

Comparison between conservative and surgical treatment of midshaft clavicle fractures: Outcome of 151 cases

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Abstract.

INTRODUCTION: Midshaft clavicle fractures comprise up to 15% of all adult upper extremity fractures and account for 76% of all clavicle fractures. The treatment of choice remains controversial. The aim of our retrospective study was to compare the outcome of the surgical and conservative procedure in a trauma care unit (single center study).

MATERIAL and METHODS: In a cohort of 151 (mean age 36.1y/♂ 115/♀ 36) cases, between 2005 and 2009, 70 patients (46.4%) were treated conservatively (mean age 40.8y) and 81 (53.6%) underwent either surgical treatment with a locking compression plate ($n = 73$ /mean age 40.3y) or an intramedullary nail system ($n = 8$, mean age 27.1y). Mean follow up was 15 months. Nine patients (5.9%) were lost to follow-up, due to poor compliance. The clinical outcome was assessed by the Disability of Arm, Shoulder and Hand (DASH) score and the Constant shoulder score.

RESULTS: The average DASH score was 7.3 and the Constant score measured 91.7 in the surgical group. The conservative group achieved a DASH score of 11.1 and a Constant score of 88.1. The clinical scores showed a significant superiority for the benefit of the surgical treatment for the DASH ($p = 0.037$) and Constant score ($p = 0.036$). Totally nine patients had a non-union in the conservative group and six a hardware failure in the surgical group which were revised.

DISCUSSION: The treatment options for midshaft clavicle fractures have to be discussed carefully for each patient with regard to the non-union risk, function, cosmesis and revision surgery.

CONCLUSION: Both therapeutic modalities demonstrated comparable efficacy. For active and younger patients we would favour a surgical treatment due to the short time of rehabilitation, the return to sport activities and the high non-union rate after conservative treatment.

Keywords: Clavicle fracture, treatment, non union, outcome

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Fig. 1. Preoperative view.

1. Introduction

Clavicle fractures have an overall incidence of 64 out of 100,000 per year, occurring in up to 15% of all adult upper extremity fractures [3,11,12,16]. About 76% of all clavicle fractures affect the midshaft part and can be managed conservatively. Fractures of the lateral part of the clavicle remain still a clear surgical indication. The treatment of choice, however, remains controversial as the conservative management is associated with high non-union rates, function deficits, shoulder shortening and poor cosmetic outcome [5,9,10,13,14]. A surgical intervention is especially indicated for open fractures and in cases of neural disorders.

Different surgical techniques have been described including an intramedullary stabilisation, screw fixation, K-wires or plate fixation. The aim of the current study is to compare the clinical and radiographic outcome between conservative and surgical treatment of midshaft clavicle fractures.

2. Material and methods

Between 2005 and 2009, 151 patients were treated in our trauma care unit with a midshaft clavicle fracture. A surgical treatment was recommended in cases of a highly-displaced midclavicular fracture in active and/or young patients. All of them received a detailed information regarding the different therapeutic options.

Totally 70 (46.4%) patients (♂ 51/♀ 19) were treated conservatively (mean age 40.8y) which includes a closed reduction followed by a figure – of eight – bandage for four to six weeks. Clinical and radiographic follow-up was done after two, four and six weeks. In cases of delayed consolidation and nonunion or progressive dislocation a surgical adjustment was performed as a second-stage procedure.

The surgical procedure was primarily performed in 81 (53.6%) patients (♂ 64/♀ 17) using either a locking compression plate ($n = 73$ /mean age 40.3y) or an intramedullary titanium elastic nail (TENs) system ($n = 8$, mean age 27.1y), each followed by application of a neck-wrist sling for at least four weeks (Figs 1–2).

Early passive physiotherapy was recommended with a maximum range of motion of 90° during the first two weeks postoperatively. Clinical outcome was assessed by the Disability of Arm, Shoulder and Hand (DASH) Score and the Constant shoulder score. Furthermore, documentation of neurovascular complications, wound healing problems or infections was performed.

Table 1
Statistical Outcome measurement

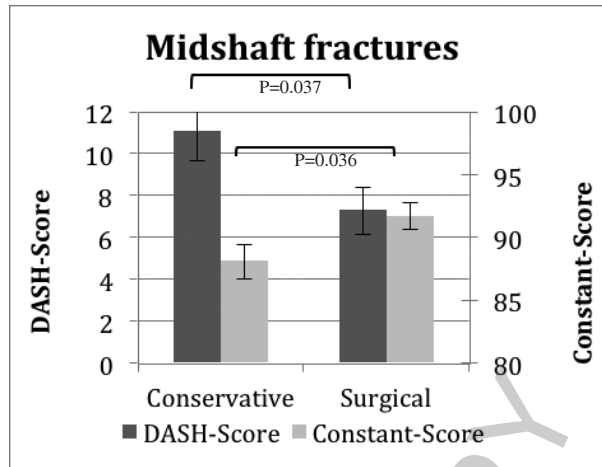


Fig. 2. Postoperative a.p. view after osteosynthesis stabilization.

Radiographic assessment contained of standardised true anteroposterior and 15° caudo-cranial position at each follow-up examination. In cases when X-ray image-based diagnosis remained unclear, an additional CT-scan was performed to illustrate the extent of bone healing, to determine the non-union extent and to improve visualisation of the implant’s position. The mean follow up period was 15 months.

3. Statistical analysis

The statistical analysis was performed with the Student’s t-test for independent samples after using the Kolmogorov-Smirnov-test to check for normal distribution and the Levene-test to determine the equality of variances. Level of significance was set at $p < 0.05$. All patients signed an informed consent to participate in the study. The study was carried out in accordance with the World Medical Association Declaration of Helsinki.

4. Results

In the conservative treatment group, the average DASH score was 11.1 and the Constant score 88.1 (Standard error: 1.4). The average DASH score in the surgical group was 7.3 and the Constant score 91.7

(Standard error: 1.1) at last follow-up. The DASH ($p = 0.037$) and Constant score ($p = 0.036$) were significantly better for the surgical treatment, indicating a better outcome in comparison to conservative therapy (Table 1).

Totally nine patients (12.9%) had a non-union in the conservative group and nine patients (11.1%) suffered from wound healing and associated complications in the surgical treated group.

All patients who suffered from a non-union after conservative therapy ($n = 9$) were surgically revised using a locking plate fixation (LCP), with or without autologous bone graft. After that, no further complications were documented.

In the surgical treated group nine patients had to be revised. From these, six (8.2%) had a primary plate osteosynthesis and three (37.5%) received an intramedullary fixation with TENs. The main reasons for revision in the surgically treated group were hardware failure ($n = 6$) and wound healing delay ($n = 3$). In the TENs subgroup two cases of a dislocation and one case of wound healing problems were detected. Totally six patients were revised (four plates and two TENs) with a reosteosynthetic LCP, the others ($n = 3$) healed after removing the plate ($n = 2$)/TENs ($n = 1$).

Displacement or deformity after consolidation (especially shortening or gap/step > 1 mm) was identified in 18 cases ($n = 12$ conservatively/ $n = 6$ surgical) that were clinically asymptomatic.

5. Discussion

The most important finding of the present study is the high non-union rate after conservative treatment. Both therapeutic modalities demonstrated comparable efficacy but for active and younger patients we would favour a surgical treatment due to the short time of rehabilitation and the return to sport activities. These results are in line to the current literature [1,6,8–10,14].

Khan et al. favour for undisplaced fractures of the clavicle a nonoperative treatment with good functional outcome and a high union rate. In cases of dislocation shaft fractures a surgical treatment is to prefer because of the higher nonunion rate. The effect on nonunion on the functional outcome remains still unclear [7].

Chen et al. reported a case series of 41 patients (FU 14.5 mo.) which were treated with TENs [4]. They showed that implantation of TENs consisted a safe procedure with good functional results and high patient satisfaction.

We would like to acknowledge the limitations of our study. The low number of patients in our cohort does not allow to draw firm conclusions regarding the efficiency of TENs. This option should be reserved for rare cases in young patients and has to be individually prescribed [7,8,17]. Another limitation is the retrospective nature of our work which cannot exclude potential bias.

6. Conclusion

The indications for the operative management in midshaft clavicle fractures remain controversial due to the grade of dislocation. For active and younger patients we would favour a surgical treatment due to the short time of rehabilitation, the return to sport activities and the high non-union rate after conservative treatment. Further prospective randomized comparative clinical studies are necessary for to better elucidate the role of surgical treatment in this patient group.

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