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Editorial

Minimally invasive plate osteosynthesis

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Abstract

Locking Compression Plate (LCP) is a minimally invasive plate osteosynthesis procedure that has been frequently employed in trauma patients. Its benefits include the MIPO technique's lack of interference with the fracture site, which allows for better biological healing, and the LCP's good angular stability. Its use in bone lengthening, on the other hand, has not been proven. In such instances, it is preferable to reduce the time spent externally fixing the skeleton as much as feasible. In order to minimize the external skeletal fixing period, the MIPO approach was used in conjunction with an LCP to treat femoral distraction osteogenesis. The MIPO procedure was used in two stages for femoral lengthening. For bone lengthening, Orthofix external fixators were utilized to implant screws from the anterolateral side of the femur rather than the lateral side. When sufficient callus formation was observed postoperatively at the site of bone lengthening and infection was ruled out, limb draping was performed, which included the use of a complete external fixator, and the MIPO technique with an LCP was used. The average external skeletal fixation time was 134 days, the average external-fixation index was 24 days/cm, and the average consolidation index was 22 days/cm in three cases (5 limbs). In femoral lengthening, the MIPO approach with an LCP allowed for a shorter external skeletal fixation-wearing period.

Keywords: Locking Compression Plate (LCP), Minimally Invasive Plate Osteosynthesis (MIPO), bone lengthening

INTRODUCTION

Fractures of the proximal humerus are the third most common fracture among the elderly [1]. The majority of fractures are traditionally treated conservatively. Conservative approaches, on the other hand, require extended immobilization in elderly patients with weak bones, which can lead to joint stiffness, contractures, and disuse osteoporosis [2]. As a result, surgical therapy is advised for fractures where conservative treatment has failed. Open reduction internal fixation with plating and antegrade intramedullary nailing are two regularly utilized surgical procedures [3]. Both strategies, on the other hand, have drawbacks. Although nailing is a percutaneous procedure, it can cause problems such as shoulder discomfort and non-union [4]. To create an entrance portal, the rotator cuff must be sliced. Shoulder rehabilitation is difficult for elderly adults who already have some degree of peri-arthritis in their shoulders.

Large skin incisions and extensive soft tissue dissection are required for open plating, which increases the risk of problems such as infection, non-union, and radial nerve injury [5]. Such problems are particularly likely in elderly adults with reduced immunity, concomitant morbidities, and osteoporosis.

With a greater understanding of fracture healing, fracture stabilisation has shifted from absolute mechanical stability to a balance between fracture biology and mechanical stability over time. MIPO (Minimally Intrusive Plate Osteosynthesis) is one such approach that preserves fracture biology while providing relative stability for fracture union. MIPO plating for proximal metadiaphyseal humerus fractures has received relatively little research.

The majority of shaft humerus fractures are traditionally treated conservatively. However, recent published data has revealed that operational procedures provide considerable advantages in terms of improved functional outcomes and lower nonunion rates [6]. Complex metadiaphyseal proximal humerus fractures in the elderly require lengthy immobilisation, which can have a significant detrimental impact on quality of life. The most common surgical treatment for proximal humerus fractures is open reduction internal fixation with plating via the deltopectoral route. For difficult metadiaphyseal proximal humerus fractures, James et colleagues observed that open reduction and internal fixation with plating yielded satisfactory outcomes [7].

Antegrade intramedullary nailing is a minimally invasive procedure that does not expose the fracture site. However, in 60 percent of patients over 65 years old with proximal metadiaphyseal fractures, Garnavos, et al. reported problems such as loss of reduction, failure of closed reduction, difficulties in distal locking, increased radiation exposure, and prolonged shoulder pain [8]. In the follow-up, no cases of loss of reduction were reported. In our investigation, just one case resulted in restricted shoulder movements.

For metadiaphyseal fractures in the elderly, the MIPO approach with a lengthy PHILOS plate is a very good alternative. Because this is a tissue-sparing procedure, the risks of open plating and nailing are avoided.

However, for a successful outcome, surgical skill and a thorough understanding of neurovascular systems are required [9]. In comparison to other procedures, the MIPO approach had a low incidence of nonunion, infection, nerve damage, shoulder stiffness, and the requirement for revision surgeries. In our study group, there were no cases of infection, nerve damage, or nonunion. With both PHILOS and helical plating, a number of studies have showed great results with MIPO plating for humerus shaft and proximal humerus fractures. There are minimal trials of MIPO plating in senior patients with complicated metadiaphyseal proximal humerus fractures. In their 24 senior patients with proximal metadiaphyseal proximal humerus fractures, Seyfattingulo colleagues found a 100 percent union rate, two occurrences of shoulder impingement, and two cases of radial nerve palsy. The potential of axillary nerve damage is a disadvantage of MIPO plating with deltoid splitting approach proximally [10]. To avoid radial nerve damage, some recent studies have advised anterior distal window and anterior distal contouring for long PHILOS plates during MIPO procedure. However, while dividing the brachialis muscle during anterior window development, the musculocutaneous nerve is at risk.

In the treatment of various long bone fractures, Minimally Invasive Plate Osteosynthesis (MIPO) has been shown to be better to Open Reduction and Internal Fixation (ORIF). Nonetheless, there is little evidence of MIPO in distal fibula fractures. After the soft tissue swelling had subsided, surgery was performed. A two-step method was used in cases of high-energy trauma or subluxated fractures with significant edoema, which included temporary fracture stabilization with an external fixator [11].

Patients in both groups were positioned on a radiolucent table in a supine posture (supine with a bump under the ipsilateral hip and the knee slightly flexed). All bars and pins were removed if an external fixator was used.

An open surgical approach was established in the ORIF group. If extra access to the anterior syndesmosis was required, the skin incision was made lateral to the fibula and somewhat anterior. With one or two Weber clamps, the fracture region was uncovered and gradually decreased. A lag screw was used if necessary. Then, using the AO approach, a plate was put. Based on preoperative radiographic planning, the correct plate dimension (in these cases only LCP 1/3 tubular plate or premade distal fibula LCP) was chosen in the MIPO group [12]. A tourniquet was worn throughout the surgery, with a pressure of 100 mmHg above the patient's systolic arterial pressure. The tip of the malleolus was detected under fluoroscopic control, and a 2-cm-long, gently curved incision was performed distally to the tip. A grip was created by inserting a distal locking drill sleeve into the plate. The plate was then retrogradely pushed subcutaneously along the fibula, taking care not to create false paths. The plate was then centered on the fibula with good bone contact using a second locking drill sleeve, and a locking screw was inserted into the most distal plate hole.

Clinical and radiographic follow-up was done 6 weeks, 3 months, 6 months, and 1 year after surgery. Operation time measured between incision and wound closure as well as length of stay after surgery was noted. Postoperative skin necrosis, nonunion, fracture-related infections, wound healing abnormalities, and vascular-nerve injuries were all reported and characterised as postoperative complications. A nonunion was defined as a fracture that did not mend entirely within 9 months of damage or did not show any indications of healing for three months in a row.

The operative surgeon and a competent radiologist separately assessed the union of fractures on plain radiography. In both the anteroposterior and lateral views, bone healing was defined as the absence of pain during weight bearing and the bridging of at least three out of four cortices. A computed tomography scan was performed if there was any doubt. Any differences between the operating surgeon and the radiologist were resolved through discussion.

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