



ANALYSIS OF MINIMALLY INVASIVE PERCUTANEOUS PLATE OSTEOSYNTHESIS (MIPPO TECHNIQUE) FOR EPIPHYSEODIAPHYSEAL FRACTURES - A PROSPECTIVE STUDY

Orthopaedics

**Dr Utsav
Katakwar**

Shalby Hospital, Jabalpur, MP, India

**Dr Jayanta Kumar
Laik***

Tata Main Hospital, Jamshedpur, Jharkhand, India *Corresponding Author

ABSTRACT

Over the past two decades, principles of internal fixation have favored minimally invasive surgery over traditional open methods because of the excessive trauma to the soft tissues in the latter. This prospective study was done in 16 patients where MIPPO technique was used to see the final outcome of fixation and patient satisfaction of proximal long bone fractures. There were lower rate of complications where 1 patient (6.25%) developed superficial infection as an early complication. Approx (6.25%) patient developed malunion as a result of implant bending in late case of implant failure as late complication. In the study, shortening was in 2 cases. Overall 76% had good results stating the superiority of MIPPO over traditional AO plating methods.

KEYWORDS

INTRODUCTION

Biological fixation, which comprises of minimally invasive technique is recognized as the treatment of choice for most articular fractures with metaphyseal extension, and certain diaphyseal fractures. This is to preserve the fracture hematoma and blood supply, to improve the rate of fracture healing, decrease the need for bone grafting, minimise soft tissue compromise and devascularisation of fracture fragments and decrease the incidence of infection.

MIPPO is based upon biological fixation, which can be summarized as ; -

- 1) Repositioning and realigning by manipulation at a distance to fracture site, preserving soft tissues (Indirect reduction techniques).
- 2) Leaving comminuted fragments out of mechanical construct, which preserves their blood supply.
- 3) Using low elastic modulus, biocompatible materials.
- 4) Limited operative exposure.

More flexible fixation should encourage the formation of callus while less precise, indirect reduction with reduced operative trauma. This approach is described as "*biological fixation*". A biological internal fixation avoids the need for precise reduction, especially of the intermediate fragments, and takes advantages of indirect reduction. The principle applies equally to locked nailing, bridge plating and internal-fixator-like devices. Indirect reduction aims only to align the fragments.

In Minimally invasive plate osteosynthesis percutaneously inserted plate is fixed at a distance proximal and distal site through minimal exposure.

MATERIAL AND METHODS

This prospective study has been conducted in the dept. Of Orthopaedics, of a tertiary care hospital from 1st January 2013 to 31st December 2013. All patients where MIPPO technique can be used were included in the study. Further they were followed up consecutively in next 5 years.

All cases received first aid in casualty with through examination to find out associated injuries. I.V fluids, analgesics and blood transfusion if needed managed shock, pain and dehydration. After proper stabilization and preop protocol, patients were taken up for surgery.

Exclusion criteria

- 1) Grade II and Grade III open fracture
- 2) Pathological fractures.
- 3) Intra articular fractures with gross displacement, which require open technique.

Operative Technique –

Surgery performed under regional anaesthesia. A small stab incision is taken on one end of the fractured comminuted area without disturbing

the soft tissue envelope of the fracture fragments. The incision is extended right up to the bone with the periosteal tube opened. A subperiosteal tract is made along the surface where the plate is going to be applied and extended across the fracture to the other side with a periosteal elevator. The pre-contoured plate used depended on the anatomy and location of the fracture, at least 6 to 8 cortices hold is obtained on either side. Screws are fixed subcutaneously with help of C Arm.

Non-weight bearing crutch walking and toe touch weight bearing started initially as patient tolerated. Full weight bearing was allowed subjected to good clinical and radiological evidence of progressive fracture healing.

Patients were followed up at four weekly intervals and progress was recorded till the fracture united with acceptable range of motion achieved.

Evaluation of Results

- Pain
- Complication
- Proximal / Distal Joint stiffness
- Deformity of the fractured long bone
- Limb length discrepancy
- Clinical and radiological union

Criteria for Results

Good – Complete union, No Pain, Loss of moment less than 5 to 10 at proximal or distal joint, No shortening, No implant failure and patient resumes to daily activity life.

Fair – Loss of movements of more than 15° at joint proximal or distal to fracture operating site, association of mild swelling and pain, which continued after removal of implant.

Poor – Disability due to pain and or stiffness of joint. Bending or failure of implant with or without non, mal or delayed union, associated with or without Neuro vascular defect.

DISCUSSION

The present study has been conducted on 16 patients of fractures of long bones admitted a tertiary care hospital aiming to evaluate the role of minimally invasive plate osteosynthesis in selected patients. 6 patients (37.5%) patients were in age group of 41 to 50 years with all male patients. 4 male patients (25%) was of age group 31 to 40 years. Only one female patient comprised of higher age group of 51 to 60 years with 3 males (25%). 13 (81.2%) cases closed fractures. Rest 3 (19%) of cases was of grade I open fractures of 16 cases, out of which 7 (44%) had open fractures.

7(44%) cases of femur, which were further classified into subtrochanteric 2 cases (91.25%), shaft 3 cases (18.75%) and supracondylar, 2 (12.5%) types. Rest of the 9(56%) cases was of

proximal tibial metaphysical fractures..

Most of the cases 12 (75%) got admitted to the hospital 1st day itself after the injury, 2 (12.5%) cases were admitted case in 10 days and 2 (12.5%) cases were referred late and got admitted by more than 10 days. Operative procedure was less than 90 minutes in 14 (87.5%) of cases, whereas 2 (12.5%) required more than 90 minutes.

Hospital stay was significantly less. 10 (62.55%) patients were discharged within a week, usually on 4th postoperative day after the first

dressing. 6 patients, (37.5%) were discharged after one-week duration. There were lower rate of complications where 1 patient (6.25%) developed superficial infection as an early complication. 1 (6.25%) patient developed malunion as a result of implant bending in late case of implant failure as late complication.

In the present study, there was shortening in 2 cases. As per classification, one (6.25%) had shortening less than 1 cm, whereas the other case had shortening of more than 1 cm but less than 2.5 cm.

OBJECTIVE EVALUATION OF RESULTS

RESULTS	OBJECTIVE CRITERIA		SUBJECTIVE CRITERIA		RADIOLOGICAL CRITERIA		FINAL	
	No of Cases	Percentage	No of Cases	Percentage	No of Cases	Percentage	No of Cases	%
GOOD	14.3	89.6 %	13	81.25 %	9	56.25 %	12.1	75.6 %
FAIR	1.3	8.3 5%	2.3	14.4 %	6	37.5 %	3.2	20 %
POOR	0.33	2.1 %	0.7	4.35 %	1	6.25 %	0.7	4.4 %

FINAL EVALUATION OF RESULTS

Criteria	Range Of Knee Movement Flexion			Range Of Hip Movement			Shortening			Average Score	
	Range	No. Of Cases	%	Range	No. Of Cases	%	In cm	No. Of Cases	%	Average No. Of Cases	Average %
GOOD	> 110°	14	87.5 %	No limitation of movement of hip joint	15	93.75%	No Shortening	14	87.5 %	14.3	89.6 %
FAIR	>90° - 110°	2	12.5 %	10° - 20° limitation of movement one axis	1	6.25%	> 1cm	1	6.25 %	1.3	8.3 %
POOR	< 90°	0	0 %	Considerable restriction of all movements	0	0%	< 1cm	1	6.25 %	0.33	2.1 %

CONCLUSION

For nearly a decade, the priority has been the optimal maintenance of the biology of bone tissue and the repair of adjacent tissues in order to diminish complications after osteosynthesis. Throughout the study, we became more “progressive” and skilled with this attempt in the non-anatomical reduction. Wedges were left untouched ‘in situ’ without anatomical precise reduction and sometimes the main fragments were only adapted but not compressed. Minimally invasive internal fixation techniques have been developed to minimize soft tissue dissection and to reduce the incidence of aseptic healing disturbances. Soft tissue “respect” has proved to be more useful than achieving absolute anatomical correction for final outcome.

Compared with the traditional techniques, all these minimally invasive methods are more demanding and require fluoroscopy to ensure proper limb alignment

Recently, implants have been designed for percutaneous insertion, like LISS, consisting of an anatomically contoured condylar 'buttress' plate into which the self-drilling, self-tapping monocortical screws lock. The system combines the design of the condylar buttress plate with the fixed angle characteristics of a dynamic condylar screw

MIPPO certainly is the right choice as per needs in a selected group of injuries. There is no doubt that “*physiology* was restored better in an attempt to maintain the *biology*”.

REFERENCES

- 1- Apivatthakakul T, Arpornchayanon O. Minimally invasive plate osteosynthesis (MIPO) combined with distraction osteogenesis in the treatment of bone defects. A new technique of bone transport: a report of two cases. *Injury*. 2002 Jun; 33(5): 460-5.
- 2- Schutz M, Muller M, Krettek C, Hontzsch D, Regazzoni P, Ganz R, Haas N. Minimally invasive fracture stabilization of distal femoral fractures with the LISS: a prospective multicenter study. Results of a clinical study with special emphasis on difficult cases. *Injury*. 2001 Dec;32 Suppl 3:SC48-54.
- 3- Wenda K, Runkel M, Degreif J, Rudig L. Minimally invasive plate fixation in femoral shaft fractures. *Injury*. 1997;28 Suppl 1:A13-9.
- 4- Helfet DL, Shonnard PY, Levine D, Borrelli J Jr. Minimally invasive plate osteosynthesis of distal fractures of the tibia. *Orthopaedic Trauma Service, Hospital for Special Surgery, New York, NY 10021, USA*.
- 5- Russell GV Jr, Smith DG. Minimally invasive treatment of distal femur fractures: report of a technique. *J Trauma*. 1999 Oct; 47(4):799-801.
- 6- Farouk O, Krettek C, Miclau T, Schandelmaier P, Guy P, Tschern H. Minimally invasive plate osteosynthesis and vascularity: preliminary results of a cadaver injection study. *Injury*. 1997;28 Suppl 1:A7-12.
- 7- Krettek C, Muller M, Miclau T. Evolution of minimally invasive plate osteosynthesis (MIPO) in the femur. *Injury*. 2001 Dec;32 Suppl 3:SC14-23.
- 8- Farouk O, Krettek C, Miclau T, Schandelmaier P, Guy P, Tschern H. Minimally invasive plate osteosynthesis: does percutaneous plating disrupt femoral blood supply less than the traditional technique? *J Orthop Trauma*. 1999 Aug;13(6):401-6.
- 9- Rallis G, Mourouzis C, Ainatzoglou M, Mezitis M, Zachariades N. Plate osteosynthesis of condylar fractures: a retrospective study of 45 patients. *Quintessence Int*. 2003 Jan;34(1):45-9.
- 10- Miclau T, Holmes W, Martin RE, Krettek C, Schandelmaier P. Plate osteosynthesis of the distal femur: surgical techniques and results. *J South Orthop Assoc*. 1998 Fall;7(3):161-70.