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A Retrospective analysis of various management strategies for compound fractures of tibia and functional outcome

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Abstract
Introduction*: Management of open fractures of tibia is still debatable. Several patient factors and injury patterns keep the surgeon wondering as to optimal choice of implant. With recent report favouring nailing in open fractures a retrospective analysis was done regarding management of open fractures of tibia.*
Material And Method*: Retrospective study done at our center from December 2014 to March 2017wherein 106 cases of compound fractures of tibia were reviewed regarding patient factors, injury mechanisms, management and outcome. Only skeletally mature patients with compound fractures of tibia shaft Gustilo grade IIIA were included in study.*
Result*: Data analysis revealed that 106 cases of open fracture shaft of tibia were managed between May 2014 to September 2016 of which 62 were managed primarily by external fixator and 44 by interlocking nailing. Average follow-up available for patients was 14 months (range 10-18 months). Patients managed by external fixator had more cases of delay in presentation as compared to patients managed by interlocking nailing.*
Conclusion*: Primary management of open injuries is still largely done using external fixators. Several factors play a role, mainly being delay in presentation and patient health status.*
Key Words: open fractures, tibia, external fixator, intramedullary nailing.

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I. Introduction

Tibia, because of its very location is frequently exposed to injuries. It's one third surface being subcutaneous; it often suffers from open fractures. Furthermore, the blood supply to the tibia is already precarious and it is guarded by the presence of hinge joints at the knee and the ankle which allow no adjustment for the rotatory deformity.

The open fractures are more common of tibia than in any other long bone. These fractures are frequently complicated by delayed union, malunion and infection. [2][3]

Open tibial shaft fractures are generally classified according to the three-graded system published by Gustilo and Anderson. [4] But this system does not take into account patient characteristics.

External fixation devices have been quite popular in the management of these fractures. But recently unreamed intramedullary nailing, as initial definitive management of these fractures, has been gaining acceptance. Historically, the 6-hour rule has been employed as the time limit within which an open fracture should be taken to the operating room for initial debridement. [4]Many factors influence this parameter including the operating room availability, surgeon availability, and the patient's physiologic status.[5] But this is rarely possible considering the frequent delays in patient presentation. Strict adherence to the emergent 6-h rule does not seem to be justified based on empiric evidence available in the literature. [6-11] The purpose of the present study was to evaluate the patient characteristics pertinent in decision making for open fractures of tibia of similar grade and compare the outcomes.

II. Material and methods

We collected data on patients presenting to us with open fractures of tibia from December 2014 to January 2017. Only patient's with open injuries of tibial diaphysis classified as Gustilo grade IIIA were included in the study. Patients with neurovascular injuries and extension of fracture into metaphyseal region of proximal and distal tibia were excluded. Patient records were carefully analysed and following things were recorded; duration between injury to presentation to hospital, nature of primary treatment, duration from injury to surgery for stabilization of fracture, associated injuries, serial photographs of wounds, serial X-rays, antibiotic protocol, pre-existing co-morbid conditions, need for secondary surgeries and final outcome as assessed at follow-up of one year or more.

III. Results

Data analysis revealed that 106 cases of open fracture shaft of tibia were managed between May 2014 to September 2016 of which 62 were managed primarily by external fixator and 44 by interlocking nailing. Average follow-up available for patients was 14 months (range 10-18 months).

There were 82 male and 24 female study participants with an average age of 38 years (range 20-64 years). High velocity road traffic accidents (86) were the most common cause of injury, followed by fall from height (12) and assault by hard and blunt object (8).

Figure 1 Wound Management

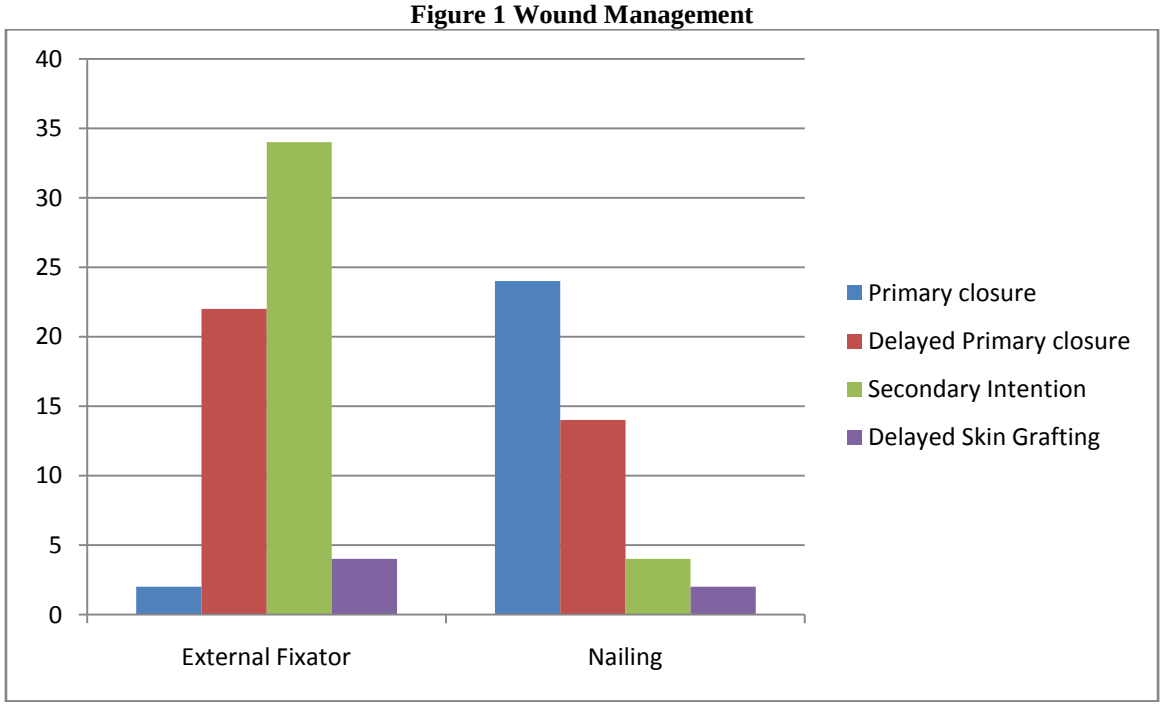


Figure 2 Fracture pattern

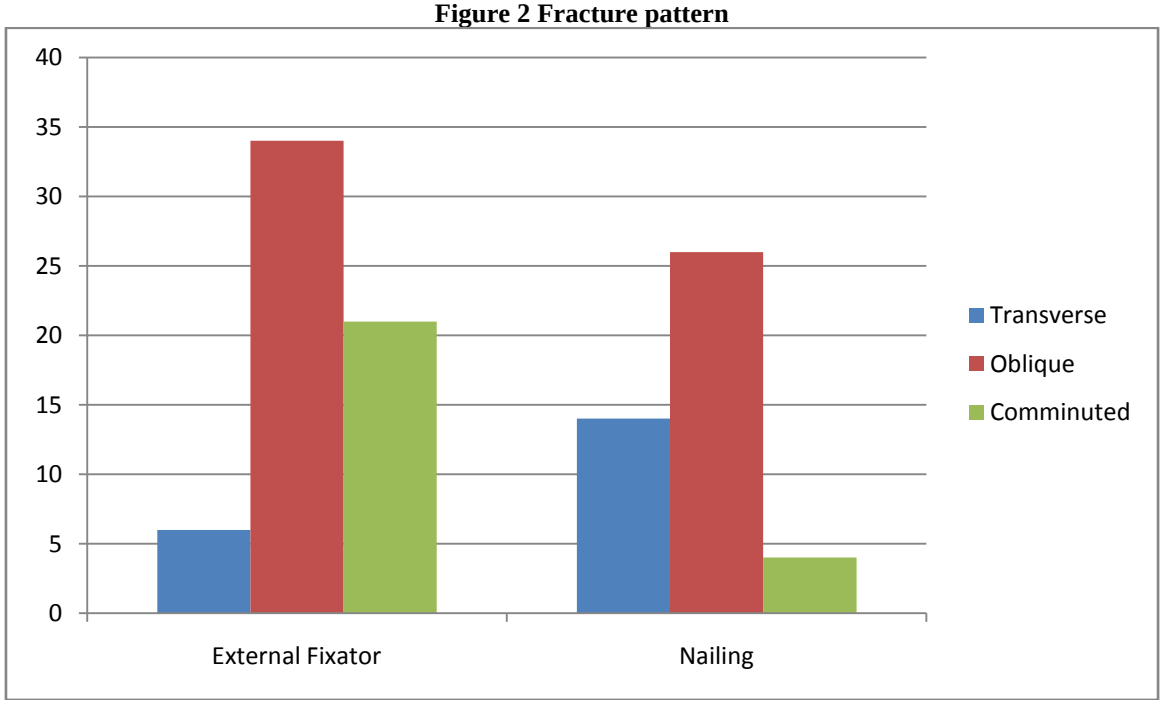


Figure 3 Age distribution

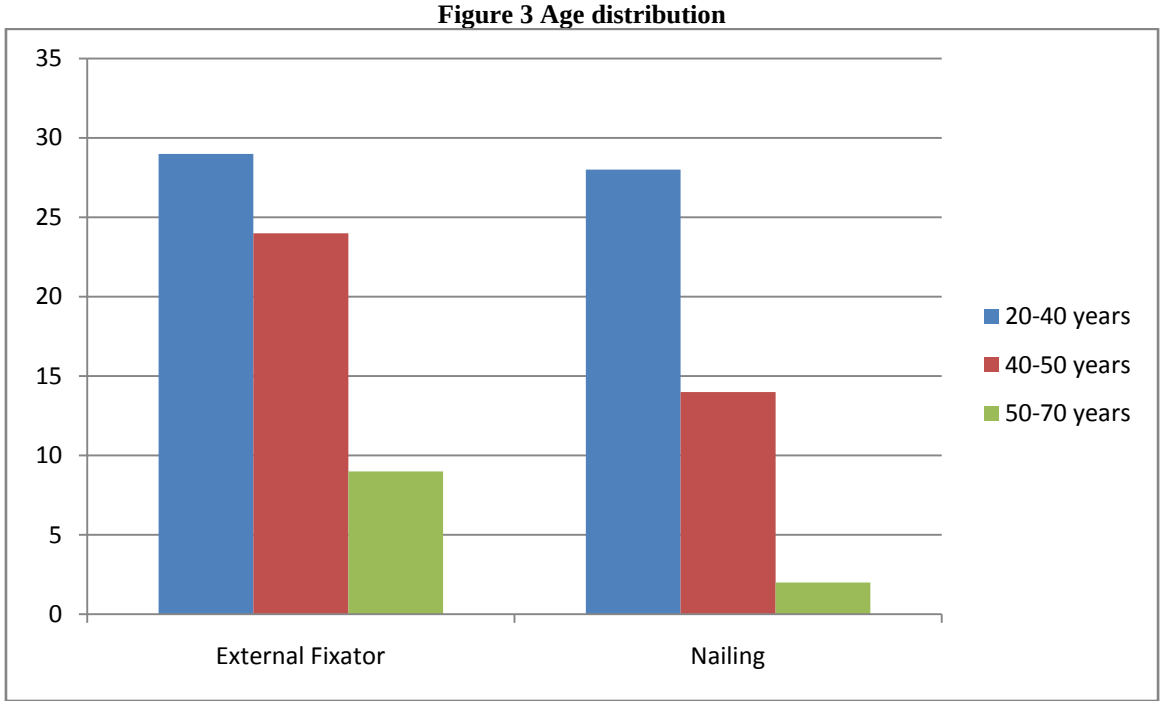


Figure 4 ASA Classification of patients

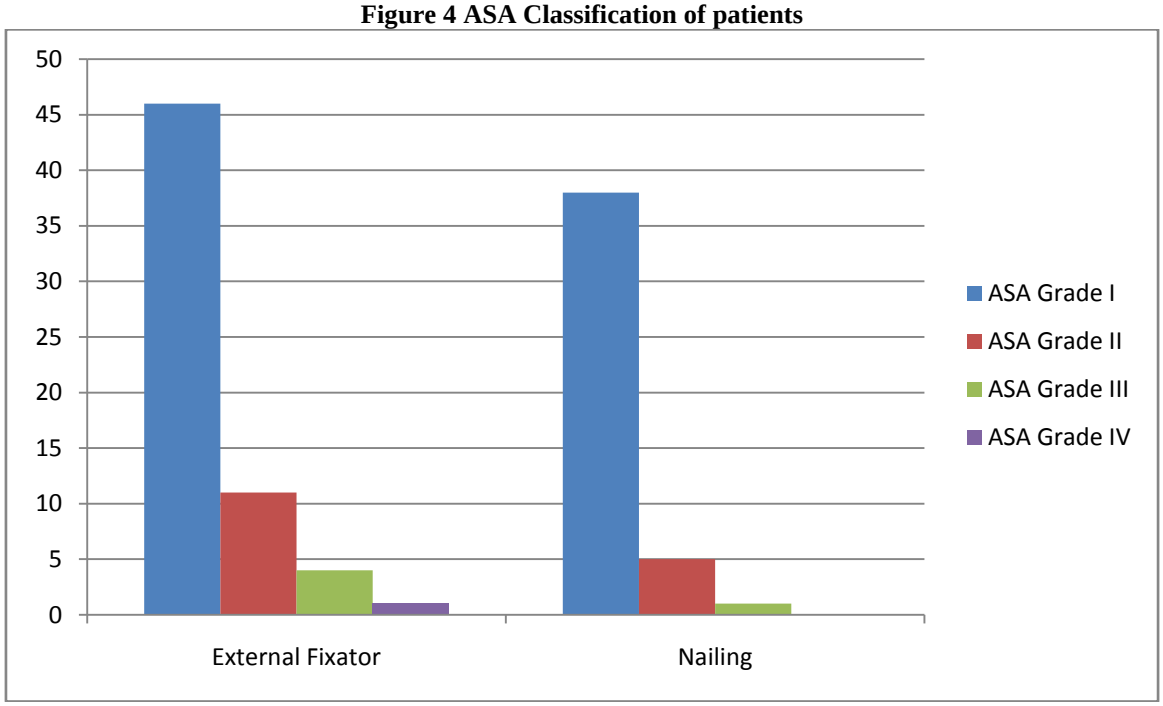


Figure 5 Secondary procedures for non union

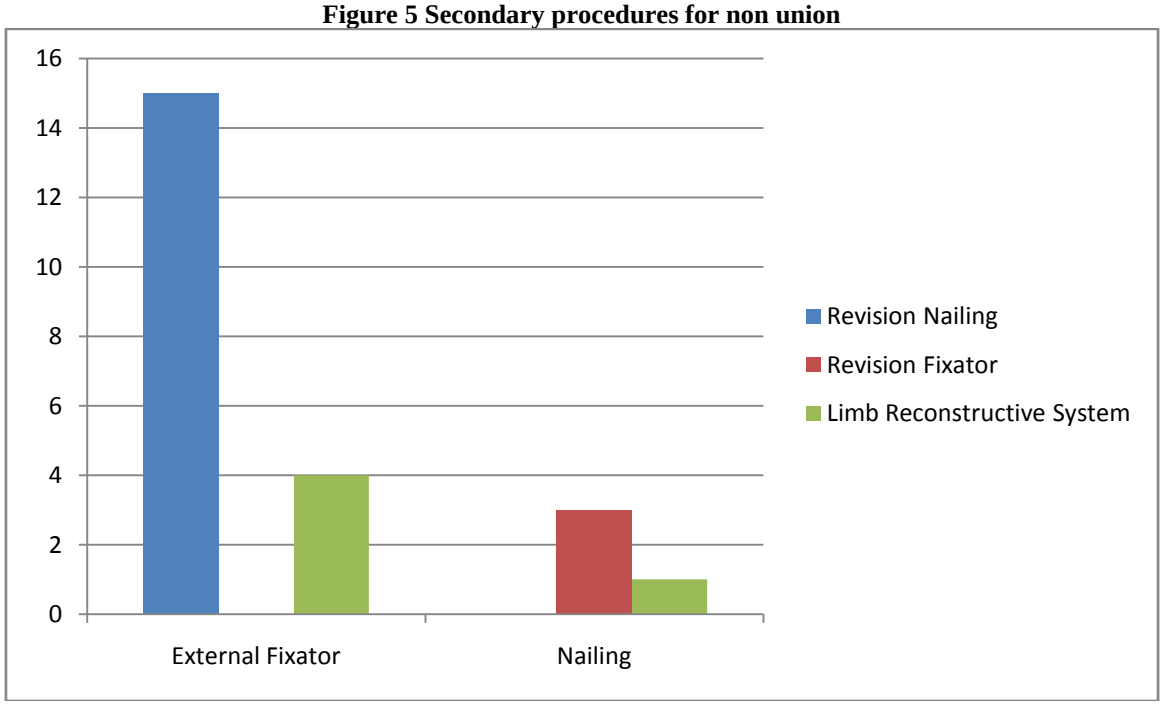
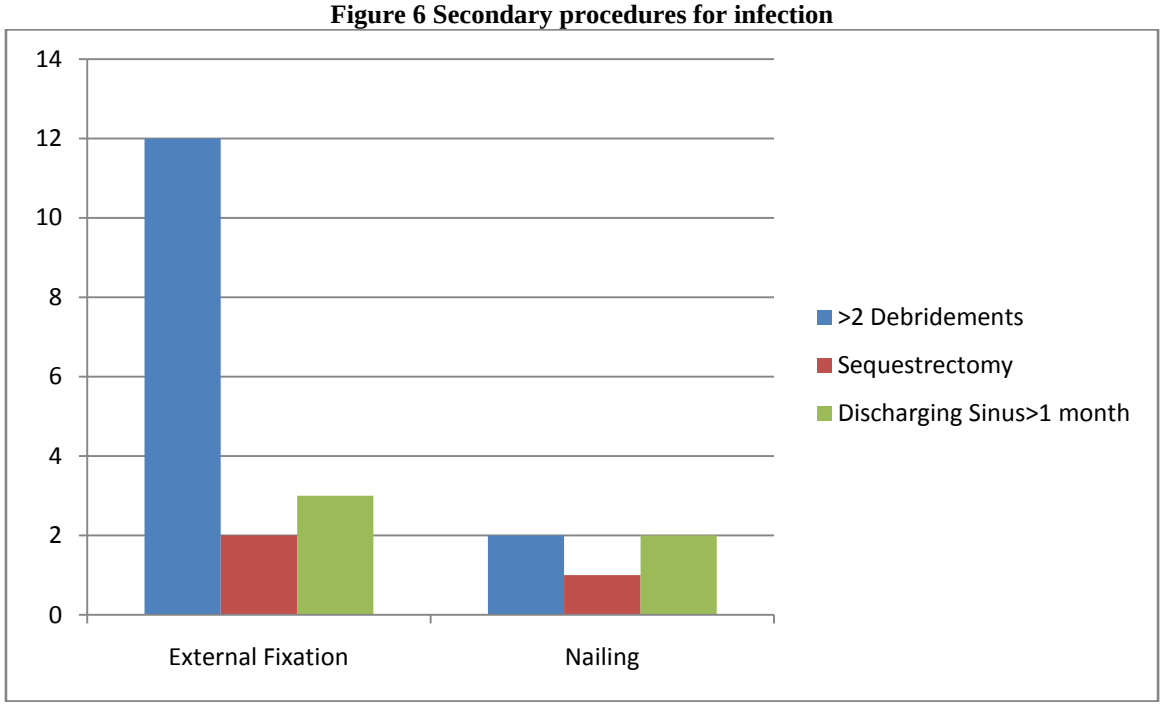
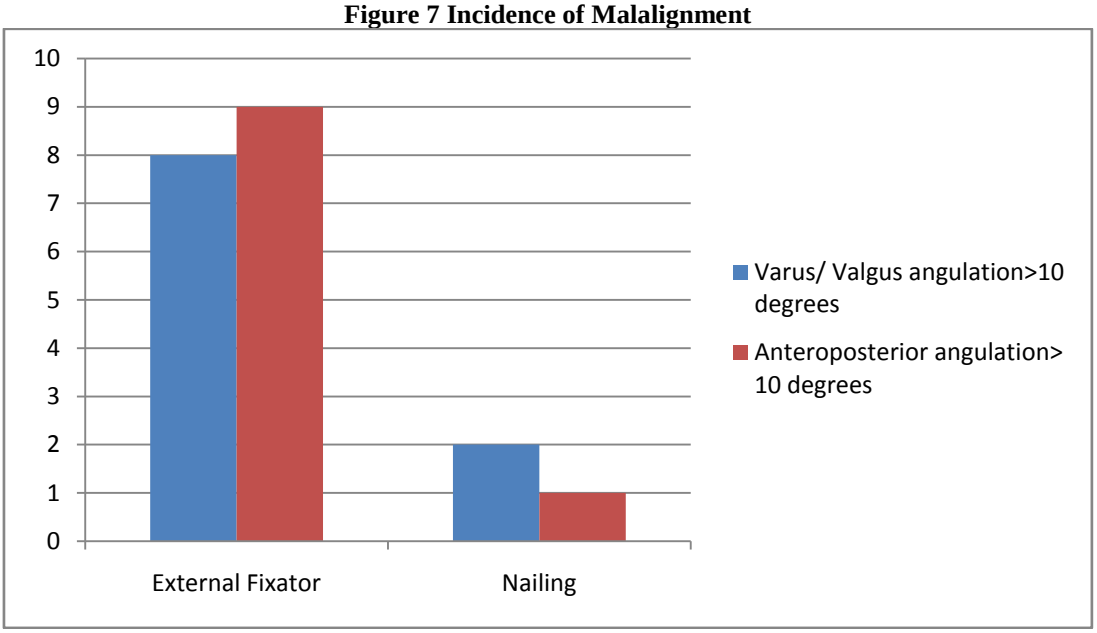


Figure 6 Secondary procedures for infection



Average time between injury to surgery was higher for patients primarily managed by external fixator (6 days, range 1-16 days) as compared to patients primarily managed by nailing (3 days, 1-5 days). Union without requirement of secondary procedure, was seen in 43 (69.3%) patients in External Fixator group and in 40(90.9%) patients in nailing group. In fractures that united average time to union was 20.2 weeks in External Fixator group, whereas in solid nail group it was 23.8 weeks. Pin tract related complications like infection (18 cases, 29%) and pin loosening (4 cases, 6.4%) were observed in patients in external fixator subgroup.

Figure 7 Incidence of Malalignment



IV. Discussion

Tibia fractures are one of the commonest fractures, resulting frequently from road traffic accidents. Open fractures of tibia are common owing to subcutaneous nature of bone. At our centre which is a tertiary level hospital, several cases are referred from remote places, resulting in delay in primary management. Primary management of wound is of extreme importance as reduction of bacterial load at earliest possible opportunity would prevent infection related complications.

Throughout 1980's external fixators had been the treatment of choice in open fractures as they provided stabilization with adequate wound management and soft tissue care. But they had been associated with complications of pin tract infection, pin loosening, malunion, delayed union, and non-union [12] [13]. Plating is associated with increased risk of infection and skin necrosis [14] . Intramedullary fixation of tibial shaft fractures has gained popularity in recent years with the development of interlocking nails. However, the decision for nailing depends upon patient's health status, time of presentation and several other factors and a small wound if neglected can result in fulminant infection. Better results of nailing can be attributed to selection of patients with following characteristics; timely presentation to emergency, better health status as as dictated by ASA grading. This is evident from results showing lesser mean duration from injury to surgery and better mean ASA scoring of patients in whom nailing was done. These factors are assessed by the surgeon on the basis of experience and decision for procedure is taken. It is difficult to establish a guideline because of variation in patient presentation.

Bhandari and associates in a metaanalysis of studies found that nail in comparison to external fixator led to fewer reoperations, less incidence of superficial infection and malunion. [15] Henley et al in a study to compare results of management of open fracture of tibia with external fixator and intramedullary nailing found that malunion was higher in cases treated with external fixator. [16]

Whittle et al on trial of unreamed intramedullary nailing of open fracture of tibia reported a infection rate of only 5% in grade III, 25% in grade IIIb with 96% union rate and no malunion. [17]

Joshi et al concluded that unreamed interlocking tibial nailing can be safely used for type-I and type-II open injuries even with delayed presentation.[18] Use of unreamed nailing in those type-III fractures with delayed presentation was associated with high incidence of complications. An adequate soft tissue management is mandatory in treatment of these fractures.

With better alignment and lesser incidence of secondary procedures for infection and malalignment, the results of patients in nailing group were better than patients in external fixator group. But external fixation continues to be the procedure of choice for cases with delayed presentation, patients with poor ASA score, and as a secondary salvage procedure following osteomyelitis for patients with nail in situ following implant removal. External fixation helps surgeon manage infection and wound better.

V. Conclusion

Though several studies have established that interlocking nailing is an effective procedure in compound fractures of tibia, but patient characteristics prevent it from being universal, with external fixation being the more common procedure for management of open fractures of tibia.

References

[1]. Canale TS, Daugherty K, and Jones L (2003): Campbell's operative orthopaedics. 10th ed. Mosby, Philadelphia (Pa).
[2]. Rhinelander FW. Tibial blood supply in relation to fracture healing. Clin. Orthop.1974;105,34-81
[3]. Rosenthal RE, Mac Phail JA, Ortiz JE. Nonunion in open tibial fractures. Analysis of reasons for failure of treatment. J Bone Joint Surg (Am). 1977;59, 244-248.
[4]. Gustilo RB and Anderson JT (1976): Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones. Retrospective and prospective analyses. J Bone Joint Surg 58-A: 453–458.
[5]. Pollak AN. Timing of debridement of open fractures. J Am Acad Orthop Surg 2006;14:S48-51
[6]. Ashford RU, Mehta JA, Cripps R. Delayed presentation is no barrier to satisfactory outcome in the management of open tibial fractures. Injury 2004;35:411-6
[7]. Bednar DA, Parikh J. Effect of time delay from injury to primary management on the incidence of deep infection after open fractures of the lower extremities caused by blunt trauma in adults. J Orthop Trauma 1993;7:532-5
[8]. Gopal S, Majumder S, Batchelor AG, Knight SL, De Boer P, Smith RM. Fix and flap: The radical orthopaedic and plastic treatment of severe open fractures of the tibia. J Bone Joint Surg Br 2000;82:959-66
[9]. Harley BJ, Beaupre LA, Jones CA, Dulai SK, Weber DW. The effect of time to definitive treatment on the rate of nonunion and infection in open fractures. J Orthop Trauma 2002;16:484-90.
[10]. Khatod M, Botte MJ, Hoyt DB, Meyer RS, Smith JM, Akeson WH. Outcomes in open tibia fractures: Relationship between delay in treatment and infection. J Trauma 2003;55:949-54.
[11]. Merritt K. Factors increasing the risk of infection in patients with open fractures. J Trauma 1988;28:823-7.
[12]. Sisk TD. External fixation. Historic review, advantages, disadvantages, complications and indications. *Clin* Orthop.1983;180,15-220.
[13]. Heiser MT, Jacobs RR. Complicated extremity fractures: The relation between external fixation and non-union. *Clin.* Orthop. 1983;178,89-95.
[14]. Beck AW, Henson ST. Plates versus external fixation in severe open tibial fractures: A randomized trial. *Clin* Orthop. 1989;241.29-34.
[15]. Bhandari M, Gordon H, Guyatt, Swiontkowski MF, Sheimitch EH. Treatment of open fractures of the shaft of the tibia. J Bone Joint Surg (Br). 2001;83,62-68.
[16]. Henley MB, Chapman JR. Comparison of unreamed tibial nails and external fixator in the treatment of grade II and grade III open tibial fractures. *J Orthop Trauma.* 1994;19,143-144.
[17]. Whittle AP, Taylor CJ. Treatment of open fractures of the tibial shaft with the use of interlocking nailing without reaming. J Bone Joint Surg (Am). 1992;74,1162-1171.
[18]. Joshi D, Ahmed A, Krishna L, Lai Y. Unreamed interlocking nailing in open fractures of tibia.J Orthop Surg (Hong Kong).2004; 12(2): 216-21. 20.

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