

**KLAVİKULA ORTA BÖLGE KIRIKLARININ KONSERVATİF TEDAVİ SONUÇLARI****RESULTS OF CONSERVATIVE TREATMENT OF MIDCLAVICULAR FRACTURES****Dr. Kemal DURAK\*, Dr. Bartu SARISÖZEN\*, Dr. Çağatay ÖZTÜRK\*\*****ÖZET**

**Amaç:** Bu çalışmada klavikula orta bölge kırıklarının kapalı redüksiyon ve 8-bandaj kullanılarak tespit yöntemi, literatür gözden geçirilerek diğer tedavi metodlarının bildirilen sonuçları ile karşılaştırıldı.

**Gereç ve Yöntem:** Uludağ Üniversitesi Tıp Fakültesi Ortopedi ve Travmatoloji Anabilim Dalı'nda 1997-2002 yılları arasında konservatif yöntemlerle tedavi edilen klavikula orta bölge kırıklı 37 hastanın sonuçları değerlendirildi.

**Bulgular:** Olguların 26 (%70.2)'si erkek, 11 (%29.8)'i kadın olup ortalama yaş 34.3 (9-65) idi. Kırıkların Allman Sınıflandırması'na göre tümü grup I idi. Kırıklar kapalı redüksiyon sonrası 8-bandaj ile tespit edildi. Olguların ortalama takip süresi 29.8 (6-48) ay olup 1 (2.7%) olgu dışında tüm kırıkların kaynadığı saptandı. Hastaların %16.2 oranında kozmetik nedenlerden yakındıkları gözlemlendi.

**Sonuç:** Cerrahi tedavi gerektirmeyen klavikula orta bölge kırıklarında konservatif tedavi, kolay uygulanabilir, düşük maliyetli, komplikasyonları az olan ve öncelikle düşünülmesi gereken bir yöntemdir.

**Anahtar Kelimeler:** Klavikula orta bölge kırığı, konservatif tedavi, kapalı redüksiyon, sekiz bandaj

**ABSTRACT**

**Background:** In this study, we compare the outcome of conservative management by closed reduction and figure of eight bandage in cases of midclavicular fractures with previously published results of other treatment methods.

**Methods:** In our department between 1997-2002, 37 cases of midclavicular fractures having undergone conservative treatment were evaluated.

**Results:** 26 patients (70.2%) were male and the remaining 11 (29.8%) female. The average age was 34.3 years (range; 9 to 65). The clavicle fractures were classified according to the Allman classification and all fractures were in group I. After reduction, a figure of eight bandage was applied. The mean follow-up period was 29.8 months (range; 6 to 48). All the fractures showed a complete union but one case (2.7%). In 16.2% of the cases minor cosmetic problems were observed.

**Conclusions:** We conclude that conservative treatment is the preferred method of treatment in cases of midclavicular fractures, unless there is an absolute indication for surgical therapy. This approach is easily applicable, cost effective and has fewer complications.

**Key Words:** Midclavicular fracture, conservative treatment, closed reduction, figure of eight bandage.

**INTRODUCTION**

The clavicle fractures comprise 5% of all fractures and 35% to 45% of those are in the shoulder area(1-4). These fractures commonly occur from sports injuries, simple falls or high velocity injuries(1-5). The pathologic fracture of the clavicle is also rarely seen(6,7).

The anatomical classification is simply formed by dividing the clavicle into three parts(8). The lateral area can be subdivided according to intact coracoclavicular ligaments

and extension of the fracture line to the acromioclavicular joint(9,10). Several classifications on the basis of anatomical classification have been published(1,11,12). This type of fractures can be treated either conservatively and externally after the initial closed reduction or by open reduction with pins and screw plate fixation(4,13-16). To date, numerous types of bandage have been used in the conservative treatment of clavicle fractures(17-19).

In this study, we compare the results of cases treated by

closed reduction and figure of eight bandage with previously published results.

**MATERIAL AND METHODS**

The results of 37 cases of midclavicular fracture treated by closed reduction and figure of eight bandage fixation in our department, between 1997 and 2002, were evaluated.

The fractures were classified according to Allman scale(8) equally as middle third group I, lateral third group II and medial third group III. Initially displaced fractures were reduced and all the fractures were fixed with a figure of eight bandage with the patient in a sitting position. Neurovascular checks on the extremities were then carried out. Radiological controls using anteroposterior view were conducted after reduction and fixation.

For the patients with additional injuries, requiring emergency treatment, an interscapular pillow was used initially while the patients were bedridden and the figure of eight bandage was postponed until they were sufficiently mobile.

The bandage was removed when localized pain and tenderness had reduced and if there was an evidence of union on X-ray. Exercises to restore movement were started immediately by the physiotherapy department.

At the final examination, the range of shoulder motion of the injured side was compared with the uninjured side. Pain during daily activities and return to previous habits were investigated.

Fischer's exact test was used for the statistical analysis.

**RESULTS**

In this study of 37 cases, 26 (70.2%) were male and 11 (29.8%) were female. The average age was 34.3 years (range; 9 to 65). In 10 (27%) cases there were additional injuries (Table I). Seventeen (45.9%) cases were caused by falls that affect the directly shoulder (Table II). The mean follow-up period was 29.8 months (range; 6 to 48). The fracture was in

Table I: Additional injuries to clavicle fractures

Cases	Head trauma	Chest trauma	Abdominal trauma	Pelvis fracture	Vertebra fracture	Long bone fracture	Proximal humerus fracture
1		+	+			+	
2	+	+				+	
3	+		+			+	
4		+				+	
5		+		+		+	
6					+	+	
7					+		
8					+		
9						+	
10							+
Total	2	4	2	2	2	5	1

Table II: Mechanism of injury

Mechanism of injury	n	%
Fall directly on shoulder	17	45.9
Fall on to open hand	8	21.7
Hit by vehicle	7	18.9
Direct blow to the shoulder area	3	8.1
Traffic accident (inside vehicle)	2	5.4
Total	37	100

the dominant extremity in 25 (67.5%) cases.

All the fractures were group I according to Allman(8) classification. Twenty-eight (75.6%) cases showed an initial displacement of the fracture.

The mean period of use for the figure of eight bandage was 6.1 weeks (range; 4 to 8) and with the exception of one case (2.7%) all fractures showed complete fusion.

In ten (27%) patients with concomitant injuries that had required priority treatment, an interscapular pillow was applied initially and the figure of eight bandage was carried out on the average 7.2 days (range; 3 to 15) after trauma. In one case, abrasion and skin tenting were observed, but following dressings, the skin healed without any problems.

Neurovascular complications were not observed in any case. There was nonunion in one case (2.7%). It has been learned that this patient removed the figure of eight bandage early and did not comply with the treatment plan. Despite this, the patient experienced painless full range of movement and had no complaints. In six (16.2%) patients, a protuberance was observed in the fracture area at the final patient examination; but these were only of a cosmetic nature. All of these six cases had first been treated with interscapular pillow due to additional injuries. In these cases, sufficient reduction could not be achieved from the beginning of the treatment. A significant statistical difference is shown in cosmetic complications between the cases where the figure of eight bandage was applied immediately and where it had to be delayed (P<0.001)

All the patients had full range of motion and no pain during daily living activities. They returned to their previous jobs and activities in an average of 2.1 months (range; 2 to 3).

**DISCUSSION**

Fractures of the middle third of the clavicle, which has both strut and suspensory functions within the shoulder girdle, are not uncommon(1). Compressive force directed laterally towards the shoulder may result in fracture of the medial area(20,21). It is known that the majority of mid-clavicle fractures are caused by direct falls onto the shoulder(22). In this study, fall on the shoulder was also the most common cause of injury. It is our opinion that the mid-clavicle area, having lower bone density than the medial and lat-

eral areas and where it forms the central part of the anatomical S shape, is therefore more susceptible to external laterally directed force. This opinion is also supported by others(17).

In our department the clavicle fractures are classified according to Allman(8). This arrangement is suitable for simple anatomical classification but is not sufficient to classify all types of clavicle fracture in detail. Therefore in this study only Allman group I cases were included. For cases in group II (lateral) and group III (medial) a more comprehensive detailed system of classification is required(1,9-12).

Stanley and Morris(23) reported that there was no difference in the healing rate and healing time of clavicle fractures treated conservatively by either figure of eight bandage or arm sling. In this current study, all fractures were fixated externally by figure of eight bandage. We believe that this method increases the fracture rigidity and enables the patient to use the dominant hand more easily as stated by Lazarus(17).

The rate of additional injuries is reported by Grassi et al(24) as 52.5% in the conservative treatment of clavicle fractures. However, among our cases the rate was determined as 27%, which is much lower than other published rates, because direct falls onto the shoulder or open hand accounted for a much higher number of injuries than high velocity injuries such as traffic accidents.

The duration of figure of eight bandage fixation in midclavicular fractures varies between 4-6 weeks(17,24). In this study, the fractures were fixated externally by figure of eight bandage for an average of 6.1 weeks. Also, the duration of external fixation by Velpau bandage after open reduction and intramedullary fixation of clavicle fractures has been reported as an average of 33 days(24). These external fixation periods in both conservative and surgical treatment have given us reason to believe that both methods carry similar risks in terms of possible complications such as joint stiffness.

The absolute indications of surgical treatment of midclavicular fractures are neurovascular injury, open fractures, scapulothoracic dissociation, irreducible fractures and fractures with initial shortening more than 20 mm(17,25). Hill et al(2) reported the rate of nonunion as 15% in displaced midclavicular fractures of initial shortening more than 20 mm at the end of the conservative treatment. This rate is 0.13% in Neer(13). Grassi et al(24) published that all conservatively treated fractures showed union whereas there was nonunion in 5% of midclavicular fractures treated by surgical methods. Nonunion was seen in one (2.7%) case in our study. This fracture was the result of a high velocity traffic accident. It has been determined that the patient's compliance to the treatment was not sufficient and she removed the bandage in the early stages of treatment. The absence of pain and functional loss in this patient are due to the success of the shoulder and upper extremity exercise program which was started early in the treatment.

It has been reported that the rate of unpleasant scarring after surgical treatment of clavicle fractures was 20% whereas protuberant hypertrophic bone callus was present in 17% of cases after conservative treatment(24). Similar to above results; cosmetic problems due to a protuberance in the fractured area were present in 16.2% of cases in our study. There were additional injuries in all these cases to whom the application of figure of eight bandage was delayed. This leads us to the conclusion that delayed application of figure of eight bandage in conservative treatment of midclavicular fractures increases the chance of cosmetic problems.

Return to daily living activities is earlier in patients treated by conservative treatment compared with surgical treatment(24). In our study, the cases returned to normal previous activities in 2.1 months and they could use their injured side extremities after external fixation of the fractures.

Taking into account the complications of surgical treatment(24,25), we conclude that conservative treatment of midclavicular fractures with closed reduction and figure of eight bandage fixation is a cost effective, easily applicable method with adequate functional results even in nonunion, which may avoid the risks of surgical treatment. In our opinion it is the preferred method for treatment of midclavicular fractures.

## REFERENCES

1. Nordqvist A, Petersson C. The incidence of fractures of the clavicle. *Clin Orthop* 1994; 300: 127-132.
2. Hill JM, McGuire MH, Crosby LA. Closed treatment of displaced middle-third fractures of the clavicle gives poor results. *J Bone Joint Surg* 1997; 79: 537-539.
3. Neer CS. Fractures of the clavicle. In: Rockwood CA, Green DP, eds. *Fractures in Adults*. 2nd ed. Philadelphia: JB Lippincott; 1984: 707-713.
4. Rowe CR. An atlas of anatomy and treatment of midclavicular fractures. *Clin Orthop* 1968; 58: 29-42.
5. Hutchinson MR, Ahuja GS. Diagnosing and treating clavicle injury. *Phys Sport Med* 1996; 24: 23-29.
6. Bernard RN Jr, Haddad RJ Jr. Enchondroma of the proximal clavicle. An unusual cause of pathologic fracture-dislocation of the sternoclavicular joint. *Clin Orthop* 1982; 167: 239-241.
7. Dambrain R, Raphael B, Dhem A, et al. Radiation osteitis of the clavicle following radiotherapy and radical neck dissection of head and neck cancer. *Bull Group Int Rech Sci Stomatol Odontol* 1990; 33: 65-70.
8. Allman FR Jr. Fractures and ligamentous injuries of the clavicle and its articulation. *J Bone Joint Surg* 1967; 49A: 774-784.
9. Neer CS. Fractures of the distal clavicle with detachment of the coracoclavicular ligaments in adults. *J Trauma* 1963; 3: 99-110.

10. Neer CS. Fractures of the distal third of the clavicle. *Clin Orthop* 1968; 58: 43-50.

11. Craig EV. Fractures of the clavicle. In: Rockwood CA, Matsen FA, eds. *The Shoulder*. Philadelphia: WB Saunders, 1990: 367-412.

12. Robinson CM. Fractures of the clavicle in the adult. Epidemiology and classification. *J Bone Joint Surg* 1998; 80B: 476-484.

13. Neer CS. Nonunion of the clavicle. *JAMA* 1960; 172: 1006-1011.

14. Andersen K, Jensen PO, Lauritzen J. Treatment of clavicular fractures. Figure-of-eight bandage versus a simple sling. *Acta Orthop Scand* 1987; 58: 71-74.

15. Eskola A, Vainionpaa S, Myllynen P, et al. Outcome of clavicular fracture in 89 patients. *Arch Orthop Trauma Surg* 1986; 105: 337-338.

16. Nordqvist A, Petersson CJ, Redlund JI. Midclavicle fractures in adults: End result study after conservative treatment. *J Orthop Trauma* 1998; 12: 572-576.

17. Lazarus MD. Fractures of the clavicle. In: Bucholz RW, Heckman JD, eds. *Fractures in Adults*. Philadelphia, Lippincott Williams&Wilkins, 2001: 1041-1078.

18. Craig EV. Fractures of the clavicle. In: Rockwood

CA, Matsen FA, eds. *The Shoulder*. Philadelphia: WB Saunders, 1998: 428-482.

19. Jupiter JB, Ring D. Fractures of the clavicle. In: Iannotti JP, Williams GR, eds. *Disorders of the Shoulder: diagnosis and management*. Philadelphia: Lippincott Williams & Wilkins, 1999: 709-736.

20. Fowler AW. Treatment of fractured clavicle. *Lancet* 1968; 1: 46-47.

21. Sankarankutty M, Turner BW. Fractures of the clavicle. *Injury* 1975; 7: 101-106.

22. Stanley D, Trowbridge EA, Norris SH. The mechanism of clavicular fracture. A clinical and biomechanical analysis. *J Bone Joint Surg* 1988; 70B: 461-464.

23. Stanley D, Norris SH. Recovery following fractures of the clavicle treated conservatively. *Injury* 1988; 19: 162-164.

24. Grassi FA, Tajana MS, D'Angelo F. Management of midclavicular fractures: Comparison between nonoperative treatment and open intramedullary fixation in 80 patients. *J Trauma* 2001; 50: 1096-1100.

25. Zenni EJ, Krieg JK, Rosen MJ. Open reduction and internal fixation of clavicular fractures. *J Bone Joint Surg* 1981; 63A: 147-151.

\* Uludağ Üniversitesi Tıp Fakültesi, Ortopedi ve Travmatoloji Anabilim Dalı, Bursa-TÜRKİYE  
 \*\* Uludağ Üniversitesi Tıp Fakültesi, Ortopedi ve Travmatoloji Anabilim Dalı, Bursa-TÜRKİYE  
 Yazışma Adresi: Dr. Kemal Durak  
 PK. 207 Ulucami (16372) BURSA-TÜRKİYE  
 E-mail: kdurak@uludag.edu.tr