Surgical management of Bimalleolar ankle fractures: A narrative review

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Abstract
Bimalleolar injuries are the most common significant lower extremity fractures. Open reduction of the fracture and internal fixation methods have become the good option of the treatment for bimalleolar fractures. The aim of the study is to assess the outcome following surgical management of ankle fracture. Classifications used is Danis-Weber. The outcome is assessed using the olerud and molander scoring system. We performed a narrative review to assess the functional outcome of surgically managed bimalleolar ankle fractures. An extensive search of articles was done electronically using databases like PUBMED, Google scholar, reference checking. We concluded that internal fixation for bimalleolar ankle fractures gives better reduction, and functional outcome showing significant improvement in the function of the ankle joint.

Keywords: Bimalleolar ankle fractures, functional outcome, Olerud and molander scoring

Introduction
Bimalleolar ankle fractures are the most common injuries treated by orthopaedic surgeons [1-3]. Bimalleolar ankle fracture is usually caused by twisting injury with multiple force mechanisms [4-6]. The ligaments around the medial and lateral malleoli provides stability to the ankle joint [7]. Identification of these injuries and their treatments involve not only bone injuries, but also identification of damage to soft tissue and ligaments around them [8-9]. Bimalleolar fractures are intra-articular injuries [10-12]. The main goal in the management of these fractures is to restore normal anatomy. Anatomy and contact-loading characteristic of joint are restored by the operative method. Other advantages in this methods are, we can mobilise the patient as early as possible, no need for cast application, the patient can weight bear earlier and rehabilitation will be easier [13]. The diagnosis is made by proper history taking and examination.

Investigations
x-rays are taken in 3 different views- Anterior-posterior view, a Lateral view and a Mortise view [14].

CT scan and MRI is also taken
The various modalities for internal fixation of bimalleolar ankle fractures are plating, Screw fixation, K-wire fixation and Tension band wiring [15-17]. Only a few researchers performed a study in examining the outcomes and recovery of patients followed by internal fixation of fractures of the ankle. This study purpose is to evaluate the outcome of operated bimalleolar fractures using C Olerud and H Molander scoring scale [18].

Methodology
Extensive search of articles was done electronically using databases like PUBMED, Google scholar, reference checking. Since the type of studies are different and the outcomes are measured using various different methods, a narrative review was appropriate for this study. Number of articles found were 212, in which 11 studies were selected which satisfied the inclusion criteria. The articles were from august 2000 to august 2020.
Danis-Weber/AO Classification [18]
Type A: Lateral malleolar fractures below the level of the ankle joint space.
Type B: Oblique fractures of the lateral malleolus that start at level of joint space and then extend proximally.
Type C: Distal shaft of the fibula proximal to the ankle joint

Olerud-Molander Ankle Score
The scale is a functional rating scale and it consists of nine parameters, which are listed below [3, 19].
Such as pain, then Running, then Stiffness, then Swelling, Stair climbing, Jumping, Squatting, Supports, daily living activities

Results
Ramana et al. did a study on internal fixation of 48 cases bimalleolar fractures from Vijayawada. They concluded that pronation – abduction type of mechanism was common and then followed by supination & external rotation mode of injury. The most common cause was slip and fall [20].
Vivian et al. conducted a study on the functional outcome of operated cases of 45 ankle fractures from Mangalore. Olerud and Molander scoring system was used in this study. They observed fractures with internal fixation yield good outcomes. They concluded early treatment of fractures of the ankle without delay, provides better anatomical reduction and fixation in 16 cases. Better post-operative mobilization and rehabilitation helps in improving outcome in operated ankle fractures [21].
Alamgir et al. did a study on tension band wiring for displaced lateral malleoli fractures and for bimalleolar fractures, plating was done in 20 patients. They concluded displaced lateral malleolus fractures demands surgical management accompanied with tension band wiring with the use of 2 k-wires which gives a stable fixation and helps in the union of fracture [22].
Ayyoub A. Mohammed et al. performed a study to compare tension band wiring and screw fixation for medial malleolus fractures among 20 patients. The outcome was good in four fifth of patients of malleolar screw fixation and 90% of tension band wiring cases [23].
Dhoju Singh Jhatoh did a study to evaluate the outcomes in 27 patients who underwent internal fixation. Baird & Jackson scoring system is used. It was observed that 83.2% as Good, 8.3% as Fair and 8.3% as poor outcome [24].
Vijay et al. performed a prospective study in assessing surgical management of 36 cases of malleolar fractures from Pune. The outcome were based on Baird & Jackson scoring system and they observed excellent results in 30.6% patients, 55.6% had good results, 8.3% patients had fair results and results were poor in 5.5% [25].
Mohan et al. did a study to assess the clinical outcome of 45 cases of ankle fractures from a period of June 2015- February 2016 in Mangalore. They observed improvement in pain and also in activity levels [26].
Ostrum et al. did a study on open reduction internal fixation of bimalleolar fracture of ankle along with syndesmotic injury and stated that failure to sufficiently recognise and treat injuries to tsyndesmosis may outcome in continued ankle instability and poor patient outcomes [27].
K. Ramkumar Reddy et al. Did A study in which he did tension band wiring for fractures of the medial malleolus and assessed their outcome in 30 patients who are in Warangal. They concluded understanding the mechanism of fracture preoperatively is significant for reduction and fixation procedure, in terms of better outcomes of procedures [28].
Dhoju D performed a study on Outcome of 32 cases of Bimalleolar Fractures in Nepal. Excellent results were found in surgically treated cases. They concluded syndesmotic screw was not a significant association in comparing outcomes [29].

Conclusion
As per the review of literature done, studies suggest that internal fixation for bimalleolar ankle fractures gives better reduction, and functional outcome. In our study all patients had Good functional outcome, in our study ankle joint was mobilised early to achieve good range of movements. Early weight bearing and mobilisation is achieved in all patients. Further studies can be performed with better period of follow up and better assessment using radiological methods.

References
1. Srivastava D, Yadav SJ, Shukla M, Gupta A, Singh A, Yadav RR. Comparative Study of Functional Outcome of Different Methods of Treatment of Fracture Talus and their Complications: A Prospective Study. J Bone Jt Dis 31(2), 30-2.
2. Verhage SM, Schipper IB, Hoogendoorn JM. Long-term functional and radiographic outcomes in 243 operated ankle fractures. J Foot Ankle Res 2015;25:8(1).
3. Court-Brown CM, McBirnie J, Wilson G. Adult ankle fractures - An increasing problem? Acta Orthop Scand. 1998;69(1):43-7.
4. Bugler KE, White TO, Thordarson DB. Focus on Ankle Fracture. J Bone Joint Surg Br 2012;94:1107-12.
5. Dhoju D. Operative outcome of bimalleolar fractures. Kathmandu Univ Med J 2019;17(66):131-5.
6. Anghong C. Ankle fracture configuration following treatment with and without arthroscopic-assisted reduction and fixation. World J Orthop 2016;7(4):258-64.
7. Prathap P, HS A, Kondlapudi ASH. Functional outcome in surgical management of Bi- malleolar fractures in adults. Int J Orthop Sci 2016;2(4b):72-6.
8. Beris AE, Kabbani KT, Xenakis TA, Mitsionis G, Soucacos PK, Soucacos PN. Surgical treatment of malleolar fractures. A review of 144 patients. Clin Orthop Relat Res 1997;(341):90-8. 66
9. Reddy KR, Rao TK, Rathod J, Kiran V. A Prospective Study on Surgical Management of Medial Malleolar Fractures with Tension Band Wiring. Int J Contemp Med Res ISSN 2016;3(7):2049-52.
10. Ostrum RF, Avery MC. Open reduction internal fixation of a bimalleolar ankle fracture with syndesmotic injury. Vol. 30, Journal of Orthopaedic Trauma. Lippincott Williams and Wilkins 2016, S43-4.
11. Lamontagne J, Blachut PA, Broekhuyse HM, O’Brien PJ, Meek RN. Surgical treatment of a displaced lateral malleolus fracture: The antiglide technique versus lateral plate fixation. J Orthop Trauma 2002;16(7):498-502.
12. Ngcelwane MV. Management of open fractures of the ankle joint. Injury 1990;21(2):93-6.
13. Pritchett JW. Rush rods versus plate osteosyntheses for unstable ankle fractures in the elderly. Orthop Rev 1993;22(6):691-6.
14. Kaplan AV. [Surgical treatment of ankle fractures]. Khirurgiya (Sofia) 1956;32(9):6-10.
15. Ankle Fractures and Dislocations. In: Surgical Treatment...
of Orthopaedic Trauma. Georg Thieme Verlag 2016.

16. Singh A. Ankle Joint Anatomy | Bone and Spine [Internet]. Boneandspine.com. 2018 [cited 2020 Aug 29]. Available from: https://boneandspine.com/ankle-joint-anatomy/

17. Greenfield DM, Eastell R. Risk factors for ankle fracture. Osteoporos Int 2001;12(2):97-103.

18. Bimalleolar Fracture | Broken Ankle: Causes, Symptoms, Diagnosis, Treatment [Internet]. [cited 2020 Aug 29]. Available from: https://www.medindia.net/patients/patientinfo/bimalleolar-fracture.htm

19. Bimalleolar Left Ankle Fracture [Internet]. [cited 2020 Aug 29]. Available from: http://medicalexhibits.com/medical_exhibits.php?exhibit=15086_02X&query=lateral_front_fibula_tibia_talus_calcanus

20. Segal G, Elbaz A, Parsi A, Heller Z, Palmanovich E, Nyska M et al. Clinical outcomes following ankle fracture: a cross-sectional observational study. J Foot Ankle Res 2014;7(1):1-7.

21. Tejwani NC, McLaurin TM, Walsh M, Bhadsavle S, Koval KJ, Egol KA. Are outcomes of bimalleolar fractures poorer than those of lateral malleolar fractures with medial ligamentous injury? JBJS 2007;89(7):1438-41.

22. Hancock MJ, Herbert RD, Stewart M. Prediction of outcome after ankle fracture. J Orthop Sport Phys Ther 2005;35(12):786-92.

23. Nilsson GM, Jonsson K, Ekdahl CS, Eneroth M. Unsatisfactory outcome following surgical intervention of ankle fractures. Foot Ankle Surg 2005;11(1):11-6.

24. Ovaska M. Complications in ankle fracture surgery. Acta Orthop 2015;86(s358):1-35.

25. Schepers T, De Vries MR, Van Lieshout EMM, Van der Elst M. The timing of ankle fracture surgery and the effect on infectious complications: a case series and systematic review of the literature. Vol. 37, International orthopaedics. Springer 2013, 489-94.

26. Home | AOFAS [Internet]. [cited 2020 Aug 29]. Available from: https://www.aofas.org/

27. Miller AG, Margules A, Raikin SM. Risk Factors for Wound Complications After Ankle Fracture Surgery. J Bone Jt Surgery-American 2012;94(22):2047-52.

28. Ankle-Foot Outcome Measures | eORIF [Internet]. [cited 2020 Aug 28]. Available from: https://eorif.com/ankle-foot-outcome-measures

29. Olerud C, Molander H. A scoring scale for symptom evaluation after ankle fracture. Arch Orthop Trauma Surg 1984;103(3):190-4.