BEST TRAUMA RELATED POSTER–2016 ORS MEETING

Analysis of Medial Cortical Support Using Postoperative X-ray Assessment of Reduction and Three Dimensional Multiplanar Reconstruction Computed Tomography Images After Trochanteric Femoral Fractures

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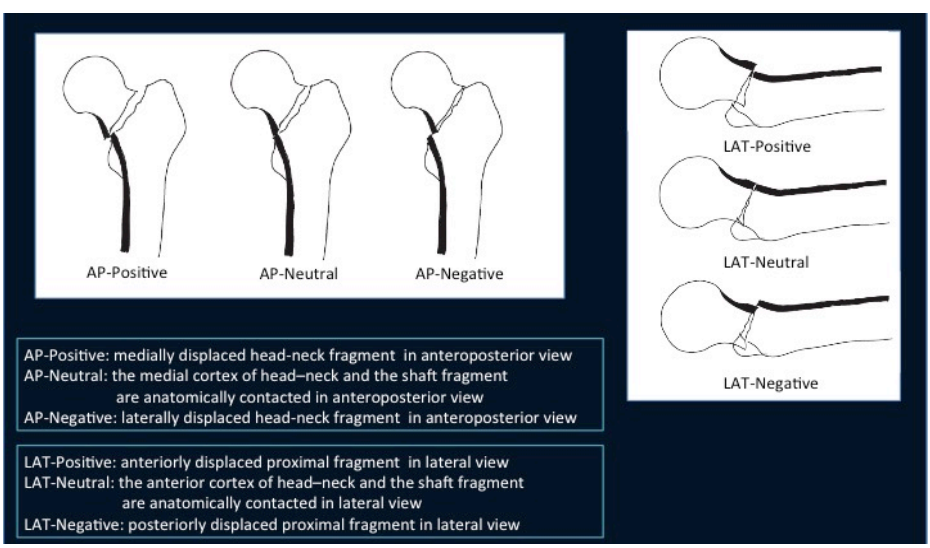
Introduction: X-ray is used to assess postoperative reduction after trochanteric femoral fractures treated using a short femoral nail. When the proximal fragment (headneck fragment) is placed within the medulla of the distal fragment (femoral shaft), the amount of telescoping is expected to increase because the amount of contact with the cortical bone is reduced. Meanwhile, if there is a medial cortical support, then the amount of telescoping is expected to decrease. Although postoperative X-ray assessment of reduction can predict medial cortical support, we do not know whether there is indeed cortical support until we perform examinations with three dimensional multiplanar reconstruction computed tomography (3D-MPR CT). We investigated whether there is a correlation between X-ray assessment of reduction and the amount of medial cortical support.

Methods: The study subjects consisted of 36 patients (36 limbs) with trochanteric femoral fractures treated using a short femoral nail known as CM-nail. The breakdown of fracture types was as follows: 3, 12, 5, and 16 subjects with Jensen type II, III, IV, and V fractures, respectively. In the postoperative X-ray assessment of reduction, these were classified as positive, neutral, or negative on anteroposterior (AP) and lateral views [1], (fig1).

(fig1)



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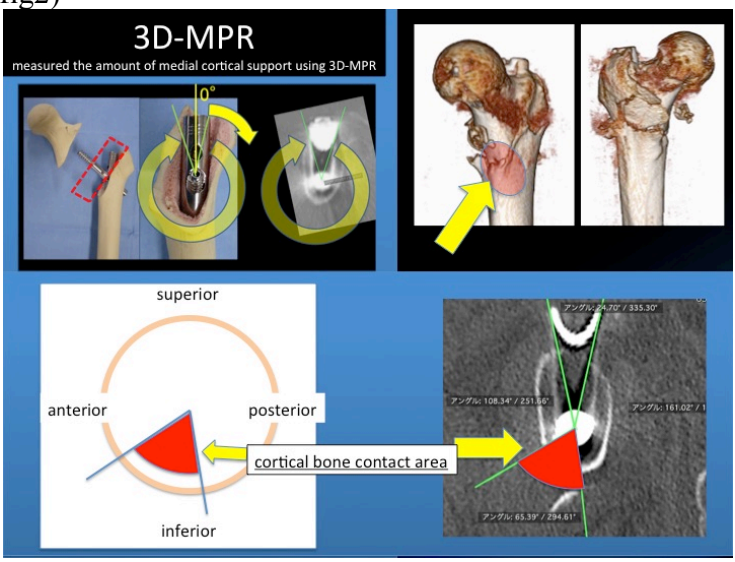
The method of evaluation involved using 3D-MPR images created using DICOM imaging and the medical image processing software (Osirix MD). To investigate the condition of the contact area for the proximal and distal bone fragments, coronal cuts distributed 360° radially around the lag screw were taken and analyzed (fig2).

(fig2)



The amount of telescoping was measured using CT 2 days and 2 weeks after surgery. During the first measurement, we performed postoperative X-ray assessment of reduction (AP view: positive, neutral, and negative) and measured the amount of medial cortical support using 3D-MPR, and then analyzed the amount of telescoping after 2 weeks postoperatively.

During the second measurement, we performed postoperative X-ray assessment of reduction (lateral view: positive, neutral, and negative) and measured the amount of medial cortical support using 3D-MPR, and then analyzed the amount of telescoping after 2 weeks postoperatively.

Results: There were 36 males in this study. The first results for postoperative X-ray assessment of reduction showed that 12 subjects were classified as positive, 24 as neutral, and 0 as negative on the AP views. The amount of medial cortical support was 76.6° for positive cases and 96.2° for neutral cases. Telescoping after 2 weeks postoperatively was 1.4 mm for positive cases and 1.82 mm for neutral cases. There were no statistically significant differences in terms of the amount of medial cortical support or telescoping between the positive and neutral groups.

The second results for postoperative X-ray assessment of reduction showed that two subjects were classified as positive, 20 as neutral, and 14 as negative on the lateral views. The amount of medial cortical support was 59.4° for positive cases, 126.0° for neutral cases, and 42.0° for negative cases. The amount of telescoping was 0.06 mm for positive cases, 0.75 mm for neutral cases, and 3.21 mm for negative cases. There were statistically significant

differences in terms of the amount of medial cortical support or telescoping between the negative and neutral groups.

We confirmed that the amount of medial cortical support and telescoping were larger in the "negative in the lateral view" group than in the "neutral in the lateral view" group.

Discussion: Postoperative X-ray assessment of reduction is important as it is related to the prediction and prevention of cut out. Because surgery involves performing a direct reduction via a small skin incision, there were no subjects in the "negative in the AP view" group. From the first results, we were able to confirm that the medial cortical support was not increased in the "positive in the AP view" group. From the second results, we were able to confirm that the amount of medial cortical support decreased and telescoping increased in the "negative in the lateral view" group using 3D-MPR. We confirmed that stability was achieved by ensuring anterior contact, i.e., reduction of the anteromedial cortex, resulting in a large area of contact.

Significance: To date, postoperative X-ray assessment of reduction has been difficult because it has not been possible to quantify the amount of medial cortical support. In the group where there was successful assessment of the fracture site using postoperative 3D-MPR-CT (negative in the lateral view), we confirmed that telescoping increased because medial cortical support decreased.

References: [1] Fracture reduction with positive medial cortical support: a key element in stability reconstruction for the unstable pertrochanteric hip fractures. Chang SM et al.Arch Orthop Trauma Surg. 2015 ;135(6):811-8.

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See pages 49 - 106 for financial disclosure information.