

Indications and Expected Benefit of Plate Removal After Open Reduction and Internal Fixation of the Proximal Humerus

Manuel Kramer, MD; Menduri Hoessly; Kimberley Wyss; Vilijam Zdravkovic, MD; Bernhard Jost, MD; Christian Spross, MD

Purpose: The treatment of proximal humerus fractures extends from conservative therapy to open reduction and internal fixation (ORIF) and prosthetic treatment. ORIF leads to later plate removal (PR) in one-third of all cases. It is still unclear which of these treatment groups will benefit the most from PR. We were looking for predictive factors for the clinical benefit after PR.

Methods: All proximal humerus fractures from 2014 to 2020 were recorded in a prospective database. The minimal follow-up was 1 year and all revision surgeries leading to a shoulder prosthesis were excluded. Clinical and radiographic follow-up at 3 and 12 months and before and after PR were compared. For the radiographic analysis, known measurements (acromion-tuberosity-index, lateral-acromion-angle, critical-shoulder-angle) as well as newly designed measurement methods (acromion-plate-angle = APA, acromion-plate-index = API) were compared between these subgroups.

Results: We included 95 patients. 31 underwent later PR. A significant difference between the group without (nPR) and with plate removal (PR) was seen in the age (PR = 50 years, nPR = 63 years; $P = 0.001$). Sex, fracture constellation, bone quality and the absolute Constant Score (aCS) showed no differences. By comparing the values before and after PR, a significant improvement in aCS (+12.6), rCS (+16.6), elevation (+29.5), abduction (+32.6), and external rotation (+18.1) ($P < 0.001$) was achieved. In the regression analysis, the age and the APA were shown to be relevant predictors for an improvement in the aCS. The cut-off values for a clinically relevant increase in the aCS of at least 10 points were calculated for an age > 55 years and an APA of $< 36^\circ$.

Conclusion: Significant improvements in clinical scores and range of motion were achieved across all groups. PR was performed more frequently in younger patients, but led to a relevant increase in aCS 5x more frequently in patients over 55 years. An APA of $< 36^\circ$ is a positive predictor for an increase in the aCS after PR and can be applied easily on conventional shoulder radiographs, which is why this new defined measurement provides significant added value for preoperative patient education.