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Locking plate versus nonsurgical treatment for proximal humeral fractures: better midterm outcome with nonsurgical treatment

Rick J. Sanders, BS[a,b], Luc G. Thissen, BS[a,b], Jop C. Teepen, BS[a], Albert van Kampen, MD, PhD[b], Ruurd L. Jaarsma, MD, PhD, FRACS[a,*]

[a]*Department of Orthopaedics, Flinders Medical Centre, Adelaide, Australia*
[b]*Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands*

Background: Since its introduction, there has been controversy about the use of locking plates in the treatment of proximal humeral fractures. Have they really improved the functional outcome after a proximal humeral fracture or should nonsurgical treatment have a more prominent role? In order to evaluate our hypothesis that nonsurgical treatment for proximal humerus fractures should be the first choice of treatment, a matched controlled cohort study was conducted to compare the midterm (>1 year) functional and radiologic outcome of a group of patients treated with a locking plate and a matched group of patients treated nonsurgically. Complications in each group of patients were evaluated.

Materials and methods: Through direct matching, 17 patients (1 bilateral fracture) treated with a locking plate were matched to 18 patients treated nonsurgically. Medical records and radiographs were reviewed retrospectively to obtain relevant patient related data and fracture type according to Neer classification (i.e. 2-, 3- and 4-part fractures). At the time of clinical follow-up, EQ-5D, American Shoulder and Elbow Surgeons (ASES) score, visual analog pain (VAS) pain and VAS satisfaction scores were completed. Active range of motion was tested. New radiographs were made to evaluate fracture healing, complications and, in the locking plate group, the position of the plate and screws.

Results: No significant differences were found in the characteristics of the patient groups. A significant difference in range of motion was found in favor of the nonsurgically treated patients. Results of ASES and patient satisfaction scores were also tending toward nonsurgical treatment. Furthermore, the complication rate was higher with locking plate treatment. Patients treated with a locking plate needed significantly more additional treatment on their injured shoulder ($P = 0.005$).

Discussion: This study's main limitation was the fact that the choice of initial fracture management was based on clinical judgement, as well as patient's fitness for surgery and therefore not randomized. By matching for fracture type this bias was largely overcome. Surgical treatment had a higher complication rate, requiring more additional treatment, which was often related to the initial surgery. Improving surgical technique could possibly lead to better outcomes for the surgically treated patients. In addition to the more favorable outcomes, nonsurgical treatment is also a more cost effective treatment.

This study received approval from the Southern Adelaide Flinders Clinical Human Research Ethics Committee (SAFC HREC).

*Reprint requests: Ruurd L. Jaarsma, MD, PhD, FRACS, Flinders Medical Centre, Department of Orthopaedics and Trauma, Flinders Dr, Bedford Park, SA 5042, Australia.

E-mail address: ruurd.jaarsma@health.sa.gov.au (R.L. Jaarsma).

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Conclusion: Nonsurgical treatment should have a more prominent role in the treatment of proximal humeral fractures.
Level of evidence: Level III, Retrospective Case Control Study, Treatment Study.

Keywords: Proximal humeral fracture; locking-plate; nonsurgical treatment; active range of motion; EQ-5D score; ASES score; complication rate

Approximately 4% to 5% of all fractures involve the proximal humerus,[10] making it a common fracture in the general population. The male/female gender distribution is 3:7, and more than 70% of patients are aged older than 60 years.[27,28] Other factors related to proximal humeral fractures are a high risk of falling and a low bone density.[19,25]

Proximal humeral fractures can be treated nonsurgically in 80% to 90% of patients.[15] Approximately 10% to 20% require surgery[5] by open reduction and internal fixation (ORIF), according to the indications for operative treatment as outlined by Neer,[22] or by hemiarthroplasty.

Since the introduction of the locking plate, it has gradually become the most commonly used method for a surgical fixation of a proximal humeral fracture. Several studies have reported favorable short-term clinical results of locked plating for proximal humeral fractures, but these studies also highlight complications related to this technique.[1,2,4,5,11,12,16,24,26-28] However, good results for nonsurgical treatment of proximal humeral fractures, including 3- and 4-part fractures, have also been described.[7-9,17,29]

Despite these results, there still is no consensus on the first choice of treatment for proximal humeral fractures. Studies comparing longer-term results after treatment of patients with a locking plate vs a control group are scarce. The main purpose of this cohort study was to compare midterm outcome (>1 year) of patients with proximal humeral fractures treated nonsurgically and patients treated with a locking plate.

Materials and methods

Patients

A cohort study was done of patients who were treated nonsurgically or with a locking plate for a proximal humeral fracture. This included a retrospective review and observational follow-up. All patients presented between January 1, 2002, and December 31, 2008, at a level 1 trauma center in Australia. They were identified using the hospital databases. The study excluded patients aged younger than 18.

This resulted in a list of 234 patients treated for a proximal humeral fracture, of which 178 patients received nonsurgical treatment, 41 received a locking plate, and 15 received another surgical treatment. Of this group, 18 patients with a locking plate were able to participate in the study.

To get 2 comparable patient groups, patients treated with a locking plate were directly matched with patients from the nonsurgical group. The matching was done primarily based on the fracture type according to Neer classification,[22] age, and gender, without having any knowledge about other demographic and clinical data. Fracture type was assessed using the first radiographs made after the incident (Fig. 1). Every patient was evaluated according to the initial treatment received (intention to treat).

In all of the patients treated with a locking plate, a deltopectoral approach was used to insert the plate, which were either Synthes (West Chester, PA, USA) or Smith & Nephew (Andover, MA, USA). Postoperative management consisted of treatment with a collar and cuff, early pendular exercises, and physiotherapy. After 2, 6, and 12 weeks, patients were reviewed in the outpatient department and x-rays images were made at each of these occasions.

The standard nonsurgical management in this hospital consisted of treatment with a collar and cuff, pendular exercises after 1 week, and referral to physiotherapy after 2 weeks. After 1, 6, and 12 weeks, patients were reviewed in the outpatient department. X-ray images were made at each of these visits.

Data collection

Medical records were checked for demographic and clinical information (eg, comorbidity such as osteoporosis). Radiographs were evaluated by the first 2 authors (R.S., L.T.) for fracture type according to the Neer classification. If there was disagreement about the classification, the x-ray images were reevaluated with help of a consultant (R.J.), thereby reducing interobserver variation. Fractures were divided into 2-, 3-, and 4-part fractures.

Follow-up

All patients who returned to the hospital for midterm clinical follow-up were evaluated by the first 2 authors. A consent form was signed by each patient.

Two standardized questionnaires were completed to review the patients' current shoulder function and general health state. The current shoulder function was evaluated using the American Shoulder and Elbow Surgeons (ASES) self-assessment score.[21] For the general health state of the patient, the EQ-5D score was used.[6,23] A visual analog scale (VAS) was used to grade patient satisfaction with the current shoulder function.

To measure flexion, extension, abduction, external rotation, and internal rotation, an active range of motion (ROM) test was performed. The ROM of the affected side was compared with the unaffected side. Internal rotation was determined by the highest vertebra level that could be reached by putting the hand behind the