

Results of Autogenous Bone Marrow Injection in Delayed Union Cases of Open Fractures of Tibial Shaft Treated by Various Surgical ProceduresSahu Manoj¹, Gupta Mansi², Sharma Saurabh³, Gupta Anshul⁴, Shriwastava Ashish⁵¹Assistant Professor, Department of Anaesthesia, Govt. Bundelkhand Medical College, Sagar (M.P.)²Demonstrator, Department of Microbiology, Govt. Bundelkhand Medical College, Sagar (M.P.)³Assistant Professor, Department of Orthopaedics, Govt. Gandhi Medical College, Bhopal (M.P.)⁴Associate Professor, Department of Orthopaedics, Govt. Bundelkhand Medical College, Sagar (M.P.)⁵P.G. Resident, Department of Orthopaedics, Govt. Bundelkhand Medical College, Sagar (M.P.)

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Conflict of interest: Nil

Abstract:

Introduction: Tibia is the most commonly fractured long bone from its shaft.¹Tibial fractures are most common fracture among long bones with complications of delayed union, non-union and infection. The purpose of this study to access the role of bone marrow infiltration in delayed union, non-union cases as this method is quick, easy and effective.

Material and Methods: 36 patients' cases of displaced compound fracture of tibial shaft selected for bone marrow infiltration treated by conservative method, external fixator and intramedullary nailing.

Results: 25 patients out of 36 patients showed rapid healing by bone marrow infiltration method.

Discussion: Autologous bone marrow infiltration is a percutaneous method with 70% success rate in delayed union and non-union case. It is safe and easy method.

Keywords: Delayed union, Non-union, Bone-marrow infiltration.

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Introduction

Tibia is the most commonly fractured long bone from its shaft. [1] Most of the tibial fractures occur in 20-40 years age group which is the most productive age group population & thus morbidity caused by this fracture to the patient & family is very high. [2] Throughout most of its length one third of tibial surface is subcutaneous hence open fractures are more common [3] in this bone along with delayed union, non-union and infection. These are relatively common complications of tibial shaft fractures, because of more frequency of compound fractures and high energy fractures due to Road Traffic Accidents (RTA). Delayed union and non-union is more common in distal 1/3 of tibia because of its precarious blood supply. Bone marrow infiltration is a quick, easy and effective method of bone grafting.

Our aim in the present study is to evaluate the results of bone marrow infiltration in the healing process in the fractures of tibial shaft complicated by delayed union.

Material & Methods: The present study comprised of 36 selected cases of displaced compound fracture of tibial shaft from September 2005 to September 2007 admitted in the Department of Orthopaedics,

Shyam Shah Medical College (S.S.M.C) Rewa M.P. from August 2006 to August 2007 that resulted in delayed union treated by various modalities.

Selection of patients for Bone Marrow Infiltration: A total of 36 delayed union cases of compound fractures of tibial shaft on follow up were selected for bone marrow infiltration treated by various methods of treatment. Delayed union was defined according to its definition that union is considered delayed when healing has not advanced at the average rate for the location & type of fracture (usually 6 month).

Method (Bone Marrow Infiltration): Bone marrow infiltration was done in selected delayed union cases on follow-up, in which heals was very slow. Bone marrow infiltration was done by percutaneous needle insertion either under general anesthesia or local anesthesia on outdoor patient basis. Part preparation of entire iliac-fossa, iliac-crest & hip region done by usual method & the leg which was to be infiltrated was prepared. A 16 gauge spinal needle was inserted in the iliac bone at the anterior superior iliac spine and directed towards iliac crest. Needle was advanced into the medullary cavity & loss of resistance was felt when it had advanced into the medullary cavity.

Aspiration of bone marrow was done by a 20 ml syringe and about 20-40 ml of bone marrow was aspirated. Aspirated marrow was infiltrated at the fracture site (intraosseous & periosteous region) under image intensifier, if available, from the well vascularised posterior surface of tibia by a 16 gauge

needle. Sterile dressing was applied at the both sites and PTB cast was applied as required.

Follow Up: One monthly follow up was done of every patient to assess clinical and radiological union. (not in bold letters)



Figure 1: Technique of aspiration of bone



Figure 2: Technique of infiltration of marrow from iliac crest. at delayed union site.

Results: Out of 36 patients infiltrated bone marrow from iliac crest 2-3 times, 25 patients demonstrated accelerated fracture healing and union and 11 patients had gone into non-union despite repeated bone marrow infiltration as shown in table no.1

Table 1: Bone Marrow Infiltration

S. No.	Methods	No. of Patient	Effect - united	No Effect- Non union	Infection due to BMI
1	Conservative	16	12	4	0
2	External Fixator	13	8	5	0
3	Intramedullary Nailing	7	5	2	0

Discussion

Autologous bone marrow infiltration is a simple minimally invasive, percutaneous technique of bone grafting. [5] In our study it is applied with 70% success rate in the prevention of non-union in delayed union cases [4], when combined with other stimulants of healing such as weight bearing & gradual dynamization of fixator in external fixator

group. It's not a substitute of adequate stabilization of fracture.

Connolly et al. [5] used bone marrow injections to treat 20 tibial non-unions with an 80% success rate. Bone marrow contains progenitor cells that enhance healing of fracture. It is indicated in atrophic uninfected non-union of tibia or other bone, delayed union to prevent non-union and hypertrophic non-union. It is contraindicated in cases of, in the absence

of a completely healed wound, a gap between fragments exceeding 5 mm, pre-existing angular deformity or shortening both of which must be addressed with direct access to the non-union site. Precautions should be taken as infiltration should be done in the intraosseous & periosteal space not in the muscle or neurovascular bundle and compartment syndrome in leg should be avoided which may occur when volume reaches excessively.

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