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Is hospitalization necessary in isolated traumatic sternal fractures?

Atıf Yolgösteren[1], Ahmet Yüksel[2], İris İrem Kan[1], Vahide Aslıhan Durak[3]

[1]*Department of Cardiovascular Surgery, Uludağ University School of Medicine, Bursa, Turkey*
[2]*Department of Cardiovascular Surgery, Abant İzzet Baysal University School of Medicine, Bolu, Turkey*
[3]*Department of Emergency Medicine, Uludağ University School of Medicine, Bursa, Turkey*

ABSTRACT

Objectives: Clinical characteristics, follow-up and treatment outcomes of patients with isolated traumatic sternal fracture were presented and our clinical experiences on these patients were shared.

Methods: Between January 2010 and December 2017, a total of 87 patients with isolated traumatic sternal fracture who were admitted to the emergency department and were hospitalized, were included in this observational cohort study. Medical data of these patients were collected from hospital records and then were retrospectively reviewed.

Results: There were 65 (74.7%) male and 22 (25.3%) female patients. Mean age was 42.4 ± 13.7 years (range: 17-83). The most common etiological reason was traffic accident in vehicle. Sternal fractures were localized at corpus in 64 (73.6%) patients and at manubrium in 23 (26.4%) patients. The most common concomitant pathology was rib fracture with a ratio of 23% (20 patients). Mean length of hospital stay of patients was 3.1 ± 0.8 days. During the hospitalization period, no evidence of cardiac injury was observed in any patient.

Conclusions: In view of rising healthcare costs and increasing demand for acute hospital and intensive care beds, it is crucial to determine hospitalization criteria for cases with traumatic sternal fracture. We believe that the hospitalization is not necessary in isolated traumatic sternal fractures where there is no other major injury.

Keywords: Sternal fracture, trauma, treatment, hospitalization

Sternal fractures are encountered with a 3% to 8% prevalence in blunt thoracic trauma cases [1]. These fractures are seen frequently in passengers in the front seats of vehicles involved in accidents are increasingly observed in recent years since the compulsory usage of safety belts [2, 3]. Pain in the sternal area and extreme sensibility on palpation are the most frequent symptoms and their presence should prompt suspicion of a sternal fracture. Sternal fractures are usually on a transverse direction and usually upper and mid portion of the sternum is involved. Physical examination reveals sensibility at the fracture site, eccyhymosis and crepitation on palpation of the injured area. Usually a lateral chest x-ray is sufficient for radiological confirmation of a suspected sternal fracture. Thoracic CT which is a more sensitive radiological technique is resorted when the diagnosis is not certain or when accompanying pathologies are anticipated [4]. The localization and structural properties of the sternum lends itself as an important barrier for the vital organs like the heart, great vessels and the lungs. This said the injuries to these vital

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Address for correspondence: *Ahmet Yüksel, MD., Assistant Professor, Abant İzzet Baysal University School of Medicine, Department of Cardiovascular Surgery, Gölköy Campus, 14280, Bolu, Turkey. E-mail: ahmetyuksel@ibu.edu.tr*

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organs due to sternal fractures are more important than the sternum fracture itself.

Isolated sternum fracture is by definition a traumatic sternal fracture without accompanying cranial fracture, intracranial hemorrhage, hemothorax, pneumothorax, intra-abdominal organ damage or any other kind of major injury [5, 6]. There is no universally agreed upon consensus regarding the evaluation of the sternum fractures nor on the algorithm of the treatment of them [7]. Naturally the evaluation and treatment is dictated by each center's experience and their equipment which leads to a variety of approaches among different centers.

In this study, patients who were admitted to the emergency department with sternum fracture and hospitalized were analyzed and their clinical and demographic features, and follow up and treatment outcomes were presented, our clinical experiences with this patient group were shared. Also, in view of our experience with this patient population that we had hospitalized, the merits of hospitalization were discussed.

METHODS

Over an 8-year period between January 2010 and December 2017, a total of 87 patients with isolated sternum fractures who were admitted to the emergency department of a tertiary referral center in Turkey and later hospitalized are included in this retrospective observational cohort study. Patients who were diagnosed as isolated sternum fractures after physical examination, laboratory and radiological studies at the emergency room were admitted to the Cardiovascular Surgery intensive care unit and ward where the patients were observed and treated. Emergency room registrations, forensic registrations and clinical documents were used to determine the patients' age, gender, type of the trauma, localization of the fracture, symptoms, employed diagnostic tools and treatment modalities, treatment outcomes, hospitalization duration and other minor pathologies accompanying the traumatic sternal fracture. The patients' hemodynamic parameters as arteriel blood pressure and heart rate were monitorized and electrocardiogram (ECG) monitorization was performed, furthermore cardiac damage indicators such as creatinine kinase (CK), creatinine kinase-myocardial band (CK-MB) and troponin-I levels were all periodically measured. Patients with suspected cardiac damage were evaluated with echocardiography. The treatment mainly consisted of the alleviation of pain, bed rest and treatment of associated other diseases if present. Patients with hypovolemic or hemorrhagic shock, multi-organ trauma, a history of cardiac disease such as coronary artery disease and congestive heart failure and had severe comorbid conditions (malignancy, hepatic and renal insufficiency, etc.) were excluded from the study.

The study protocol was approved by the institutional ethics committee, and the study was conducted in accordance with the principles of the Declaration of Helsinki.

Statistical Analysis

All statistical analysis of our study was done using Statistical Package for Social Sciences (SPSS) program (version 20.0, SPSS, Chicago, Illinois, USA). Continuous variables were shown as average ± standard deviation, while categorical variables were expressed as frequency and percentage.

RESULTS

The average age of patients was 42.4 ± 13.7 years, with an age range of between 17 and 83 years. Sixty five (74.7%) of the patients were male, while 22 (25.3%) of the patients were female. When the type of trauma and etiological causes of the sternum fractures were evaluated, the most common cause was found to be in-vehicle traffic accidents with 44 (50.6%) cases (Table 1). The remaining causes were falling in 30 (34.5%) cases, workplace accidents in 5 (5.7%) cases, animal induced trauma in 4 (4.6%) cases, vehicle induced trauma in 2 (2.3%) cases and assault (battering) again in 2 (2.3%) cases. While all patients had pain and sensitivity with palpation on sternum, only 19 (21.8%) patients displayed an eccyhymosis and/or crepitation with palpation. When the patients were evaluated radiologically; fractures were seen at the corpus sterni in 64 (73.6%) patients (Fig. 1) and at the manubrium of sternum in 23 (26.4%) cases. The most frequent pathology accompanying sternal fracture was rib fracture which was detected in in 20 (23%) cases.

Table 1. Clinical characteristics of patients

Characteristics	Data
Age (years) (mean ± SD)	42.4 ± 13.7
Gender, n (%)	
Male	65 (74.7)
Female	22 (25.3)
Etiological factors, n (%)	
In-vehicle traffic accident	44 (50.6)
Falling	30 (34.5)
Workplace accident	5 (5.7)
Animal induced trauma	4 (4.6)
Vehicle induced trauma	2 (2.3)
Assault	2 (2.3)
Fracture localization, n (%)	
Corpus sterni	64 (73.6)
Manubrium sterni	23 (26.4)

Average length of hospital stay was 3.1 ± 0.8 days. During the hospitalization, none of the patients displayed hemodynamic instability, major changes on ECG, cardiac enzymes levels, and echocardiographic finding to indicate cardiac injury.

DISCUSSION

The most important finding of this study was that in our study population none of the patients with isolated traumatic sternal fracture had apparent traumatic cardiac injury. Sternal fracture presents itself in a conscious patient with direct or indirect pain over the sternum. Physical examination may reveal irregularity and/ or step-up deformity of the sternum on palpation. Eccyhmosis, hematoma and contusion may be observed in inspection. Posterior-anterior, lateral and oblique sternum x-rays are essential in cases of suspected sternal traumas [8, 9]. In our study population 65 (74.7%) patients were diagnosed solely with direct radiography. In cases with uncertain diagnosis and/or suspected additional pathologies, computed tomography was performed and 22 (25.3%) patients in whom sternal fracture could not be verified by direct radiography were diagnosed as such.

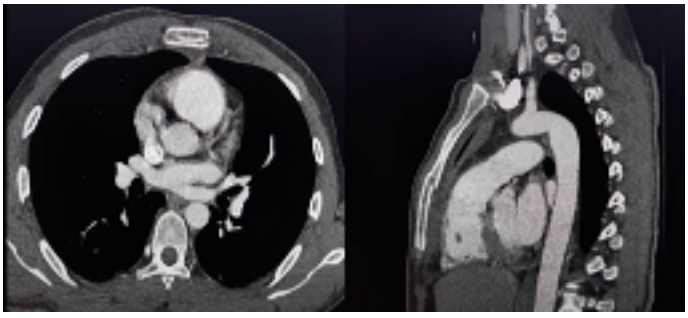

Fig. 1. Fracture on corpus sterni

Treatment of patients with sternal fracture consists of bedrest in supine position, pain relief and respiratory physiotherapy. Pain can persist for six weeks. Complete sternal stabilization with conservative management generally ensues in two months [10]. Sternal fracture rarely necessitates surgical treatment. If sternal stability has been disrupted sternal fixation is required. In some patients in which severe paradoxical respiration evolves stabilization can be performed surgically. Due to prominent visible compression surgical repair may be warranted on cosmetic grounds [11-13]. In any case no patient in our study required surgical stabilization nor correction. We recommended only bedrest and analgesic therapy to our patients on discharge.

Pericardial tamponade, mediastinal hematoma and abscess, osteomyelitis due to delayed healing can be seen in sternal fracture. Furthermore patients should be carefully evaluated for myocardial contusion and pulmonary parenchymal injuries. Upon admission ECG ,CK CK-MB values of the patients should be evaluated. In cases with suspected myocardial injury, the most convenient and time sparing diagnostic method is echocardiographic assessment [1, 14-16]. In our study group no patient had myocardial damage.

Duration of hospitalization in sternal fracture is related rather to the associated traumatic pathologies than to the sternal fracture itself. Isolated sternal fracture generally has a benign course and usually heals on its own. Analgesic therapy and respiratory physiotherapy are thought to be sufficient in isolated SF. If accompanying intrathoracic pathologies are present these pathologies determine the prognosis of the patients [2, 5, 15-18].

Limitations

The most important limitation of our study was that it was designed as a retrospective data analysis with a relatively small sample size in a single-center.

Another important limitation was the lack of the follow-up data.

CONCLUSION

The results of our study have demonstrated that the isolated sternum fractures are benign entity. Considering the ever increasing health care expenses and the demand for the hospital beds both of wards and intensive care units; establishing the criteria for hospitalization of patients with traumatic sternum fractures is very important. We believe that in patients diagnosed as isolated sternum fracture without any coexisting major injury in the emergency room do not warrant hospitalization. We suggest that this patient group can be treated at home with medical recommendations and organizing home therapy.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

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