richard Wolf Company in Chicago, developed special cutting tools designed by his innovative technician, Chuck Ericksen, to remove torn meniscal fragments. He also developed the first operating arthroscope with an offset eye piece and a long direct operating channel.

HISTORY OF THE DEVELOPMENT OF INTERNATIONAL ARTHROSCOPY ASSOCIATIONS

At the 1968 academy meeting in Las Vegas, a small group gathered in Dr. Robert W. Jackson's hotel room and developed the concept of forming an arthroscopic association. However, it was not until 1973, when John Joyce, M.D., arranged the first private course in arthroscopy to be held in Philadelphia, that plans were made to form the International Arthroscopy Association (IAA) at a second course to be held the following year.

The founding fathers included Masaki Watanabe, M.D.; Robert Jackson, M.D.; Ward Casscells, M.D.; John Joyce, M.D.; Ralph Lidge, M.D.; and Maurice Aignan, M.D. Masaki Watanabe, M.D., was elected president; Robert Jackson, M.D., became vice president; Dr. Casscells was secretary; and Dr. O'Connor became treasurer. Dr. O'Connor further contributed to the development of arthroscopy through his publication of the O'Connors textbook of arthroscopic surgery (3).

The original chapters of IAA were Japan and North America, but later any country that had 10 or more practicing arthroscopist surgeons could form a "chapter" of the IAA. Soon, other chapters were developed in Brazil, and Australia. The next meeting of the IAA was in Kyoto, Japan in 1978 with Dr. Watanabe as president.

The last president of the IAA was Harold Eikelaar, who presided at the final combined meeting in Hong Kong in 1995. Then the International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine (ISAKOS) was formed and became the official international organization to represent arthroscopy, knee surgery, and sports medicine globally.

The North American chapter of the IAA was legally converted into the "Arthroscopy Association of North America (AANA).

In 1982 a group of knee surgeons and arthroscopists met in Berlin and discussed the formation of a European society similar to AANA to cover these exciting new fields of knee surgery and sports medicine. In 1984 at a conference held in Berlin the European Society for Knee Surgery and Arthroscopy (ESKA) was officially formed.

CONCLUSION

THE EAAA formation and launch of the journal (EAJASM) is in keeping with the history and development of arthroscopic surgery practice in the different regions of the world.

Dr. Masaki Watanabe deserves full credit for his contribution to arthroscopy, which medical historians will undoubtedly establish as one of the greatest advances in orthopaedic surgery in the twentieth century.

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Crossover Study Design: The administration of two or more experimental therapies one after the other in a specified or random order to the same group of patients.

Cohort Study: Involves identification of two groups (cohorts) of patients, one which did receive the exposure of interest, and one which did not, and following these cohorts forward for the outcome of interest.

Case-Control Study: A study that involves identifying patients who have the outcome of interest (cases) and patients without the same outcome (controls), and looking back to see if they had the exposure of interest.

Cross-Sectional Study: The observation of a defined population at a single point in time or time interval. Exposure simultaneously and outcome are simultaneously determined.

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Doctor's Plaza 1st Floor, Room 102, Nairobi