International Journal of Orthopaedics Research
www.orthopaedicsjournal.in
E-ISSN: 2663-0923, P-ISSN: 2663-0915
Received: 07-04-2025, Accepted: 08-05-2025, Published: 23-05-2025
Volume 7, Issue 1, 2025, Page No. 40-44

Presentation and management of old unreduced knee dislocation in a Sub-Urban African setting: A case report

Nwokike OC[1], Enoma O[1], Ogbue AI[1], Ujaddughe OM[2]
[1] Department of Orthopaedics and Traumatology, Irrua Specialist Teaching Hospital, Irrua, Nigeria
[2] Department of Anatomical Sciences, University of Witwatersrand, Johannesburg, South Africa
DOI: https://doi.org/10.66856/ijor.2025.7.1.7007

Abstract
The knee joint is very stable; it is a major weight-bearing joint in mechanical alignment with the hip and ankle for the locomotor system. The knee may dislocate following severe direct trauma and thus become an orthopaedic emergency. If a dislocated knee is not reduced within two weeks, secondary changes such as arthrofibrosis progressively occur. Poor health services, socio-cultural attitudes towards musculoskeletal injuries, and activities of traditional bonesetters are key reasons why patients often present with old or neglected unreduced knee dislocations.
This research reports two cases seen so far within the forty-year existence of our institution, which is in a suburban region of southern Nigeria. The cases reflect the challenges and outcomes of this rare condition with such a bizarre presentation.
The first is a 24-year-old man from a rural farming community who sustained a closed anterior knee dislocation to his right knee following a motorbike accident two years before presentation. He sought care with several traditional bone setters. During that period, he developed an ulceration over the knee that was complicated by the presence of desiccated bones and purulent discharges, following which, a clinico-radiological diagnosis of old unreduced right anterior knee dislocation with peri-articular osteomyelitis was made. We managed by performing a knee arthrodesis procedure, and the patient returned to his daily activities.
The second is a 40-year-old male patient who fell into a ditch while running to escape from assailants and, during which, sustained a closed anterior dislocation of the right knee. He first presented to a traditional bone-setter's care, on account of which the dislocation remained unreduced for greater than three months post-injury. On presentation in our facility, we performed an open reduction. He attained a knee range of motion of 10-90 degrees (flexion) with physiotherapy and was subsequently discharged.

Keywords: Unreduced, dislocation, knee, neglected, old

Introduction

The knee joint is a critical part of the human locomotor system [1]. Its mechanical alignment with the hip and ankle ensures efficient functioning and movement of the lower limbs, which allows for the transmission of the body weight to the foot while standing [2]. The stability of the knee joint is maintained by the static and dynamic stabilisers, such as the menisci and ligaments [1, 3]. The principal static stabilizers of the knee are the medial collateral, lateral collateral, anterior cruciate, and posterior cruciate ligaments [1, 3]. The muscles around the knee, which include the quadriceps, the hamstrings, the popliteus, and the pes anserinus, constitute the dynamic stabilizers of the knee [1, 3, 4]. The joint capsule, the bony configuration of the proximal tibia and distal femur, and the medial and lateral meniscus contribute minimally to the knee's stability [4]. Knee dislocation is generally considered a multi-ligamentous injury, as two or more ligaments in many instances are affected during a knee dislocation [5].

Knee dislocation is a painful musculoskeletal injury that is an emergency requiring immediate attention. Such injury puts the associated soft tissues, ligaments, and neurovascular structures at great risk of damage [5, 6]. The peroneal nerve is at particular risk of injury because it winds around the proximal head of the fibula [5, 6]. A similar fate befalls the popliteal vessels, which are tethered superiorly at the adductor hiatus and inferiorly at the soleal fascial arch, where they lie in close anatomical approximation to the knee joint [7, 8].

Secondary pathological changes affect the knee and periarticular structures in old or neglected unreduced dislocation. Hence, chondrolysis and other secondary joint changes are inevitable 7. The articular cartilage in a dislocated knee suffers both direct physical damage and metabolic derangement from the disruption of the synovial fluid nourishment and oxygen supply [7, 9]. The cartilage, therefore, begins to degenerate. Cartilage fibrillation, wear, and erosion progressively and rapidly occur over time. Inactivity across the joint predisposes the bones to localized osteopenia [8].

The ligaments and joint capsules of the knee suffer the greatest brunt and, in turn, become the greatest impediments to the reduction and stability of the joint [7, 9]. Ligament rupture or tear is common in the setting of knee dislocation, and following a prolonged period of being unreduced, ligament contracture and capsular fibrosis will set in [10]. The peri-articular muscles atrophy with a consequential decline in the gross power of the limb. This decline is proportionate to the duration the knee stays unreduced [10]. Fibrosis and heterotrophic calcifications are the other pathologies that compound an old unreduced knee joint dislocation. The neuro-vascular structures are also affected by secondary changes in old unreduced or neglected dislocation, fibrosis, and tethering, putting the popliteal vessels, peroneal, and tibia nerve in great danger.

All these secondary or pathological changes are made worse if infection and fracture supervene.

Neglected or old unreduced knee dislocation is rare, and only a few reports can be found in the literature. It rarely follows diagnostic errors [11], but more of a reflection of the quality of health care in a society and the socio-cultural health practices and beliefs of the people [12].

Suburban Nigeria has a high patronage of traditional bone setters [13, 15]. These are groups of unorthodox or traditional medicine practitioners who transmit their unstructured orthopaedic skills of practices from generation to generation through close family apprenticeship with no formal education1 [12, 13, 16]. This report examines two cases of unreduced dislocated knees encountered in the forty years of our institution and orthopaedic practice in a suburban region of Nigeria.

Case 1

A 24-year-old man from a rural farming community was involved in a motorcycle crash two years before presentation. He was unable to bear weight on the left lower limb, accompanied by pain and deformity of the left knee, but there were no open injuries at the time. He was taken to a local traditional bone setter, where he had the knee massaged using herbal extracts and immobilized with strips made from bamboo (*Oxytenanthera abyssinica*). Despite several months of undergoing this treatment option, pain, deformity, and swelling persisted, and the patient could still not bear weight. Occasioned by the lack of improvement, the patient changed from the index traditional bone setter to another, only to receive a similar treatment with no improvement in his morbid status. Two years on, as a consequence of the tight bamboo wood strapping, he developed a recurrent discharging wound at the medial side of the affected knee, with parts of the medial femoral condyle exposed. The failure of the wound to heal necessitated his seeking medical attention in our hospital facility. There were no other adverse health factors in this patient.

Examination revealed a swollen, deformed left knee with ulceration at the posteromedial aspect of the knee and a discharging sinus. A partially desiccated medial condyle of the femur was visible through the wound. The patient had limb shortening on the left knee, with a limb length discrepancy of 3.0 cm. There was a mediolateral instability and hyperextended knee with restriction in knee flexion. He had no distal neurovascular deficit. The contralateral knee, both ankle, and hip joints had a full range of motion, with no demonstrable deformity or anatomical disorder. A plain radiograph of the affected knee showed an anteriorly dislocated knee joint (Fig 1); financial limitation prevented further investigation. A diagnosis of an infected open old unreduced anterior knee dislocation was made.

We performed a knee arthrodesis using a Chanley's clamp through a medial parapatellar approach to the knee. Operation findings include multiple loose flakes of cartilage, patches of denuded femoral condylar articular cartilages, sequestrums, abscess cavities, and soft tissue contractures. The surgery involved extensive soft tissue debridement, removing all necrotic tissues and debris, as well as shaving off the distal femur and proximal tibia articular cartilage. Tibiofemoral reduction was in five-degree external rotation and flexion. Chanley's clamp was applied and locked in this position, following which a long leg back slab was applied to enhance stability.

The process of tibiofemoral fusion was achieved at the fifth postoperative month, and he has successfully returned to his farming, fully engaging in his activities of daily living. The patient was thereafter followed up in the department for 10 years (Fig2).

Fig 1: Preoperative radiograph of the joint showing anterior knee displacement.

Fig 2: Postoperative radiograph showing 10 years post arthrodesis

Case 2

A 40-year-old man fell into a ditch while running to escape from some assailants; in the process, he sustained a closed knee injury. The injury was characterized by pain, deformity, limb shortening, and abnormal movement. He was treated at a nearby primary healthcare facility with no significant changes. He resorted to traditional bone setters and yet did not achieve any progress.

He then presented to our facility after three months of injury. On examination, the knee was swollen and deformed and had a bony fullness of the popliteal fossa with limitation in flexion and extension movement as well as mediolateral instability. The distal peripheral pulses were palpable with no neurological deficit. Plain radiograph showed anterior knee dislocation (Fig 3). A diagnosis of old unreduced anterior knee dislocation was established.

Closed manipulation failed to reduce the knee, and an open reduction was performed through a mid-line knee incision and medial para-patellar arthrotomy approach to the knee joint. The patella was retracted laterally to expose the distal femur and proximal tibia. The findings were a dislocated knee joint with contracted soft tissues and pockets of dull areas in a largely glistering femoral and tibia articular cartilage. The anterior cruciate ligament (ACL) was avulsed from the tibia attachment. A blunt homman retractor was inserted into the intercondylar space of the femur, and using the tibia plateau as a fulcrum, the femur was levered onto the tibia to achieve an effective reduction. The detached ACL was reattached to the tibia through drill holes. Trans-articular cross-Steinman pin was driven from the tibia into the femur to stabilize the reduction (fig 4 and 6). An above-the-knee back slab support was applied to reinforce stability. The patient was ambulated non-weight bearing, and the Steinman pins were retained for 6 weeks before it was removed, and partial weight bearing commenced on a functional knee brace. Physiotherapy was continued, and by three months post-surgery, the patient attained a 10 to 90degree range of motion (flexion).

Fig 3: Anterior knee dislocationKD11

Fig 4: Erosion of articular cartilage femoral condyles

Fig 5: Cross Steinman pin immobilization

Fig 6: Cross Steinman pin immunization

Fig 7 – 6: Months post reductio

Discussion

Knee dislocation usually results from significant trauma [17]. It is relatively uncommon and constitutes about 0.05 % of all orthopaedic trauma18. Old unreduced knee dislocation can pose a lot of challenges to the surgeon and the patient, as reflected in the case presented. The literature on this subject is mainly case reports reflecting the rarity of this condition [19, 20].

Expectedly, patients who suffer significant trauma that resulted in knee dislocation should present promptly in the Emergency room, and with the help of a plain radiograph, it is usually easy to make a diagnosis. This is, however, not the finding in these two cases under reference. Patients in our locality have their health-seeking attitude greatly influenced by strong socio-cultural beliefs in the activities of traditional bone setters [18]. These traditional bone setters are untrained, unorthodox traditional healers who deploy different uncensored approaches to patient management [14]. They mainly acquire their skills from their family lineages engaged in business apprenticeship through oral tutelage with no knowledge of basic human anatomy and physiology [12, 13, 16]. This accounts for the obvious mismanagement of a serious injury like a knee dislocation, misdiagnosed, unreduced, and neglected, as seen in the two cases presented. Sadly, the patients have so much confidence in the TBS and are willing to stick to them unless the practitioners give up or some other complications develop, as typified in our first case. The potential for neurovascular damage in knee dislocation is high. In our two cases, there was no vascular damage, perhaps the presentation would have been more dramatic [8].

Our first patient was complicated by a foot drop, which probably resulted from damage to the common peroneal nerve1, either due to direct damage from the injury or iatrogenic damage from compartment syndrome [21]. Common peroneal nerve damage is the most common neurological involvement in knee dislocation6. This is probably due to the anatomical vulnerability of the common peroneal nerve as it winds around the fibular neck, where immobility of the dislocated knee joint further restricts it via a pulling force [7].

Multiple ligament injuries are common with knee dislocation [22]. In the first patient, it was difficult to delineate the affected ligaments due to the prolonged duration of injury and severe secondary changes [10, 22]. The second case, however, presented with avulsion of the tibia insertion of the anterior cruciate ligament. This was, however, reattached during the primary procedure of joint reduction. It is generally agreed that the ligament should be repaired to improve the stability of the knee joint, but there is no consensus on the modality of repair [23]. Some authors have deferred repairs of ligament as a secondary procedure [23].

The key secondary changes seen in neglected or old unreduced knee dislocations are arthrofibrosis and chondrolysis [7]. This is manifested in the cases presented; the severity of these complications depends on the time interval between injury and the reduction of the joint. In the first patient, it was made worse by the superimposed infection. Arthrofibrosis makes close reduction nearly impossible [24]. This is seen in the failed attempt at a close reduction in the second case presented. There are varied options and reported outcomes of treatment of old unreduced knee [22]. The joint changes make it inevitable that at some point in time, the patient will require a total knee replacement.

We offered our first patient an arthrodesis because of the degree of joint damage, the observed osteonecrosis of the exposed condyles, open injury, ongoing infection, the age of the patient, and the severe financial constraint of the patient and his family. It was the desire of our team to get the patient back to his activities of daily living and functional as soon as possible at a cost he could afford, as to do otherwise would have required multiple surgeries with a largely unpredictable outcome [7]. We were mindful of the challenges of arthrodesis [25]. The presence of normal right and left hip and ankle joints, as well as a normal contralateral knee joint, made arthrodesis plausible[25]. Arthrodesis came in handy as our best option for him, and as expected, the patient is back to his farming occupation and activities of daily living.

The second patient presented to our facility somewhat earlier and had no infection. The managing team was able to achieve an open reduction following the failed attempt at close reduction, using the method reported by Mani *et al* [26]. (2016) [26] and achieved an outcome similar to our second case presented. [26]

The patient was able to achieve a satisfactory range of knee motion and has returned to his work and activities of daily living. This patient, however, reported moderate knee pain, a situation that is not unexpected. The goal of our treatment in the second case presented was essentially to temporize, buy time, and make the patient suitable for further treatment because total knee replacement is inevitable with time[11]. Options for the treatment of old unreduced knee dislocation with optimal outcomes are evolving, with no consensus but largely dictated by the presenting condition and time to reduction [27, 28].

Conclusion

Old unreduced knee dislocation is a rare presentation. It is challenging for the patient who is incapacitated by this condition and for the doctor who will deal with the task of managing the complications. Advocacy, advances in healthcare delivery, public enlightenment and health education will mitigate further the incidence of neglected knee dislocation. The two cases presented are typical of the dilemma faced in the management of old unreduced knee dislocation.

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