



Study of Biological Plate Osteosynthesis in Communitated Fractures of Shaft of Tibia

RAHUL N. BADE

Professor ,Department Of Orthopaedics ,R.C.S.M. GMC Kolhapur.

PRADIP N. KULKARNI

Professor ,Department Of Orthopaedics,K.I.M.S. AND DEEMED UNIVERSITY Karad

SANJAY MORE

Associate Professor, Department Of Orthopaedics ,R.C.S.M. GMC Kolhapur.

ABSTRACT

Objective: To study long term follow up of biological plating of communitated fractures of shaft of tibia with respect to stabilization,mobilization and union.

Methods:A series of 31 cases of communitated fractures of shaft of tibia were studied at an average followup of five years. Assessment was done using Neers rating system.The results were compared to comparabile studies done by various authors in the past by statisttical evaluation using SPSS ver. 21.0.

Results:In our series excellent to good results were obtained in 90% cases while 6.66% fair and 3.33% showed poor results. The results obtained in our series were comparable to results obtained in previous series.

Conclusion:The technique of minimally invasive biological plating in communitated fractures of shaft of tibia is safe and reliable modality.

KEYWORDS : :Biological plating,Communitated fracture shaft tibia, Biological plate osteosynthesis.

Introduction:

Till mid 20th century internal fixation implants ranged from extramedullary like wires ,screws,transfixation devices and plates and intramedullary nails.

With formation of AO group in 1950,fracture fixation was based on principles of anatomical reduction, stable, rigid internal fixation and early active mobilization.This gave consistantly good results in simple fractures. In communitated fractures xrays looked good but many fractures led to delayed unions,nonunions and infections. After this, focus of research was directed to preservation of blood supply to bone either by change in implant design or change in operative technique. Thus operative technique based on concept of biological fixation using plate(Biological plate osteosynthesis) was evolved. In this technique area of fracture communitation was not opened and reduction achieved by indirect reduction techniques. The fracture was then fixed with percutaneous passage of plate with minimal incisions.Thus blood supply and biology of bone was preserved. Change in implant design ranged from simple plates to DCP and LCDCP.

This type of fixation is particularly useful in communitated periarticular fractures where intramedullary nailing is difficult or not amenable.

In past various authors like Olerud S, E,Gerry R(1996), Wisniewski T.F. Radziejowski M.J. have done such study.

Our study group involved 31 cases of communitated fractures of tibia and we evaluated results at average follow up of 5years.

Material And Methods:

This retrospective study included 31 cases of communitated fractures of shaft of femur treated at the institute of Author 2 during 1998 to 2002.Our exclusion criteria were intraarticular fractures ,infection, poor skin condition, pathological fractures. Fractures were classified according to Winquest Hansen classification. Implants used were DCP and LCDCP which were precontoured on xrays of opposite extremity. In cases where concomitant injuries delayed fracture fixation posterior slab was applied. After suitable anaesthesia reduction was done by traction in supine position and limb length ,rotation checked under C-arm. With minimal incision Plate was passed percutaneously extraperiosteally on either medial of antero lateral surface of tibia and

fixed with 4.5mm screws in shaft of 6.5 mm screws in proximal tibial metaphyseal region .

Post operatively static quadriceps exercises were begun on 2nd post-operative day. Patient was advised knee,hip and ankle exercises.

All patients were followed up up to fracture union and thereafter also for long term follow up.

Results were evaluated using Neers rating system at each follow up.

Observations and Results:

The mean age of patients was 36.4 years (range 12-70 yrs) with 26 males and 5 females. All fractures resulted from road traffic accidents. Right extremity was predominantly involved. Out of 31 cases 30 were closed and one was compound .Four patients had poly trauma. The average injury surgery interval was 7.43 days. The average period of fracture union was 17.6 weeks.The average period of full weight bearing was 16.71 weeks. The average hospital stay was 16.30 days. Average duration of surgery was 45 to 120 minutes. One patient was lost to follow up.All fractures united. There was 10% incidence of superficial and deep infection which was controlled with antibiotics and dressings.

Overall In our series excellent to good results were obtained in 90% cases while 6.66% shows fair and 3.33% showed poor results. The results obtained in our series were comparable to results obtained in previous series.

Discussion:

Communitated periarticular fractures particularly of distal and proximal tibia are difficult to manage in orthopaedic practice.These fractures are most of the times are difficult to nail and were treated by open method of reduction and rigid internal fixation which sometimes led to delayed unions ,non unions ,infection.Then this method of biological plate osteosynthesis was evolved.

There was no case of non union in our series. The average shortening in our series was 0,5 to 1 cm. Joint stiffness was observed in ankle joint 20.53%. In our series four cases of delayed union were observed which united without any secondary procedure. Two cases of malun-

ion were seen in proximal tibia of which one had 15° external rotation deformity and one had varus malunion. Two cases of delayed skin dehisence and plate exposure were seen which warranted implant removal . One case of deep infection with osteomyelitis was seen which subsided with implant removal.

Four plates were removed and no incidence of refracture was noted. Good functional results were obtained in isolated fractures. The functional results were affected by associated injuries as weight bearing was delayed.

In other series K Wenda reported 76.47% excellent results.J.S.Chhina had 93% excellent results.

Thus results of our series were comparable to previous series.

Conclusion:

The technique of minimally invasive biological plating is a safe and reliable treatment modality for comminuted fractures of tibia. The technique is easy and has a shorter learning curve.Minimal inventory is required. Technique causes much less blood loss as compared to conventional plating. Operating time is less. Only limitation of this technique is that it requires intact soft tissue cover over fracture site.

Acknowledgement:

All the authors read and approved the final manuscript. No conflicts of interest were declared by the authors. No external funding was received for this study.

TABLES:

Table No.1 :- Side of Fracture :

Side	Tibia	
	No	%
Right Side	20	64.51
Left Side	11	35.48
Total	31	

Table No.2 :- Distribution of Cases :-

Fracture Configuration	Tibia	
	No	%
Grade 1 Comminuted	4	12.90
Grade II	8	25.80
Grade III	10	32.25
Grade IV	2	6.45
Segmental	4	12.90
Spiral Comminuted	3	9.67
Total	31	

Table No. 3 :- Injury to surgery Interval .

Injury Surgery Interval In days	Tibia	
	No	%
0-8	24	77.41
9-15	4	12.9
>15	3	9.67

Table No.4 :- Duration of Surgery

Time (in minutes)	Tibia	
	No	%
< 90	30	96.77
>90	1	3.33

Table No. 5 :- Period of union of feature

Union in Weeks	Tibia		
	Closed	Compound	%
12-18	18	0	58.06
19-24	7	0	22.58
25-31	2	0	6.33
>31	0	1	3.33
Total	26	4	

Table No. 6:- Shortening

Shortening	Tibia	
	No	%
0.5 cm	0	-
0.5 to 1.5 cm	2	6.66
1.5 to 2 cm	0	-
2 to 2.5cm	1	3.33
Total	3	

Table No 7:- Malunion

Malunion	Tibia	
	No	%
Medial Angulation	1	3.33
Lateral Angulation	0	0
Internal Rotaion	0	0
External Rotation	1	3.33



References:

- 1) Baumgaestel F, M. Buhl, B.A. Rahn : Fracture healing in biological plate osteosynthesis Injury ; 1998, 29 (3) : 3-6
- 2) Chandler Robert W : Principles of Internal Fixation. Rockwood and Green's Fractures in Adults ; 1996 , 4th edition , 1:159-217.
- 3) Claiborn A. Christian : General Principles of fracture treatment campbell's operative orthopaedics : 1998,9th edition 3:1993-2036.
- 4) Gray's Anatomy; 1989, 37th edition :299-300
- 5) Helfet D, Paul Y,Shonnard Dabvid levi, Joseph Borrelli Jr : Minimally invasive plate osteosynthesis of distal fractures of the tibia . Injury : 1997,28(1):42-48.
- 6) Hooper G.J. Keddel R.G.Penny I.D: Conservative Management of closed nailing for tibial shaft fractures . A randomized prospective trial. J.Bone Joint surg (Br); 1991, 73(1):83-85.
- 7) Karnezis I A., Biomechanical Considerations in "Biological osteosynthesis" and experimental study of the "Bridging" and "Wave" Plating techniques, Archives of orthopedic trauma surg, 20000,120 (5-6) 272-275
- 8) Klemm W.W. Borner M.: Interlocking nailing of complex fractures of the femur and tibia . Clinical Orthopedics :Nov 1986,212:89-100.
- 9) Krettek C.T, Miclau , O.Grun, Schandelmaier P, Tschern H : Intraoperative control of axes rotation and length in femoral and tibial fractures. Injury .1998 , Vol.29 Supp.3:29-39
- 10) Mast J, Jacob R,Ganz R: Planning and reduction technique in fracture surgery. Springer Verlag.
- 11) Miclau T, Martin R.E: Evolution of modern plate Osteosynthesis . Injury , 1997,28(1):3-5 .
- 12) Olerud S, Karlstorm G : Tibial fractures treated by AO compression Osteosynthesis . Experiences from a five-year material. Acta orthop scand. 1972, Suppl. 140(1).
- 13) Ruedi T.P, Sommer C, leutenegger A : New techniques in indirect reduction of long bone fractures . Clinica Orthopaedics. February 1998 27-34.
- 14) Wisniewski T.F. Radziejowski M.J. : Minimally invasive treatment of pilon fractures . JBJS (BR) 1998, 80 (B-2):164.