

## Minimally Invasive Plate Osteosynthesis in Periprosthetic Femur Fractures associated with Hip Replacement.

J.P.S. Walia, Sonam Kaur Walia, Sargun Singh, Sumit Kapoor, Naveen Malu  
Department of Orthopaedics, Govt. Medical College, Patiala, Punjab, India

**Abstract** : Periprosthetic femur fractures are increasing in incidence on par with the number of arthroplasties performed in our increasingly aging population. The underlying cause in almost all cases is a decrease in mechanical strength of the host bone either due to osteoporosis, stress shielding or osteolytic lesions. 14 patients with a periprosthetic femur fracture associated with hip replacement, between 2005 and 2010 were considered. Vancouver B1 and C fractures were treated with MIPO technique. The MIPO procedure uses a single lateral long locking plate (LCP or LISS) to stabilize the periprosthetic fracture without bone allograft. Accessory percutaneous incisions were made as needed for screw and cerclage placement. All fractures healed and there was no infection. Traditional ORIF of hip periprosthetic femur fractures has been done using cortical struts, allogenic bone grafting, cerclage wiring, and plating. MIPO preserves soft tissue and bony perfusion, which are critical for successful fracture healing. The advantages of this method include preservation of periosteal blood supply and thus more rapid and reliable fracture healing, less risk of infection, refracture and need for bone grafting. **CONCLUSION**: On the basis of the finding of this study it can be concluded that MIPO technique preserves most of the osseous vascularity and fracture hematoma thus providing for a more biological and early repair.

### INTRODUCTION

Periprosthetic femur fractures, defined as femur fractures occurring around a pre-existing prosthetic hip or knee, are increasing in incidence on par with the number of arthroplasties performed in our increasingly aging population. As the number of hip replacements performed increases, peri-prosthetic fractures around the hip are further likely to increase in coming years. The exact prevalence of postoperative periprosthetic fracture is more difficult to determine but is estimated to be approximately 1% over the life of the prosthesis<sup>1</sup>.

While multiple factors contribute to causation of fracture, most of these injuries are associated with a minor fall. The underlying cause in almost all cases is a decrease in mechanical strength of the host bone either due to osteoporosis, stress shielding or osteolytic lesions<sup>2</sup>. Loosening of the femoral component is an important risk factor for postoperative fractures<sup>3</sup>. Osteolysis due to wear debris is an increasingly common phenomenon and a major risk factor for postoperative periprosthetic fractures<sup>4,5</sup>. Impingement of a stem tip against the endosteal cortex may also create a stress riser, as a loose stem drifts into varus or a long, straight, revision cementless prosthesis impinges on the anterior cortex of normally bowed femur. Canal preparation during primary or revision hip replacement at the time of reaming or broaching or at the time of cement removal in revisions can cause perforation of cortex leading to postoperative fractures. The technique of controlled cortical perforation for revision of cemented femoral stems has been recommended for revisions, as it is associated with lower incidence of fractures<sup>6</sup>.

Periprosthetic hip fractures most commonly occur around or just distal to a hip stem prosthesis (Vancouver Type B, 88%)<sup>7</sup>. Patients

with unstable implants are treated with prosthetic revision. However, patients with stable implants are treated with open reduction and internal fixation (ORIF)<sup>8</sup>. We will also like to state that all human and animal studies have been approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. We will also like to confirm that all persons gave their informed consent prior to their inclusion in the study. **We will also like to confirm that there is no conflict of interest.**

### MATERIAL AND METHODS

All patients presenting to our orthopaedics trauma unit with a periprosthetic femur fracture associated with hip replacement between 2005 and 2010 were considered. Study was done in total 14 patients with periprosthetic fractures around a hip stem prosthesis.

Periprosthetic fractures associated with a hip stem were classified using the Vancouver system, based on the location of the fracture.

Vancouver B1 and C fractures were treated with MIPO technique. The MIPO procedure uses a single lateral long locking plate (LCP or LISS) to stabilize the periprosthetic fracture without bone allograft. Patients were operated in a lateral position, if the fracture was a Vancouver B1 and in supine position if the fracture either was a Vancouver C. For Vancouver B1 fractures, the entry point of the plate was identified lateral to the distal femur where a 4 cm incision was placed. A second small incision was placed at the level of the greater trochanter to control the plate position proximally. Accessory percutaneous incisions were made as needed for screw and cerclage placement. The use of cerclage was kept to a minimum in order to limit circumferential stripping. Stability was achieved primarily using screws, and radiography was used to visualize proper reduction and fixation.

Patients were discharged to rehabilitation facilities and followed up at 2 weeks, 8 weeks, 4-6 months, and one year. Outcomes evaluated

**Correspondence:** Prof. J. P. S. Walia, Head, Deptt. Of Orthopaedics, Govt. Medical College, Patiala, Punjab, India  
Ph. No.91-98158880005 e-mail: dripswalia@gmail.com

included pain, union/non-union, function, movement, and complications.

## RESULTS

In this study, out of 14 cases, 8 were male and 6 were female. The mean age of cases was 69.5 years. The majority of peri-prosthetic fractures occurred after hip arthroplasty. There were 10 Vancouver B-1 fractures, 4 Vancouver C fractures. 8 out of 14 cases had history of cardiovascular disease at the time of fracture. None of the cases in this case series had history of pulmonary embolism (PE) or deep vein thrombosis (DVT) prior to or after surgery. 4 cases had history of diabetes mellitus.

In patients after 1 year follow-up, all fractures healed and there was no infection (Fig. 1, 2). 2 patients suffered from thigh pain at 8 months with a diagnosis of greater trochanter bursitis.



Fig 1: Pre operative X ray of a patient



Fig 2: Post Operative X ray of a patient at one year

## DISCUSSION

Traditional ORIF of hip peri-prosthetic femur fractures has been done using cortical struts, allogenic bone grafting, cerclage wiring, and plating. ORIF can involve significantly extensive procedures that often result in significant blood loss and patient morbidity. One-year mortality rate across all peri-prosthetic fractures can be as high as 33%<sup>9-12</sup>. Recently, the development of locking plates and the increased experience with minimally invasive plate osteosynthesis (MIPO) has

provided a new alternative. MIPO preserves soft tissue and bony perfusion, which are critical for successful fracture healing. We present in this study our experience using MIPO technique in the management of peri-prosthetic femur fractures.

The MIPO technique offers sound improvements over the traditional approach. It is a technique widely accepted for the management of long bone fractures and has been shown to achieve comparable or better overall outcome in both elderly and general populations than ORIF with larger surgical exposures<sup>13</sup>. The advantages of this method include preservation of periosteal blood supply and thus more rapid and reliable fracture healing, less risk of infection, refracture and need for bone grafting<sup>14</sup>.

In the present study of MIPO in peri-prosthetic fractures associated with hip replacement, results were very exciting. Patients undergoing MIPO have experienced lower transfusion requirements and low postoperative complications such as DVT, MI or PE. Healing had occurred in all cases, and all patients had achieved acceptable levels of ambulatory function similar to their pre-operative status. Results were comparable to the study of Po-Hao chen et al<sup>15</sup>. On the basis of the finding of this study it can be concluded that MIPO technique preserves most of the osseous vascularity and fracture hematoma thus providing for a more biological repair. There is rapid fracture consolidation due to preserved vascularity. There is a decreased need for bone grafting and incidence of infection is less due to limited exposure.

## REFERENCES

1. Beals RK, Tower SS. Peri-prosthetic fractures of the femur. An analysis of 93 fractures. *Clin Orthop Relat Res* 1996;327:238-46.
2. Schmidt AH, Kyle RF. Peri-prosthetic fractures of the femur. *Orthop Clin North Am* 2002;33-1:143-52, ix.
3. Bethea JS, 3rd, DeAndrade JR, Fleming LL, Lindenbaum SD, Welch RB. Proximal femoral fractures following total hip arthroplasty. *Clin Orthop Relat Res* 1982;170:95-106.
4. Kelley SS. Peri-prosthetic Femoral Fractures. *J Am Acad Orthop Surg* 1994;2-3:164-72.
5. Pazzaglia U, Byers PD. Fractured femoral shaft through an osteolytic lesion resulting from the reaction to a prosthesis. A case report. *J Bone Joint Surg Br* 1984;66-3:337-9.
6. Sydney SV, Mallory TH. Controlled perforation. A safe method of cement removal from the femoral canal. *Clin Orthop Relat Res* 1990;253:168-72.
7. Lindahl H, Garellick G, Regnér H, Herberts P, Malchau H. Three hundred and twenty-one peri-prosthetic femoral fractures. *J Bone Joint Surg Am.* 2006 Jun;88:1215-1222.
8. Scholz R, Pretzsch M, Matzen P, von Salis-Soglio GF. [Treatment of peri-prosthetic femoral fractures associated with total hip arthroplasty]. *Z Orthop Ihre Grenzgeb.* 2003;141:296-302.
9. Bhattacharyya T, Chang D, Meigs JB, Estok DM, Malchau H. Mortality after peri-prosthetic fracture of the femur. *J Bone Joint Surg Am.* 2007 Dec;89:2658-2662.
10. Duncan CP, Masri BA. Fractures of the femur after hip replacement. *Instr Course Lect* 1995;44:293-304.
11. Crockarell JR, Berry DJ, Lewallen DG. Nonunion after peri-prosthetic femoral fracture associated with total hip arthroplasty. *J Bone Joint Surg Am.* 1999 Aug;81:1073-1079.
12. Lewallen DG, Berry DJ. Peri-prosthetic fracture of the femur after total hip arthroplasty: treatment and results to date. *Instr Course Lect.* 1998;47:243-249.
13. Kayali C, Agus H, Turgut A. Successful results of minimally invasive surgery for comminuted supracondylar femoral fractures with LISS: comparative study of multiply injured and isolated femoral fractures. *J Orthop Sci.* 2007 Sep;12:458-465.
14. Farouk O, Krettek C, Miclau T, Schandelmaier P, Guy P, Tschernke H. Minimally invasive plate osteosynthesis and vascularity: preliminary results of a cadaver injection study. *Injury* 1997;28 Suppl 1:A7-12.
15. Po-hao chen, edward rodriguez, aron chacko,, and paul appleton. minimally invasive plate osteosynthesis of peri-prosthetic femur fractures associated with total hip replacement: a case series. *ortho journal hms* 2008 volume 10:57-59.

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