

MINIMALLY INVASIVE PLATE OSTEOSYNTHESIS OF PERIPROSTHETIC FEMUR FRACTURES ASSOCIATED WITH TOTAL HIP REPLACEMENT: A CASE SERIES

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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. Periprosthetic hip fractures most commonly occur around or just distal to a hip stem prosthesis (Vancouver Type B, 88%) [1], and periprosthetic distal femur fractures proximal to a knee arthroplasty may extend into the bone-prosthetic interface. Patients with unstable implants are treated with prosthetic revision. However, patients with stable implants are treated with open reduction and internal fixation (ORIF) [2].

Traditional ORIF of hip periprosthetic femur fractures has been done using cortical struts, allogenic bone grafting, cerclage wiring, and plating. Surgical approaches for this type of treatment have had a variable rate of success with reports showing high rates of union such as 39 out of 40 patients in one case series [3]. However, others reported non-union rates of 33% and rates of refracture of 34% [1]. ORIF can involve significantly extensive procedures that often result in significant blood loss and patient morbidity. One-year mortality rate across all periprosthetic fractures can be as high as 33% [4].

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. However, its efficacy on periprosthetic fractures is not well studied. The amount of published data on MIPO applied to the management of hip periprosthetic fractures is limited to only two case series [5, 6]. We present in this report our early experience using MIPO technique in the management of periprosthetic femur fractures.

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MATERIAL AND METHODS

After IRB approval, all patients presenting to the BIDMC orthopedic trauma unit with a periprosthetic femur fractures between 2005 and 2007 were considered. The study identified and enrolled a total of 24 patients with 26 periprosthetic fractures around a hip stem prosthesis or proximal to a total knee component. Medical records, follow up notes and radiographic studies were examined.

Periprosthetic fractures associated with a hip stem were classified using the Vancouver system, based on the location of the fracture. Primarily Vancouver B1 and C fractures were treated. The surgical plan was determined by the patient's attending orthopedic surgeon after radiographic assessment of the stability of the prosthetic stem.

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 or in the supine position if the fracture either was a Vancouver C or was proximal to a knee component. For Vancouver B1 fractures, the entry point of the plate was identified lateral to the distal femur where a 4 cm incision was placed (Figure 1). 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 (Figure 2). 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

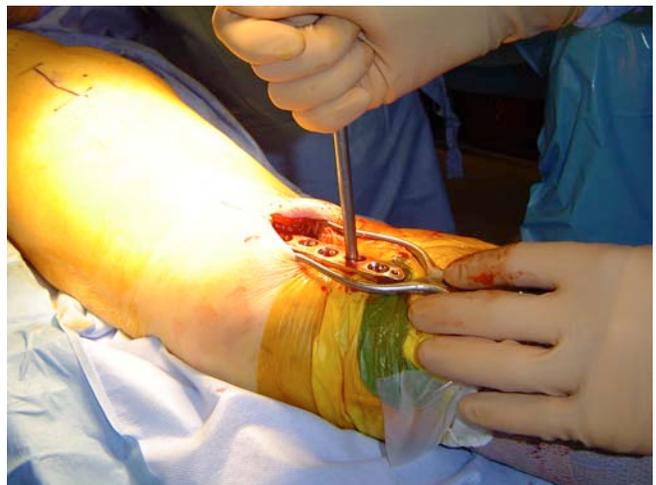


Figure 1: The entire length of the plate can be inserted through an incision of 4cm.



Figure 2: Extent of soft tissue damage after the insertion of locking plates and stabilizing nails. The MIPPO techniques leaves much of the soft tissue intact.

fixation (Figure 3). For Vancouver C or distal femur fractures proximal to a TKA, standard LISS technique was used.

Patients were discharged to rehabilitation facilities and followed up at 2 weeks, 8 weeks, 4-6 months, and one year. Outcomes evaluated included pain, union/non-union, function, movement, and complications.

RESULTS

Of the patients examined, 75% were female, and the mean age was 76.5 years old. The majority of periprosthetic fractures occurred at least 12 months after index arthroplasty. There were 14 Vancouver B1 fractures, 6 Vancouver C, and 6 fractures proximal to a total knee replacement. Twenty-five percent of the patients were being treated for osteoporosis at the time of fracture. Fifty-four percent of the patients had a history of cardiovascular diseases at the time of fracture. This includes 8% with a history of myocardial infarction (MI), 21% with congestive heart failure, and 25% with atrial fibrillation. None of the patients in the case series had a history of pulmonary embolism (PE) or deep vein thrombosis (DVT) prior to surgery or after our surgery. Thirty-eight percent of the patients had a history of diabetes mellitus and thirteen percent were smokers.

The mean number of postoperative days in hospital before discharge was 4.8 days. Sixty-three percent of patients suffered from postoperative anemia. Fifty-four percent received transfusion. Eight percent of the patients suffered from postoperative confusion, and no patient suffered from PE, MI, DVT, or infection prior to discharge. All patients were discharged to rehabilitation facilities.

Of the 24 patients, 13 patients were operated at least one year ago. The remaining do not presently have one year follow up for assessment of outcome and are excluded from this preliminary report. In patients with one-year follow up, all fractures healed, and there was no infection. One patient reported mobility without the use of walkers, and two were able to achieve ambulatory function with walkers. One patient was able to walk but suffered from thigh pain at 8 months with the diagnosis of greater trochanter bursitis. One patient suffered from knee effusion at 3 months, and a knee cartilaginous tumor was discovered at 5 months and treated by surgical excision.



Figure 3: Post-operative radiography of the installed plate

DISCUSSION

Conventional open reduction and internal fixation techniques for repairing periprosthetic fractures can carry a high morbidity and mortality, and results of ORIF had been varied [1, 4, 7, 8].

The MIPPO technique offers some theoretically sound improvements over the traditional approach. Minimizing blood loss and vascular disruptions may yield faster rate of healing and increase union rate. In MIPPO, fractures are repaired using minimal incisions and percutaneously applied plates and screws with-

out supplementary allogenic bone grafting or strut. 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 [9].

In the present study, we describe our preliminary results using MIPPO to repair periprosthetic fractures. Results have so far been satisfactory. Patients undergoing MIPPO have experience lower transfusion requirements and no postoperative complications such as DVT, MI or PE. Healing has occurred in all cases with more than one-year follow up and most of these patients have achieved acceptable levels of ambulatory function similar or slightly below their preoperative status.

This is an ongoing investigation and most patients will be followed up further. The sample also has a large range of age from 40 to over 90 years old, which does not allow stratification of outcomes for specific age groups. In each intervention, the number and lengths of screws and cerclages used were at the discretion of the attending surgeon. We believe that our MIPPO protocol is so far effective for the management of periprosthetic fractures.

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