

## Mal-Alignment After Minimally Invasive Plate Osteosynthesis In Distal Femoral Fractures

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### Introduction

Minimally invasive plate osteosynthesis (MIPO) is the most preferable treatment method for distal femoral fractures because of the superiority of fracture healing. However, MIPO with indirect reduction may result in higher rate of mal-alignment and moreover, it is difficult to assess rotational mal-alignment with simple radiographs or physical examination.

### Objectives

In this study, we assessed angular and rotational mal-alignment after MIPO in distal femoral fractures and possible affecting factors were evaluated.

### Methods

From 2005 to 2013, 138 patients with distal femoral fracture were treated by MIPO. Among them, 52 patients in whom bilateral rotational alignment could be measured by computed tomography (CT) were enrolled in this study. There were 32 men and 20 women, with the mean age of 53.4 years. There were 13 cases of distal femoral shaft fractures (according to AO-OTA classification, 2 patients of 32-A, 6 of 32-B, 5 of 32-C), and 39 cases of distal femoral fractures (7 patients of 33-A, 32 of 33-C). Coronal and sagittal alignments were assessed by simple radiographs, and rotational alignment was assessed by CT. Compared to unaffected side, the result was divided into four groups (excellent, good, fair, and poor). The possible influencing factors for mal-alignment that we assessed were; fracture location, fracture patterns (complex fracture: 37, simple fracture: 15), coronal and sagittal alignments, and associated ipsilateral long bone fracture.

### Results

The average difference of coronal alignment was -1.1 degree (-10.33 ~ 7.57, SD=3.7) compared to the unaffected side, and that of sagittal alignment was -1.1 degree (-8.2 ~ 4.0, SD=2.6). The average difference of rotational alignment was -7.7 degrees (-47.0 ~ 21.7, SD=13.9). There was no significant correlation between angular deformity in coronal and sagittal plane and degrees of rotational alignment ( $p=0.691$ , multiple regression analysis). In terms of coronal and sagittal alignments, satisfactory result was achieved in 97.3% in complex fracture and 100% in simple fracture. However, in rotational alignment, there showed unsatisfactory result in 48.6% of complex fractures (excellent : 11, good : 8, fair : 6, poor : 12), and 26.7% of simple fractures (excellent : 5, good : 6, fair : 1, poor : 3). Twenty-two patients out of 49 who obtained satisfactory results in both coronal and sagittal alignments showed unsatisfactory result in rotational alignment. In complex fractures, the presence of concomitant ipsilateral long bone fracture seemed to result in a higher rates of rotational mal-alignment ( $p=0.149$ , Chi-square test).

### Conclusions

Minimally invasive plate osteosynthesis in distal femoral fractures achieved relatively satisfactory results in coronal and sagittal alignments. However, rotational mal-alignment was occurred highly, irrespective of the fracture patterns. A caution should be taken to prevent rotational mal-alignment during surgery in distal femoral fractures.