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International Journal of Current Research
Vol. 10, Issue, 06, pp.70194-70198, June, 2018

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

ROLE OF BIOLOGICAL PLATING IN COMMINUTED LONG BONE FRACTURES: A PROSPECTIVE STUDY

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ARTICLE INFO

Article History:
Received 21st March, 2018
Received in revised form
07th April, 2018
Accepted 20th May, 2018
Published online 28th June, 2018

Key words:
Minimally invasive Osteosynthesis,
Biological Locked plate,
Screw.

ABSTRACT

The concept of biological osteosynthesis refers to the conservation of vascularity of the bone during surgical intervention to ensure the continued vitality of the individual fragments and to achieve improved fracture healing. Main principle of biological fixation by minimally invasive percutaneous plate osteosynthesis (MIPPO) in long bone fractures is relative stability which is provided by using long plate with limited number of screws. Some biomechanical studies have been reported about this issue. However, clinical studies are still missing. The aims of this prospective study were to evaluate the clinical and radiological results of adult tibia fractures treated by MIPPO. **Materials and Methods:** A prospective study was conducted with in a period of one and a half year; from Jan. 2015 to May 2016 on 60 patients who presented to emergency wing of. orthopaedic deptt in a tertiary care centre in northern India ,during this period. In our series of 60 patients most of the patients were in the age group of 25-40 years, average age was 35.7 years.RTA accidents accounted for 50% of cases in our series. Most of the patients had a follow up ranging from 6-15 months. Patients were assessed as per the criterion laid down by S.J Lam at each follow up Most of the patients (70%) had radiological union between 16-25 weeks. Out of 30 patients, 4 patients of fracture humerus were not assessed in this group.2 pateints with deep wound infection and infected non union did not ambulate and is still under treatment for infection and non union. **Conclusion**: MIPPO technique provides good bone healing and decreases incidence of nonunion and need for bone grafting. The technique of biological plating can be used in fractures where locked nailing cannot be done like vertical slit and markedly comminuted fractures.

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Citation: Dr. Tahir Afzal and Dr. Nitish Sharma, 2018. "Role of Biological Plating in comminuted long bone fractures: a prospective study", *International Journal of Current Research*, 10, (06), 70194-70198.

INTRODUCTION

Biological fixation by minimally invasive percutaneous plate osteosynthesis (MIPPO) has become an option for treating of long bone fractures. It has well-documented biological advantages compared to conventional plate osteosynthesis including reduced tissue devitalization, avoidance of iatrogenic damage of blood supply around the fracture and early fracture union with decreased wound complications (Farouk *et al*., 1997; Strauss *et al*., 2008. The basic principles of this technique include indirect closed reduction, extraperiosteal dissection, anatomic alignment and relative stability which permits limited motion at the fracture site and creates secondary bone healing with callus formation (Gautier, 2003).

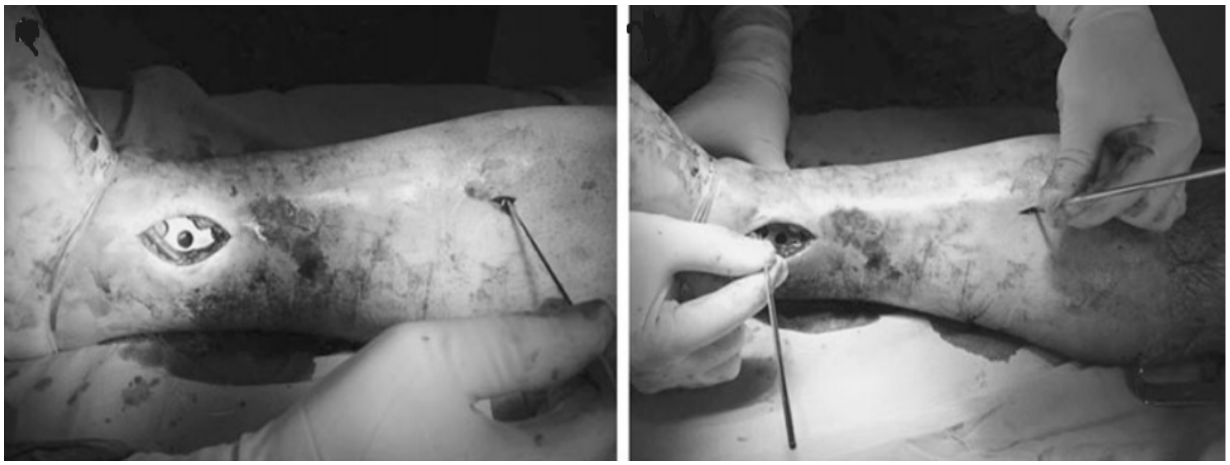
MATERIALS AND METHODS

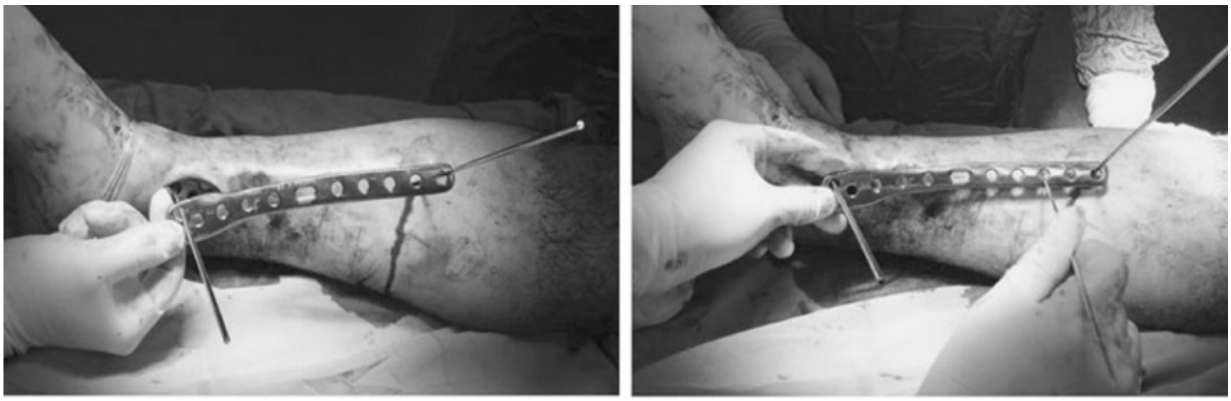
A prospective study was conducted with in a period of one and a half year; from Jan. 2015 to May 2016 on 60 patients who presented to emergency wing of orthopaedic deptt in a tertiary care centre in northern India ,during this period. In our series of 60 patients most of the patients were in the age group of 25-40 years, average age was 35.7 years.

Fractures included: fractures with longer defects, fractures with comminution with number of viable fragments filling the gap.

Fractures excluded: simple spiral, oblique or tranverse fractures where standard interfragmental compression must be used.

The strain theory of parren: In the case of short oblique or tranverse fractures, all forces (bending, shear and rotation) are concentrated to the single fracture site, causing considerable deformation.



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In more complex and comminuted fractures, the same external forces are distributed over a much longer distance, resulting in only minimal deformation at a specific fracture line. So callus once formed is not repeatedly disturbed. So comminuted fractures are healed rapidly when their vascularity is preserved. All patients were treated by the same surgical team in the first author's institution. The patients on admission after taking care of ABC of trauma management were examined carefully but in a steadfast manner to rule out any head, neck, chest, abdominal and pelvic Injuries. This was followed by primary treatment in the form of splint age to the affected limb(s) or Skin/skeletal traction, Analgesics, I.V Fluids, Antibiotics and prophylactic immunisation for tetanus. Routine investigations were done. Operative procedures were carried out at the earliest when patients were fit for Anesthesia Implants used were properly selected. Tibia being a superficial bone and could be reached easily through an anteromedial approach without damaging any important structure. For Femur, posterolateral or lateral approach were used which provided access to femoral shaft and trochanter respectively. Forhumerus posterior approach was used.

If Tourniquet was used as in case of tibial fractures, it was released and hemostasisachieved. Thorough wound irrigation was done and wounds closed in layers with a suction drain in place. Patients were put on broad spectrum antibiotics for the shortest possible period depending upon wound condition. Post operative Skiagrams both AP and Lateral views were taken for permanent record. Active static exercises and movements of adjacent joints were started the next day. Sutures removed between 10^{th} - 14^{th} post op day. Follow up of the patients was done at 4 weekly intervals until union occurred. Patients were assessed clinically as well as radiologically. Range of motion of adjacent joints and any other complications if present were noted. Patients were made ambulatory with non weight bearing crutch walking as soon as the pain was tolerable. Patients were discharged as soon as the stitches were removed with the advice of non weight bearing ambulation and were followed up every 4 weeks in the OPD. Controlled (guarded) weight bearing was allowed gradually over a period of time and full weight bearing allowed after confirming both clinically as well as radiologically the evidence of union.

Observations: The various facts that emerged during the course of this study were as follows.

Age (In years)	No of patients	Percentage
20-25	4	7%
26-30	20	33%
31-35	10	17%
35-40	12	20%
41-45	8	13%
46-50	2	3%
50 and above	4	7%
Total	60	100%

In our series of 60 patients most of the patients were in the age group of 25-40 years, average age was 35.7 years.RTA accidents accounted for 50% of cases in our series

Localisation of fractures

Site	No of patients	Percentage
Femur Diaphysis	22	37%
Subtrochanteric Fractures	12	20%
Supracondylar Femur Fractures	16	26%
Tibia Fractures	6	10%
Humerus Fractures	4	7%
Total	60	100%

Associated injuries/diseases

Associated injury/Disease	No of patients
No Associated injury/disease	32
# Leg Bone	4
# Calcaneum	2
Diabetes Mellitus	2
HTN/COPD	2
Lacerated scalp	2
Degloving foot	2
Forearm bones #	2
Neck of humerus	2
Pelvic #	2
Paraparesis	2
Soft Tiisue Injury neck	2
Patella #	2

Follow Up: Most of the patients had a follow up ranging from 6-15 months. Patients were assessed as per the criterion laid down by S.J Lam at each follow up (*Excellent*: ROM 80-100%, No pain ; *Good*: ROM 60-80%, Mild pain*; Moderate*: ROM 30-60%, Moderate pain; *Poor*: ROM<30%, severe pain).

Full weight bearing in months: Out of 30 patients, 4 patients of fracture humerus were not assessed in this group.2 pateints with deep wound infection and infected non union did not ambulate and is still under treatment for infection and non union.

Months	No of patients	Percentage
0-2	0	0
2-4	36	64.28%
>4-6	16	28.57%
>6-8	2	3.57%
Total	54	96.42%

Bone Grafting

Bone grafting	No. Of patients	Percentage
Primary	6	10%
Secondary	2	3%
No bone graft	52	87%

Radiological union in weeks: Most of the patients (70%) had radiological union between 16-25 weeks

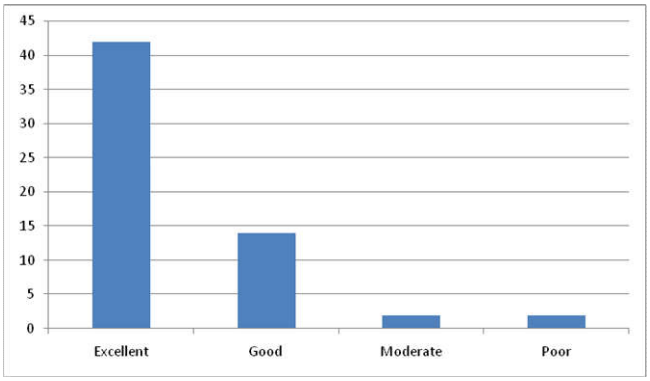
Limb length discrepancy (lld) implants used

Limb length	No of patients	Percentage
No LLD	44	73%
Shortening 1 cm	12	20%
Shortening 2 cm	4	7%
Shortening >2cm	0	0
Total	60	100%

Complications	No of patients
Superficial wound infection	8
Deep wound infection	4
DVT	2
Implant failure and non union	2
Delayed Union	2
Mortality	0

Final Results

Range of Motion	No of patients	Percentage
ROM 80-100%,No pain	42	70%
ROM 60-80%,,Mild pain	14	23.3%
ROM,30-60%,Moderate pain	2	3.3%
ROM <30%,Severe pain and non union	2	3.3%
Total	60	100%



Summary for functional results

RESULTS

The technique of biological plating can be used in fractures where locked nailing cannot be done like vertical slit and markedly comminuted fractures. There is rapid fracture consolidation due preserved vascularity. There is fewer incidences of delayed union and non union. There is decreased need for bone grafting. There is less incidence of exposure due to limited exposure and less chances of refracture. There is no chance of vascular complication by carefully inserting the plate sub muscularly through limited incisions. The method is less time consuming and cost effective. The usefulness of BIOLOGICAL PLATING has been established in the present study. Hence the procedure can be used safely in "Comminuted fractures of long bones "with proper indications.

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