

The Out Come of Conservative Treatment of Displaced Midclavicular Fractures in Adolescent, Experience at King Hussein Medical Center

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ABSTRACT

Objective: To evaluate the outcome of conservative treatment of displaced midclavicular fractures in adolescent population.

Methods: A retrospective review of all displaced mid clavicle fractures in children aged from ten to sixteen years over a period of four years in King Hussein Medical Center was done; the outcome was evaluated regarding the complications, duration of treatment and the functional outcome with the Constant Shoulder Score .

Result: A total of 79 displaced fractures with a mean age of 13.4 years were included in the study, 56 boys and 23 girls. The mean fracture shortening was 14.3 mm (range, 5 to 28 mm), the mean fracture displacement was 18.4 mm (range, 4 to 23 mm), mean follow up was 20 months (range, 13 to 34 months), all patients were treated conservatively .the mean time to radiological union was 7.9 weeks (range ,6 to 11 weeks), the mean time to return to activity was 13.1 weeks (range, 8 to 19 weeks), and the mean Constant Shoulder Score was 97.8 (range, 89 to 100).

Conclusion: Conservative treatment of mid clavicle fractures in adolescents gives good results, and the surgical treatment for this fracture in the adolescent patients is not necessary.

Key Words: Adolescent, Clavicle fracture, Conservative treatment, The outcome.

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Introduction

Clavicle fracture is a common fracture in adolescent age group and accounts for 5-15% of all pediatric fractures.⁽¹⁻²⁾ the clavicle has a unique anatomical features, it is the first bone in the body to ossify, the ossification occur by intramembranous ossification .The clavicle is S-shaped with a medial convexity and a lateral concavity. The function of the clavicle is to act as a strut which transfer forces from the trunk to the arm, the middle third is the thinnest part of the clavicle and is located

superficially under the skin. These factors make this bone a common site for fracture, especially the middle third which accounts for about 90% of clavicle fractures in children.^(2,3) The healing potential of the clavicle is excellent, with the exception of open fractures, neurologic or vascular compromise, close treatment has long been accepted as the standard treatment in patients of all ages.⁽⁵⁻⁶⁾ after the recent evidence of unfavorable functional outcome of conservative treatment of mid clavicle fractures in adults⁽⁷⁻⁸⁻²⁰⁻²³⁾, the

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treatment modalities of the same fracture in adolescent and old children is being reevaluated, whether the Conservative treatment of this type of fracture in adolescent is adequate, or Surgical Treatment would be better?. Therefore, the aim of this study is to evaluate the outcome of conservative treatment of these fractures in this age group

Methods

Retrospective analysis was carried out of all children between ten and sixteen years who presented with displaced mid clavicle fracture at King Hussein Medical Center between January 2008 and December 2011. Patients presented with non-displaced or green stick fractures were excluded, also all patients with bilateral clavicles fracture or multi-injured patients with associated ipsilateral upper limb fracture (Humerus or both Bone Fracture) or floating shoulder were also Excluded. All the patients were treated conservatively and none of them was associated with vascular or brachial plexus injury, and all the fractures were closed. Medical records and the radiograph of each patient were reviewed; the amount of displacement and shortening of each fracture was calculated from the anteroposterior chest x-ray and the shortening was measured as a length difference compared with the uninjured side. Radiographic union was defined as a bony bridging on the x-ray and confirmed by clinical examination (Fig.1). All patients have been evaluated according to the Constant shoulder score (Constant-Murley Shoulder Outcome Score CMS) which is a 100-points scale composed of a number of individual parameters, these parameters define the level of pain and the ability to carry out the normal daily activities of the patient. The CMS score was introduced to determine the functionality after the treatment of a shoulder injury. The test is divided into four subscales: pain (15 points), activities of daily living (20 points), strength (25 points) and range of motion: forward elevation, external rotation, abduction and internal rotation of the shoulder (40 points). The higher the score, the higher the quality of the function. Exclusion criteria were any patient aged older than 16 years or younger than 10

years, green stick fracture, non-displaced fracture, floating shoulder or associated other ipsilateral upper limb fractures.

If shortening was more than 1 cm, figure of 8 bandages (Fig.2) was applied in addition to Arm sling and movement restriction, and if shortening was less than 1 cm, only Arm sling was applied with motion restriction instruction.

All patients were re-evaluated after 2-3 weeks from initial evaluation and the next Clinical and Radiological evaluation was done at 6 weeks after initial injury.

After 6 weeks from initial injury all patients were re-evaluated for Radiological signs of healing in Antero-posterior X-ray image, and at the same time clinical signs of healing were examined by evaluating local tenderness over fracture site by percussion, and evaluating shoulder range of motion if causing fracture site pain or not, next visits and evaluation are arranged accordingly.

Results

A total of 79 children with displaced mid clavicle fracture fulfilled the inclusion criteria and were entered in the study. There were 56 boys (71%) and 23 girls (29%) with a mean age of (13.4 Y), as shown in Table I, the mean fracture shortening was 14.3 mm (range, 5 to 28 mm), and mean fracture displacement was 18.4 mm (range, 4 to 23 mm).

Only 2 patients (2.5%) from the group were left Handed, and both of them had left sided clavicle fracture, and 77 patients (97.5%) were Right Handed and from those 77 patients, 70 (89%) had Right sided clavicle fracture, and only 7 (11%) had left sided clavicle fracture.

All 79 patients (100%) were evaluated for functional outcome in the affected side regarding the Range Of Motion of the ipsilateral Shoulder and the function of the ipsilateral upper limb in the same way regardless of the dominant hand side.

All fractures were treated with analgesia and a simple arm sling and /or figure of 8 bandage until the symptoms subsided, and the patient was comfortably able to mobilize his shoulder. All the patients were examined in the outpatient clinic within one week of the

injury, and the second visit was done after 2-3 weeks from the initial examination; further examination was arranged according to the clinical and radiological findings and mostly after 6 weeks from initial injury. After clinical and radiological healing was achieved, the



A. at initial presentation.



B. at 3 weeks after application of figure of 8 bandage and Arm sling.



C. at 12 weeks with full consolidation and beginning of Remodeling.



Fig. 1: 13 year old boy with mid clavicle fracture.



Fig. 2 : Figure of 8 bandage.

Table I: Age and Sex distribution of fracture

Age (years)	No. of fractures	Male	Female	Average union time
10	6	4	2	6 weeks
11	9	7	2	6 weeks
12	13	10	3	6.5 weeks
13	8	5	3	6.5 weeks
14	16	11	5	7 weeks
15	14	10	4	7.5 weeks
16	13	9	4	8 weeks

patient was seen in the outpatient clinic in six months intervals. The mean clinical follow up was 20 months (range, 13 to 34 months), all fractures in this study had healed conservatively, the mean time to radiological union was 7.9 weeks (range, 6 to 11 weeks), and the mean time to return to activities was 13.1 weeks (range, 8 to 19 weeks) Table II.

When the functional assessment of each patient in the last follow up was done, none of our patients complained of pain with overhead activity, weakness, or neurological symptoms, but actually 14 patients (18% of our patients), all were males, were cosmetically concerned about the hard swelling (bump) at the fracture site, but they were functionally fine and the mean Constant Shoulder Score was 97.8 (range 89 to 100).

All females in the study were not actually concerned about the Cosmetic appearance at the fracture site if they had hard swelling (bump), since most females in our community with Islamic conservative traditions do not expose their shoulders in public.

Table II: Time to Return to Activity.

After 8 weeks of injury	14 cases
After 10 weeks of injury	15 cases
After 13 weeks of injury	22 cases
After 15 weeks of injury	19 cases
After 19 weeks of injury	9 cases
Meantime 13 weeks	79

Discussion

Clavicle fractures are one of the most common skeletal injuries in adolescents, and the incidence of these fractures each year in adolescents and adults 13 years of age and older is 29-64 per 100, 000. (2,9) After the strong evidence of the superior outcome of the surgical treatment of displaced mid clavicle fractures in adults over the conservative treatment, regarding the incidence of non-union (10,4,23), fracture mal union with associated shoulder function deficit, (7,8) and patient satisfaction, (11,12) many pediatric orthopedic surgeons started to think about this concept for older children and adolescents who present with this fracture, but the application of the adult evidence to the adolescent patients remains unclear. (19,22)

Articles published about this subject actually are split, some recommended surgical treatment based on the adult evidence^(13,20) and other recommended the conservative treatment depending on the remodeling potential for the adolescent clavicle.^(14,22)

In this study, all our patients were treated conservatively, and all the fractures healed with a reasonable healing time and they were back to their normal activities in a good time. The functional result for each patient was assessed by the Constant shoulder Score,⁽¹⁵⁾ all our patients had good functional outcome with a mean Constant Shoulder Score of 97.8. Absolute indications for surgical treatments of mid clavicle fractures are open fractures, associated vascular injury, and compromise of the brachial plexus,⁽¹⁶⁾ but these indications are usually seen in the adult population and they were not present in our patients.

There is a general agreement that the healing potential of the displaced mid clavicle fracture in children and adolescents is very good, and that nonunion is not a point of concern for these patients. However, there is considerable debate about the symptomatic mal union in adolescents.⁽²¹⁾

Shortening of the clavicle is thought to affect shoulder function secondary to shortening of the adjacent muscles resulting in weakness and muscle imbalance, and this condition can lead to the concept of symptomatic mal union, this concept is well known end result of severely displaced fractures in the adult population due to limited remodeling potential and can give poor functional outcome,^(7,8,11) but the validity of this concept to the adolescent population is still not clear.

Some published articles suggested surgical treatment for the adolescent patients,^(17,13) and they showed superior outcome in the operative patients regarding the time of healing and return to activity over the patients who were treated conservatively, actually in our hospital we have never faced a need for surgical treatment for our patients in this age group and we do not have surgical cases. Other articles showed that conservative treatment gives good outcome and no need for surgical treatment in this age group,⁽¹⁸⁾ and

they showed that all their patients are treated conservatively with a good outcome.

Regarding the cosmetic result, we have in our study 14 patients (18%) who were concerned about the swelling at the fracture site, but we think that the remodeling potential for the clavicle is strong, and even with the persistent of this swelling in some patients, this is not a big problem especially if we consider the scar appearance after surgery and the problems which may appear.

Conclusion

Based on the fact of the high remodeling potential of the clavicle, as the medial epiphysis does not ossify until age 20 years and ossifications centers rarely fuse before age 25 years, we recommend conservative treatment of displaced mid clavicle fractures in adolescents, and we think that the application of the adult concept to the adolescent is not necessary.

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