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Case Report

Conservative Treatment of Medial Shaft Clavicle Fracture with Borderline Criteria: A Case Report

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Abstract

Clavicle fractures account for 3% of all fractures in adult population. Usually, surgical treatment is the gold standard for fracture with dislocation > 2 cm, shortening > 2 cm and angulation > 30 ° or comminution, especially in young or active patients, due to the relatively high risk of non-union. In our study, we report the case of a 50-years old patient, with high functional requests, with a middle shaft clavicle fracture, presenting borderline criteria. We treated him conservatively with figure of 8-bandage for five weeks. After removal of the bandage, patient performed physiotherapy and at final follow-up patient showed a nearly complete ROM despite a non-optimal radiographic outcome. Conservative treatment is a valid option in borderline middle shaft fractures, even in mature patient requiring high functional outcomes.

Keywords

Middle Shaft Clavicle; Fracture; Conservative Treatment; Borderline

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Introduction

Clavicle fractures account for 3% of all fractures in the adult population and almost 44-66% of all scapular girdle fractures [1,2]. The incidence of clavicle fractures is higher in child, in active young adults (< 30 years) and over 70 years, following a trimodal curve. The incidence of clavicle fractures between the two sexes is quite similar in the elder, beside in the adult (> 50 years) is higher in male population [3].

Falls on outstretched hand and motor vehicle crashes are the most common causes of clavicular fractures, as contact sports injuries could be. Analyzing clavicle fractures occurred in sports injuries, the peak incidence is highest between ages 10-19 years. Men are nearly 3 times as likely to sustain a clavicle fracture [4,5]. Sports is a factor in 45% of all clavicle fractures. It's believed that 94% of clavicle fractures come from a direct blow on the shoulder; only 6% falling on the outstretched hand [6]. Low energy traumas are rare cause of clavicle fractures. Pathological fracture of the clavicle are rare and may occur following primary or metastatic neoplasia or metabolic disease [7].

The majority (69-82%) of fractures occur in the midshaft of the clavicle, followed by 12-26% in the lateral part and 2-6% in the medial part. This can be anatomically explained by the fact that the medial and lateral parts of the clavicle are firmly secured by strong ligaments and muscles. The middle part of the clavicle is the anatomical segment of the clavicle with a smaller cross section and lacks any strong attachments, making it more vulnerable to trauma (Fig. 1) [8].

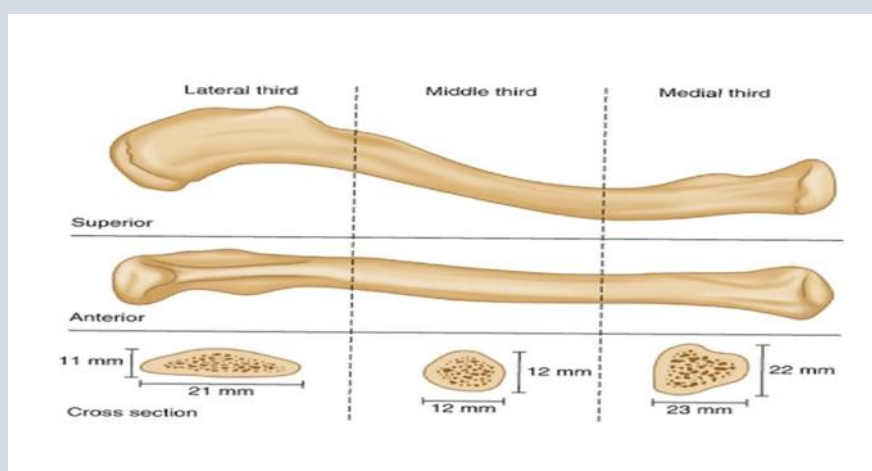


Figure 1: Clavicle cross section.

Clavicle fractures are relatively simple to diagnose. For a correct objective examination, the clinician should evaluate also the contralateral side and highlight the deformity of the

anatomical profile of the clavicle. The patient will present functional impotence and variable degree of arm pain. At the palpation of the fracture site it would be possible to appreciate the deformity of the bone, the bumps and crackles. Surface abrasions can be found in about 10% of cases and are located at the point where the traumatic force acted.

Usually, the lateral fragment dislocates in a caudal sense, due to the weight of the limb. This dislocation is often associated with a cranial displacement of the medial fragment, due to the traction by the sternocleidomastoid muscle (Fig. 2) [9].

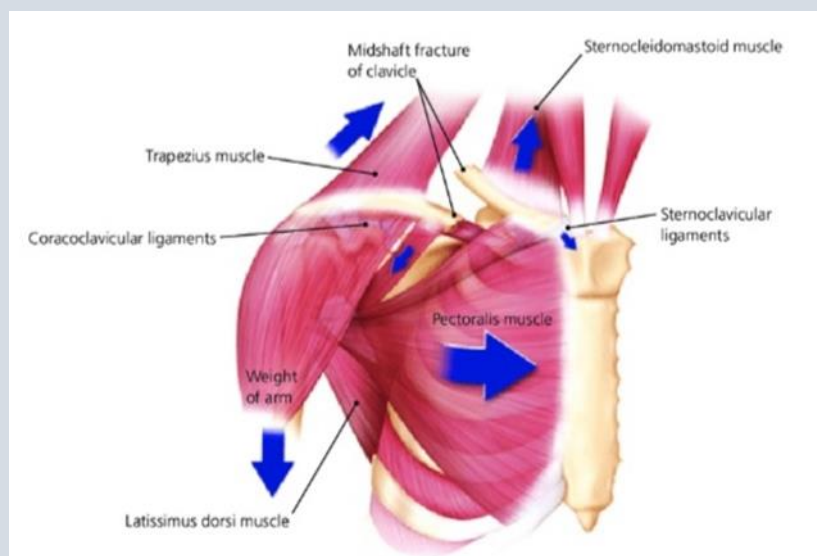


Figure 2: Clavicle muscles insertion.

The displaced fragments can protrude through the platysma muscle that interposes between the fractured bone segments [10]. The suspected diagnosis of a clavicle fracture is made clinically and confirmed with conventional X-ray in two direction [11]. X-rays are preferably performed using craniocaudal and caudocranial views, as described by Hoogervorst, et al., [12]. CT scanning may be required because routine clavicle X-rays may miss fractures due to overlap of surrounding structures, particularly at either end of the bone. MRI can show any evidence of injury to the neurovascular structures [13].

Treatment of clavicle fractures can be conservative, using a 8-bandage for 4-5 weeks or surgical, using plate and screw or K wire. The choice of surgical treatment is influenced by several parameters: (a) displacement more than 2 cm; (b) angulation more than 30°; (c) shortening more 2 cm; (d) comminution; (e) open fractures; (f) neurovascular injuries [14].

In this case report we analyze the outcome of a not surgically treated closed middle shaft clavicle fracture with borderline criteria.

Clinical Case

A 50-years old no-smoking man came to our observation for a motorcycle accident. He had no associated injury and no comorbidities. The patient reported pain and clinical evaluation showed reduction of ROMs of left shoulder, especially in flexion, extension and abduction. We did not observe the typical bump or tent deformity. The initial X-rays showed displacement of 19-20 mm with 25-26° angulation and a shortening of 24 mm (Fig. 3).



Figure 3: Initial X-Ray showing a displaced middle shaft fracture.

Comminution or neurovascular injury were not present. Patient required high functional outcome, due to his job (coiffeur) and hobbies (motorcycle and sports). The patient has been treated with an 8-bandage (Fig. 4). Immediately after applying the bandage, he reported symptom improvement and a slight improvement in the shoulder ROMs. We performed an intermediate radiographic evaluation at 14 days, according the most recent protocols for midshaft clavicle fractures that showed a significant reduction of angulation and dislocation. We kept the 8 bandage for 35 days with weekly follow-up to re-tension the bandage [15].



Figure 4: Reduction and maintained with a figure of bandage.

As soon as pain subside, after 2 weeks, physiotherapy started with passive ROM followed by active ROM and strengthening exercises preventing abduction more than 90° for 5 weeks. After removal of the bandage, pain and swelling were significantly decreased, with a residual stiffness; active ROM was about $85-90^\circ$ in flexion and $90-95^\circ$ in abduction. Radiographic evaluation showed a fracture healing. From the following week, free movement and progressive strain are allowed, with push movement and light resistance shoulder exercises. Furthermore, patients are advised to avoid contact sports for 3 months.

We performed clinical follow-up at 3, 6 and 12 months. At 3 months follow-up he reported that he had resumed his job, practiced sport and guided his motorcycle.

At final follow-up, clinical assessment, using DASH and Constant score, showed a complete ROM in all movements ($-5/10^\circ$ in flexion and abduction) without any stiffness or swelling; a negligible pain was present while lifting heavy loads. DASH and Constant were respectively 3.8 and 90° . Radiographic evaluation reported a complete healing of the fracture with residual shortening of 16-17 mm and $14-15^\circ$ angulation (Fig. 5,6).



Figure 5: 4 month clinical follow up.



Figure 6: Last X-ray performed at 4 month control showing a complete healing of the fracture.

Discussion

More recent large studies have demonstrated that patients who go on to healing of midshaft clavicle fractures with conservative treatment have similar outcomes to those treated operatively [16-18].

Excluding the risk of non-union, non-operative treatment has the benefits of lower cost, avoids potential risks of surgery and a significant rate of hardware removal [19,20]. One of the disadvantages and complications of operative treatment in general is implant-related irritation, encountered in both treatment modalities (plate and screws and K-wire) in up to 70%. As soon as the swelling has subsided, clavicle plates become prominent and often irritate. Implant-related irritation could be caused by telescoping of the nail at the entry side [21].

Other known and feared complications are wound infections. Different trials reported deep infection rates between 0 and 4%.

The most recent protocols of treatment of midshaft clavicle fractures support operative management is not a necessity for a successful outcome as a primary treatment of patients with displaced middle third clavicle fractures, because cosmetic and functional results were comparable to the conservative procedure, reducing surgical wound complications [22].

About non-union, comminution, displacement, and smoking are significantly associated with higher risk of non-union, but literature data are not homogeneous. NJ Murray, et al., developed a protocol in order to reduce the unnecessary fixation of midshaft clavicle fracture [23]. According to it, all isolated closed midshaft clavicle fractures are initially managed non-operatively in a sling or an 8-bandage. The exception to this were in patients with open fracture, floating shoulder, compromised skin, pathological fracture, severe chest trauma and those with neurovascular injury. The remaining patients underwent further fracture clinic and radiological follow-up at 2 weeks at which point all patients are clinically review. Patients are clinically examined for deformity, assessment of soft tissues, range of motion, shoulder position and progression of symptoms.

At the 2-week appointment it is possible to determine which patients are making clinical and radiological progress in order to decide if continue conservative treatment or to switch in surgical treatment.

About return to sport, one study on ice hockey players reports an average time to return to sport of 97, 6 days from injury in conservative treatment, and 65 days with ORIF [24]. Another study for football players reports that approximately the 80% of them return to their previous level of participation, that the patients turn to competition after about a median of 3, 47 months after injury and that surgical management or nonsurgical management had no significant impact on the time to return to play. Athletes who are able to return to play have no significant changes in performance after returning to play [25].

The results of our case report proved that although conservative management lacks the radiographic outcome of surgical treatment, with a certain residual shortening and angulation, this does not necessarily affect the functional outcome especially in daily living activities, avoiding risks associated with surgery [26,27].

Conclusion

The choice of treatment of middle shaft clavicle fractures is still debated in literature. Surgical treatment allows a quicker return to sport than conservative treatment. Moreover, literature showed an increased risk of non-union in displaced fractures and general tendency to prefer ORIF, but conservative treatment represents a valid option in borderline middle shaft fractures, even in mature patient requiring high functional outcomes.

Clavicle fracture treatment has evolved during the last few decades from conservative treatment towards more often an operative treatment. In general, non-displaced fractures are treated conservatively. Operative treatment has to be discussed in patients with displaced fractures, especially in the young and active patient. Clear disadvantages are the need for operation with the general surgical complications and particularly the high rates of implant-related irritation and subsequently the high implant removal rates requiring a second operation.

However, considering the overlapping outcome between conservative and surgical treatment, displaced fractures with borderline criteria, in the absence of acute complications, are amenable to initial conservative treatment, confirmed by an intermediate clinical and radiographic evaluation at approximately 2 weeks.

Author Contributions

M.A., L.G. and S.D.A. observed the case and contributed to the acquisition of data; M.A., M.C., D.D.V and G.M. performed the review of the literature and analyzed the data; M.A., M.C. and L.G. wrote the paper; F.P., S.D.S., G.T., S.P. and V.P. supervised the paper; all authors contributed to revision of the paper.

Conflict of Interest

The authors declare no conflict of interest.

References

1. Court-Brown CM, Caesar B. Epidemiology of adult fractures: A review. *Injury*. 2006.
2. Postacchini F, Gumina S, De Santis P, Albo F. Epidemiology of clavicle fractures. *J Shoulder Elb Surg*. 2002;11(5):452-6.
3. Schemitsch LASE, Kuzyk PR, McKee MD, Vicente MR. Prognostic factors for reoperation following plate fixation of fractures of the midshaft clavicle. *Orthop Trauma Assoc. Annu Meet*. 2012.
4. Saragaglia D, Refaie R. Displaced mid-shaft clavicular fractures: state of the art for athletes and young active people. *Int Orthop*. 2021;45(10):2679-86.
5. McKee R, Whelan D, Schemitsch E, McKee M. Operative versus nonoperative care of displaced midshaft clavicular fractures: a meta-analysis of randomized clinical trials". *J Bone Jt Surg Am*. 2012.
6. Garzon-Alvarado DA, Gutiérrez ML, Calixto LF. A computational model of clavicle bone formation: A mechano-biochemical hypothesis. *Bone*. 2014.
7. Garrido DG, Cañizares AP, Bisaccia M, Meccariello L, Delgado EF. Pathological clavicle fracture as the first symptom of lung cancer. *J Orthop Case Rep*. 2020;10(2):54-7.
8. Silva SR, Fox J, Speers M, Seeley M, Bovid K, Farley FA, et al. Reliability of measurements of clavicle shaft fracture shortening in adolescents. *J Pediatr Orthop*. 2013.
9. Smith CS, Schottel PC, Wellman DS, Lorich DG, Helfet DL. Using 3-dimensional fluoroscopy to assess acute clavicle fracture displacement: a radiographic study. *Am J Orthop*. (Belle Mead NJ). 2015.
10. Gullo J, Singletary EM, Larese S. Emergency bedside sonographic diagnosis of subclavian artery pseudoaneurysm with brachial plexopathy after clavicle fracture. *Ann Emerg Med*. 2013.
11. Backus JD, Merriman DJ, McAndrew CM, Gardner MJ, Ricci WM. Upright versus supine radiographs of clavicle fractures: does positioning matter?. *J Orthop Trauma*. 2014.
12. Hoogervorst P, Hannink G, Van Geene AR, Van Kampen . Reliability of measurements of the fractured clavicle: a systematic review. *Syst Rev*. 2017;6(1):223.
13. Benjamin P Kleinhenz. What is the role of CT scanning in the diagnosis of clavicle fractures?. *MedScape*. 2022.
14. Subramanyam KN, Mundargi AV, Gopakumar KU, Bharath T, Prabhu MV, Khanchandani P. Displaced midshaft clavicle fractures in adults is non-operative management enough?. *Injury*. 2021;52(3):493-500.
15. Murray NJ, Johnson T, Packham IN, Crowther MA, Chessier TJ. Reducing unnecessary fixation of midshaft clavicle fractures. *Eur J Orthop Surg Traumatol*. 2021;1-6.
16. Frima H, Van Heijl M, Michelitsch C, Van Der Meijden O, Beeres FJ, Houwert RM, et al. Clavicle fractures in adults; current concepts. *Eur J Trauma Emerg Surg*. 2020;46(3):519-29.

17. Robert Moverley. Current concepts in the management of clavicle fractures. *J Clin Orthop Trauma*. 2020;11(Suppl 1):S25-30.
18. Qin M, Zhao S, Guo W, Tang L, Li H, Wang X, et al. Open reduction and plate fixation compared with non-surgical treatment for displaced midshaft clavicle fracture: A meta-analysis of randomized clinical trials. *Medicine (Baltimore)*. 2019;98(20):e15638.
19. Song HS. Current concepts in the treatment of midshaft clavicle fractures in adults. *Clin Shoulder Elb*. 2021;24(3):189-98.
20. Micheloni GM, Tarallo L, Porcellini G, Catani F. Comparison between conservative treatment and plate fixation for displaced middle third clavicle fracture: clinical outcomes and complications. *Acta Biomed*. 2019;90(12-S):48-53.
21. Štichhauer R. Conservative versus surgical treatment of displaced midshaft clavicle fracture in adolescents. *Rozhl Chir*. 2022;101(2):66-71.
22. Murray NJ, Johnson T, Packham IN, Crowther MA, Chesser TJ. Reducing unnecessary fixation of midshaft clavicle fractures. *Eur J Orthop Surg Traumatol*. 2021.
23. Murray IR, Foster CJ, Eros A, Robinson CM. Risk factors for nonunion after nonoperative treatment of displaced midshaft fractures of the clavicle. *J Bone Joint Surg Am*. 2013;95(13):1153-8.
24. Vora D, Baker M, Pandarinath R. Impact of clavicle fractures on return to play and performance ratings in NFL athletes. *Clin J Sport Med*. 2019;29(6):459-64.
25. Robertson GA, Oliver CW, Scott H. Infographic: Return rates and return times to sport after Middle-Third clavicle fracture: Important knowledge for management of these injuries in athletes. *Br J Sports Med*. 2017.
26. Saragaglia D, Refaie R. Displaced mid-shaft clavicular fractures: state of the art for athletes and young active people. *Int Orthop*. 2021;45(10):2679-86.
27. Waldmann S, Benninger E, Meier C. Nonoperative treatment of midshaft clavicle fractures in adults. *Open Orthop*. 2018;12:1-6.