Arthroscopic and radiographic evaluation after fluoroscopic open reduction and internal fixation of distal radius fractures with impacted intra-articular fragment

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Objective

The purpose of this study was to arthroscopically assess the articular reduction after fluoroscopic open reduction and internal fixation of Distal radius fracture (DRFx) with impacted intra-articular fragment

Material and Method

Since 2014 to 2017, a total of 176 consecutive patients
Computed tomography (CT) scanning was obtained for all acute DRFx if articular incongruity is present or suspected.

From a list of CT scans, we identified 13 CT scans that had impacted intra-articular fragments according to the classification by Medoff R ¹)
There were 6 women and 7 men with an average age of 59 years (range, 24-76 y).

Operation

A volar flexor carpi radialis approach to the distal radius
the fracture was reduced using standard extra-articular techniques
reduction was verified by fluoroscopic image
a volar locking plate was applied.
After the plate fixation, the reduction was assessed arthroscopically.
Step and gap deformity were then measured using a calibrated probe at the point of maximum displacement.

Parameter

Whether there was a volar rim fracture fragment and the number of intra-articular fracture fragments based on the classification by Medoff R ¹) in the preoperative CT scanning.
Pre and intraoperative radiographs were examined teardrop angle.

Statistical analysis

Single linear regression analysis was conducted to elucidate the association between the intraoperative teardrop angle and intraoperative arthroscopic parameters. A p value of ≤0.05 was considered significant.

Definition of TDA

In plain radiographs, Medoff ¹) introduced the teardrop angle (TDA), which is a radiographic parameter and is measured as the angle formed between the central axis of the teardrop and the radial shaft. On the lateral view, the teardrop represents the volar rim of the lunate facet. Medoff ¹) described how a decrease or increase in the TDA may indicate displaced intra-articular fracture elements when the radial inclination (RI) and volar tilt (VT) is restored in distal radius fractures.

Results

A volar rim fracture fragment was found in 12 of the 13 patients.
The mean number of intra-articular fracture fragments were 4.7 (range, 4-5).
The intraoperative gap was averaged 1.2 mm.
The average step off was 1.3mm, and the averaged gap + step off 2.5mm.
The average teardrop angle were 38.1° at preoperatively and 48.8° intraoperatively respectively.
Linear regression analyses revealed that the intraoperative teardrop angle had a significantly negative correlation with postoperative gap + step off in arthroscopy (R²=0.30, p=0.05).

Conclusion

12 of 13 patients had an articular step-off of more than 2 mm with arthroscopy evaluation, although the articular surface appeared anatomically reduced under the fluoroscopy.
Arthroscopic reduction and fixation for optimal treatment for impacted intra-articular fragments of DRFx might be needed.
Almost patients had volar rim fragment and more than 4 of intraarticular fragment. Increase of the intraoperative teardrop angle significantly corresponded with decrease of intraoperative gap + step off in arthroscopy.
The teardrop angle measurement may be useful in intraoperative radiographs as well as intraoperative arthroscopic assessment.