



RESEARCH ARTICLE

TIBIAL MALUNION WITH ANGULAR DEFORMITY MANAGED WITH CORRECTIVE OSTEOTOMY AND PHILOS PLATING IN A 15-YEAR MALE - CASE REPORT AND REVIEW OF LITERATURE

Amit Supe, Jayesh Mhatre and Nihar Modi

Manuscript Info

Manuscript History

Received: 24 August 2021

Final Accepted: 27 September 2021

Published: October 2021

Key words:-

Malunited Distal Tibia Fibula Fracture,
Philos Plate

Abstract

Tibia and fibula shaft fracture are common among young and old, if they are not managed correctly, can be debilitating in long term. Management of these fractures depends on severity, stability, and pattern of fracture. Options can range from conservative management by plate to external fixation, especially in the case of an open fracture. Unfortunately, the ideal fixation option (commonly used plate or nail) implant is not always available in operation theatre, in such circumstances closed reduction if not properly maintained can lead to malunion, especially in young age when healing is very rapid and such malunion can lead to early induced arthritis or many other complications¹. here we discuss a case of 15-year-old male with a left distal tibia and fibula malunited fracture 11 months old, who presented with complaints of pain and deformity over distal 1/3 rd of right lower leg, patient required open reduction and internal fixation with 4-hole PHILOS (PROXIMAL HUMERAL INTERNAL LOCKING SYSTEM) plate for tibia and LCP (Locking Compression Plate) plate for fibula. We conclude that in cases of distal tibia and fibula malunion when managed with open reduction internal fixation with osteotomy with PHILOS plating for deformity correction gives good result.

Copy Right, IJAR, 2021., All rights reserved.

Introduction:-

Fractures of the tibial and fibular shafts are the most common long bone fractures of the lower extremity and represent approximately 15% of all paediatric fractures. They occur more frequently in boys than in girls¹. Fractures of the tibia and fibula may be the result of direct or indirect deforming forces. Direct trauma usually produces a transverse fracture or segmental fracture pattern, whereas indirect forces are usually rotational and produce an oblique or spiral fracture¹. Despite the frequency of paediatric tibial and fibular fractures, the consequences for most children are very less. These fractures heal quickly with minimal complications. Children typically have a rapid return to normal activities, including sports, and limited disability. However, in a small percentage of cases, especially those involving open fractures or severe soft tissue injury, residual disability may occur. Fractures of the shaft of the tibia often heal with some degree of angulation. Although there is biomechanical evidence that such angulation alters load transmission through the joints of the lower limb, it is not clear whether it can eventually lead to osteoarthritis². The incidence of proximal tibial fractures due to high-energy trauma has increased gradually, today accounting for 5%–11% of all tibial fractures. Surgical treatment of these traumas remains a major clinical challenge and functional recovery is affected by various factors, including the injury mechanism, the severity of the initial injury, treatment options, and the quality of fracture reduction^{3,4}.

Case Report

A 15-year-old male student presented to our hospital with complains of pain and deformity over left lower leg for 11 months and difficulty in walking, patient gives history of fall from height 11 months back approximately 11 feet in height, patient was taken to local hospital where he was given a POP slab immobilisation and then a cast for five weeks, no previous radiograph is available. on examination patient had valgus deformity of 30 degrees over left lower leg with no mobility, tenderness or swelling over fracture site, overlying skin was healthy with no scars or previous healed wounds. Ap and lateral Radiographs were done which were suggestive of Malunited left distal tibia and fibula with 30-degree valgus deformity. As he was relatively fit for surgery he was planned for open reduction and internal fixation with osteotomy, the operation was performed under spinal anaesthesia in supine position with tourniquet applied in all aseptic precautions. For tibia, medial approach was taken and for fibula lateral approach was taken, malunion site was identified, closing wedge osteotomy at previous fracture site was done for tibia and fibula, this medial fracture was not amenable to screw fixation or tension band wiring, an LCP plate was applied which did not have adequate fit. the next alternative was to use PHILOS plate as it appeared to fit the contours appropriately, intra-operative decision was made to use 3.5 mm four-hole PHILOS. the plate fit the distal tibia contours well once the fracture was reduced. three proximal non locking cortical screws and multiple distal locking screws were applied producing a stable construct, with reduction of fracture and valgus deformity.

Discussion:-

The deforming forces acting on the tibia after fracture include the extensor mechanism, which promotes an apex-anterior deformity. The gastrocnemius flexes the distal fragment. The pes anserinus and anterior compartment muscles promote a valgus deforming force. Avoiding flexion and full extension during fixation therefore helps to maintain the reduction by neutralizing these deforming forces⁵. There is no strong consensus on the optimal management of minimally displaced closed midshaft tibial fractures, with both cast treatment and intramedullary nailing (IMN) having strong support, Malalignment following IMN is more common in distal fractures than in diaphyseal fractures, since the metaphyseal flare does not give a snug endosteal fit and offers minimal cortical contact for the nail, in many cases where healing capacity of bone is normal, improperly maintained closed reduction or in cases of Intra-medullary nailing can lead to malunion which can further aggravate to traumatic arthritis⁶. In cases of open reduction principle of holding a fracture in place with locking screws and plates means that the distance of the plate from the bone is less important, in contrast to the importance of adequate proximal and distal hold. The stable Monoblock is achieved by threading of the screws into the plate and the bone. Although the locking plate does not need to be opposed to the bone with these prostheses, problems may occur if it is not close enough⁷. Any prostheses too big or distant from the ankle will result in difficult closures, tenting skin and wound-healing problems. Malunion of fractures can disrupt normal joint movement, leading to non-physiological stress and traumatic arthritis (TA) of the knee⁴. Malunion and malalignment of lower limbs after fracture healing is an important factor for knee and ankle joints to develop TA. Studies show that an individual with tibial fractures that heal with residual deformity may have increased risk of pain and stiffness in knee and ankle joints. Residual varus and valgus deformity after tibial fracture malunion can lead to obvious changes of the stress distribution of the knee joint^{8,9}. Therefore, tibial fractures should be reduced anatomically and fixed rigidly to avoid residual varus-valgus deformity and malalignment of lower limbs¹⁰. The choice of fixation method for operative cases should be reviewed on a case-by-case basis. In immobile, frail patients with un-displaced tibial shaft fractures non-operative management has a role. In most other cases a reamed tibial nail is the treatment of choice and in cases in malunited distal tibia with valgus deformity, the above protocol can be used successfully as demonstrated in our case.



Figure 1:- Pre-operative image.



Figure 2:- Day 1 Post-operative.



Figure 3:- 6 months Follow up.



Figure 4: a

Conclusion:-

We believe that the use of the Philos plate not only provided a very stable form of fixation, but also allowed for a faster recovery due to its locking screws and so the patient was able to load bear and also it avoids the external hardware which may inhibit the range of joint motion. To our knowledge, the use of a Philos plate to stabilize an osteotomy made necessary by fracture malunion has not been rarely reported. We report favourable outcome in our case by using corrective distal osteotomy with Philos plate for managing distal tibia malunion.

Funding

Nil

Conflict of interest

Nil.

References:-

1. Koval KJ, Zuckerman JD. Handbook of Fractures, 3rd edn. Lippincott Williams & Wilkins, London, 2006.
2. Ahmad J, Pour AE, Raikin SM. The modified use of a proximal humeral locking plate for tibiototalcalcanal arthrodesis. Foot Ankle Int 2007; 28:977–83.
3. Smith WR, Ziran BH, Anglen JO, Stahel PF. Locking Plates: Tips & Tricks. J Bone Joint Surg Am 2007;89A:2298–307.
4. Twaij H, Damany D. PHILOS humerus plate for a distal tibial fracture. Journal of Surgical Case Reports. 2013 Jan;2013(1). DOI: 10.1093/jscr/rjs036.
5. Milner SA, Davis TR, Muir KR, Greenwood DC, Doherty M. Long-term outcome after tibial shaft fracture: is malunion important? J Bone Joint Surg Am. 2002 Jun;84(6):971-80. doi: 10.2106/00004623-200206000-00011. PMID: 12063331.
6. Wright JG. Long-term outcome after tibial shaft fracture. J Bone Joint Surg Am. 2003 Jul;85(7):1396; author reply 1396. doi: 10.2106/00004623-200307000-00043. PMID: 12851376.
7. Greenwood DC, Muir KR, Doherty M, Milner SA, Stevens M, Davis TR. Conservatively managed tibial shaft fractures in Nottingham, UK: are pain, osteoarthritis, and disability long-term complications? J Epidemiol Community Health. 1997 Dec;51(6):701-4. doi: 10.1136/jech.51.6.701. PMID: 9519136; PMCID: PMC1060570.
8. Li M, Chang H, Wei N, Chang W, Yan Y, Jin Z, Chen W. Biomechanical Study on the Stress Distribution of the Knee Joint After Tibial Fracture Malunion with Residual Varus-Valgus Deformity. Orthop Surg. 2020 Jun;12(3):983-989. doi: 10.1111/os.12668. Epub 2020 May 27. PMID: 32462810; PMCID: PMC7307236.
9. Müller F, Dobliger M, Eckstein C, Füchtmeier B. Die PHILOS-Platte – auch an der distalen Tibia eine Indikation zur Osteosynthese? [The PHILOS plate-also an indication for osteosynthesis of the distal tibia?]. Unfallchirurg. 2020 Apr;123(4):326-329. German. doi: 10.1007/s00113-020-00782-x. PMID: 32052083.
10. Lai TC, Fleming JJ. Minimally Invasive Plate Osteosynthesis for Distal Tibia Fractures. Clin Podiatr Med Surg. 2018 Apr;35(2):223-232. doi: 10.1016/j.cpm.2017.12.005. Epub 2018 Feb 1. PMID: 29482791.