Retrospective Analysis of 513 Cases Diagnosed with Rib Fracture Secondary to Blunt Thorax Trauma

Künt Toraks Travmasına Bağlı Kosta Fraktürü Saptanan 513 Olgunun İncelenmesi

Rib Fractures

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Özet

Amaç: Bu çalışmada künt göğüs travması ile başvuran ve kot fraktürü saptanan olguların analizi ile travma olgularında ortaya çıkabilecek bölgesel farklılıkların ve tedavi yaklaşımlarının irdelenmesi amaçlanmıştır. Gereç ve Yöntem: Ekim 2013 - Aralık 2014 tarihleri arasında Siirt Devlet Hastanesi Acil Servisine ve Göğüs Cerrahisi polikliniğine künt travma nedeni ile başvuran ve kot fraktürü saptanan 513 olgu retrospektif olarak incelendi. Olgular etiyolojik faktörleri, kot fraktürüne eşlik eden torakal ve diğer sistem yaralanmaları, prognoz ve uygulanan tedaviler açısından değerlendirildi. Bulgular: Olguların 266'sında izole kot fraktürü mevcuttu. Olguların 247 (%48,1)'sinde ise kot fraktürüne eşlik eden pnömotoraks, hemotoraks, hemopnömotoraks, akciğer kontüzyonu veya laserasyonu ve sternum fraktürü gibi torakal organ yaralanmaları mevcuttu. 298 (%58) olguda 1 ya da 2 kot kırığı saptanırken 28 (%5,4) olguda 6 ya da daha fazla kot kırığı mevcuttu. Hemotoraks olgularının %78,2'si, pnömotoraks olgularının %85,3'ü, hemopnömotoraks olgularının %95,4'ü, bilateral pnömotoraks olgularının %81,8'i, bilateral hemotoraks olgularının %26'sı, bilateral hemopnömotoraks olgularının %71,4'ü tüp torakostomi uygulanarak tedavi edildi. Kot fraktürüne ek olarak torakal organ yaralanması izlenen ancak cerrahi girişim yapılmayan 129 olgu ve izole kot fraktürü saptanan 266 olgu uygun medikal tedavi sonrası şifa ile taburcu edilmişlerdir. Tartışma: Sonuç olarak künt travma nedeniyle oluşan kot fraktürlerinin birçoğu medikal tedavi ile konservatif yaklaşımlardan fayda sağlamakta ileri cerrahi tedavilere ihtiyaç duymamaktadır.

Anahtar Kelimeler

Travma; Kosta; Kırık

Abstract

Aim: This study aimed to analyze blunt chest trauma cases who were diagnosed with rib fracture and to examine the regional differences likely to appear in trauma cases and treatment approaches. Material and Method: 513 cases who applied to the Emergency Service and Department of Thoracic Surgery between October 2013 and December 2014 due to blunt trauma and were diagnosed with rib fracture were retrospectively examined. The cases were evaluated in terms of etiological factors, thoracic, and other system injuries accompanying the rib fracture, prognosis, and the treatments applied. Results: Isolated rib fracture was present in 266 of the cases. Thoracic organ injuries such as pneumothorax, hemothorax, hemopneumothorax, lung contusion, or laceration and sternal fracture accompanying the rib fracture were present in 247 of the cases. While one or two rib fractures were detected in 298 cases, six or more rib fractures were present in 28 cases. 78.2% of hemothorax cases, 85.3% of pneumothorax cases, 95.4% of hemopneumothorax cases, 81.8% of bilateral pneumothorax cases, 26% of bilateral hemothorax cases, and 71.4% of bilateral hemopneumothorax cases were treated by applying tube thoracostomy. 129 cases diagnosed with thoracic organ injury in addition to rib fracture but not subjected to surgical intervention, and 266 cases diagnosed with isolated rib fracture were discharged with full recovery after appropriate medical treatment. Discussion: Most of the rib fractures occurring due to blunt trauma are treated successfully with medical treatments and conservative approaches and do not need advanced surgical treatments.

Keywords

Trauma; Rib; Fracture

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Introduction

It is known that severe chest trauma constitutes 1/3 of the cases hospitalized due to trauma, and that thorax trauma is responsible for 20-25% of the mortalities [1]. Blunt chest traumas are increasing as a result of today's living standards. Many are due to traffic accidents. Traumas resulting from playing sports and from falling are more frequently seen than the penetrating traumas. As in all traumas, immediate evaluation, accurate diagnosis, and appropriate and rapid treatment are essential to reduce morbidity and mortality due to thorax traumas.

The objective of our study is to analyze the cases who applied due to chest trauma and were diagnosed with rib fracture and to determine the regional differences likely to appear in trauma cases.

Material and Method

This study retrospectively examined 513 cases who applied to the Emergency Service and Department of Thoracic Surgery of Siirt State Hospital between October 2013 and December 2014 due to blunt trauma and were diagnosed with rib fracture.

The cases were divided into seven different groups according to the way the trauma occurred: traffic accident inside a vehicle, traffic accident outside a vehicle, pounding, falling, sports accident, occupational accident, and other accidents. We evaluated the radiological examinations that were performed when the cases applied to our hospital and those that were performed in the hospital during their treatment. The cases were examined in terms of etiological factors, thoracic and other system injuries accompanying the rib fracture, prognosis, and the treatments applied. The patients treated by hospitalization were categorized into two groups: those being followed under service and those in intensive care conditions. The cases were evaluated in three groups according to the treatment approach: a conservative approach with medical treatment, those having tube thoracostomy, and those having thoracic surgery. A conservative approach with appropriate medical treatment and without surgical intervention was performed in the cases who were diagnosed with radiologically localized, linear, or minimal pneumothorax or hemothorax, but whose current pathology was not evident in their physical examination and did not affect their general condition. All the other cases were treated with tube thoracostomy and surgical procedures. Thoracic epidural catheter application was performed in the cases continuing to have severe pain despite the analgesic treatment.

Results

Of 513 cases included in the study, 341 (66.4%) were male and 172 were female. The average age of the cases was 37.2 (3-76).

The cases were mainly composed of those diagnosed with rib fracture after traffic accidents or pounding (Table 1). Isolated rib fracture was present in 266 of the cases. Thoracic organ injuries such as pneumothorax, hemothorax, hemopneumothorax, lung contusion or laceration, and sternal fracture accompanying the rib fracture were present in 247 (48.1%) of the cases (Table 2). The second most frequently observed injuries were musculoskeletal system injuries (33.7%) (Table 3). While one or two rib fractures were detected in 298 (58%) cases, six or more rib fractures were present in 28 (5.4%) cases (Table 4). Flail chest was not detected in any cases with multiple rib fracture.

Parenteral analgesic treatment was administered as standard to all the cases who were hospitalized; intercostal nerve blockage was applied to the cases whose pain could not be controlled completely despite the treatment. In addition to medical treatment and intercostal nerve blockage, thoracic epidural catheter application for analgesia was performed in 48 of 215 cases with severe pain in whom three or more rib fractures were monitored.

Of the 84 cases in which lung contusion was monitored, 55 (65.4%) were due to traffic accidents, 9 (10.7%) were due to pounding, 6 (7.1%) were due to occupational accident, 11 (13%) were due to falling, and 3 (3.5%) were due to other traumas

Table 1. Distribition of the patients according to the etiologies

Etiology	N	%
TAİV	147	28,6
TAOV	94	18,3
Pounding	139	27
Falling	66	12,8
Sport accident	41	7,9
Occupational accident	11	2,1
Other	15	2,9

TAİV: Traffic accident in the vehicle, TAOV: Traffic accident out of the vehicle

Table 2. Compilications according to the etiologies

Diagnosis	Total	TAİV	TAOV	Pounding	Fall	Sport accident	Work accident	Other
Isolated rib fracture	266	72	44	57	51	30	7	5
%	51,8	14,03	8,57	11,11	9,94	5,84	1,36	0,97
Hemothorax	23	8	12	2	1	-	-	-
%	4,4	1,55	2,33	0,38	0,19	-	-	-
Pneumothorax	82	24	29	11	9	3	4	2
%	15,98	4,67	5,65	2,14	1,75	0,58	0,77	0,38
Hemopneumothorax	44	11	15	8	4	-	3	3
%	8,57	2,14	2,92	1,55	0,77		0,58	0,58
Bil. Pneumothorax	11	2	4	2	-	-	3	-
%	2,1	0,38	0,77	0,38	-	-	0,58	-
Bil. Hemothorax	23	5	9	3	3	-	3	-
%	4,48	0,97	1,75	0,58	0,58		0,58	
Bil. Hemopneumothorax	7	2	3	-	1	-	1	-
%	1,3	0,38	0,58	-	0,19	-	0,19	-
Pulmonary contusion	84	20	35	9	11	-	6	3
%	16,3	3,89	6,82	1,75	2,14	-	1,16	0,58
Pulmonary laceration	3	1	1	-	-	-	1	-
%	0,5	0,19	0,19	-	-	-	0,19	-
Sternum fracture	6	3	1	-	1	-	1	1
%	1,1	0,58	0,19	-	0,19	-	0,19	0,19

Bil: Bilateral, TAİV: Traffic accident in the vehicle, TAOV: Traffic accident out of the vehicle

(Table 2). There was pneumothorax in 18 cases diagnosed with contusion, hemopneumothorax in ten cases, and bilateral hemothorax in eight cases which were detected as comorbidities. Thoracotomy plus a surgical repair operation were performed in three of the cases included in the study due to lung laceration. One case who was operated on due to lung laceration plus hemopneumothorax after a traffic accident out of the vehicle also had abdominal organ injury and died intraoperatively. One case in whom lung contusion was monitored was operated on due to the rupture of the traumatic pseudocyst observed in the contusion area after three days. Of the 34 cases having abdominal organ injury accompanying the rib fracture, liver injury was detected in 22 and spleen injury in 12. Three cases diagnosed with spleen injury were operated on by general surgery.

327 (63.1%) of the 513 cases included in the study were treated by hospitalization. Nineteen cases were followed under intensive care conditions and 308 cases were followed under service conditions. 78.2% of hemothorax cases, 85.3% of pneumothorax cases, 95.4% of hemopneumothorax cases, 81.8% of bilateral pneumothorax cases, 26% of bilateral hemothorax cases, and 71.4% of bilateral hemopneumothorax cases were treated by applying tube thoracostomy (Table 5). 129 cases diagnosed with thoracic organ injury in addition to rib fracture but not subjected to surgical intervention and 266 cases diagnosed with isolated rib fracture were discharged with full recovery after appropriate medical treatment.

The average hospitalization duration of the cases was 3.6 (2-7) days in isolated rib fracture cases and 5.2 (4-11) days in the other cases. Average hospitalization durations were 4.2 (2-6) for those under service care and 7.8 (4-11) for intensive care.

Table 3. The evaluation of injuries which are along with rib fractures

Injuries along with rib fractures	N	%
Thoracic organs	247	48,1
Abdominal organs	34	6,6
Skelatal system	173	33,7
Cranial and neural System	62	12
Others	85	16,5

Table 4. Examination of the numbers of the rib fractures

Number of rib fracture	N	%
≤2	298	58
3-5≤	187	36,4
≥6	28	5,4

Table 5. Evalution of the treatments and follow-up of the patients

Diagnosis	Follow-up in clinic	Follow-up in ICU	Thoracotomy	Tube thoracostomy	Conservative
Isolated rib fracture	45	-	-	-	266
Hemothorax	21	2	-	18	5
Pneumothorax	82	-	-	70	12
Hemopneumothorax	42	2	-	42	2
Bil. pneumothorax	4	7	-	9	2
Bil. hemothorax	19	4	-	6	17
Bil. hemopneumothorax	6	1	-	5	2
Pulmonary contusion	83	1	1	-	83
Pulmonary laceration	-	2	3	-	-
Sternum fracture	6	-	-	-	6
Total	308	19	4	150	395

Bil: Bilateral, ICU: Intensive Care Unit

Discussion

Thorax traumas are involved in a substantial portion of the patients applying to emergency service due to trauma, and it is reported that thorax traumas constitute about 1/3 of the cases hospitalized [2].

The most frequently observed complication is rib fractures in blunt thorax trauma. Generally, it is observed in the 4th-9th ribs. Fracture in the first or second ribs indicates that the trauma is very severe [3]. In the fractures occurring in the 9th-12th ribs, liver, and spleen injuries may occur. Surgical intervention is very rarely needed in rib fractures. The cases having more than three fractures or elderly cases should be hospitalized and receive treatment for preventing complications.

Of the 513 cases included in the study, 266 (51.8%) were diagnosed with isolated rib fracture. 116 (43.6%) of these cases were due to traffic accidents while 150 (56.3%) had other traumatic etiologies. Isolated rib fracture cases mainly had an outpatient follow-up with medical treatment without needing hospitalization. Rib fractures may lead to a wide range of complications, from simple pain to life-threatening organ injuries. However, as in our study, most cases can be treated with conservative approaches. Major surgical interventions such as thoracotomy or sternotomy are required in 10% of the blunt trauma cases while emergency thoracotomy is required in 1-2% [4]. Rates of thoracotomy due to trauma are reported between 1.2-12.7% in the studies conducted in our country [2]. The rate of thoracotomy in our study was 0.7%. We believe this lower rate of thoracotomy is because only the cases with rib fracture were included in the study; it may also be due to the high rate of cases with rib fracture due to pounding and falling.

At 54%, extremity injuries are the injuries most frequently accompanying thorax trauma [5]. With similar results, musculoskeletal system injuries were monitored as the most frequently accompanying injury in our study.

Pulmonary contusion is frequently seen in the posttraumatic period and paves the way for complications such as pneumonia and ARDS [6]. Contusion especially occurs during in-vehicle traffic accidents, and its mortality rate can reach 40% [7]. In our study the pulmonary contusion rate was 16.3%. We believe this high rate of contusion is probably because most of the traffic accident cases might be caused by vehicles locally known as “pat pats”, manufactured in local factories and without safety features. These vehicles, which make a thudding sound, are commonly used in the region in which our hospital give service. The injuries that occur in accidents involving these vehicles are similar to those that occur from motorcycle accidents.

It is stated that traffic accidents are among the most frequent causes of death, especially for those below the age of 40, and the majority of those exposed to such injuries are male [8]. Likewise, in our study there were more males than females.

In a study conducted in our country, while traffic

accidents constitute most of the chest traumas, chest traumas due to falling rank second [2]. In our study, however, pounding cases ranked second. Moreover, we strongly suspect that some of the cases reported during anamnesis as resulting from sports accidents or falls actually occurred due to pounding. However, to avoid revealing the situation as a judicial case, an incorrect anamnesis was given deliberately. We think that this result is due to the different sociocultural understanding of life in different regions of our country.

The most frequently observed intrathoracic pathologies are hemothorax and pneumothorax in blunt thorax traumas [1,9]. Regarding pneumothorax in thorax trauma cases, studies can be found that absolutely suggest tube thoracostomy for preventing serious complications such as tension pneumothorax [10]. In our study, tube thoracostomy was applied to 126 of 144 cases diagnosed with pneumothorax while 18 cases were radiologically followed with continuous oxygen support by 2 l/m without applying tube thoracostomy due to monitoring minimal/linear pneumothorax line. Clinical and radiological progression was not observed in any of the 18 cases and they were discharged with full recovery.

Pain control and follow-up and respiratory physiotherapy have important roles in thorax trauma cases. Therefore, in our study, medical treatment and respiratory physiotherapy were applied to all of the cases for pain control and secretion retention. Some studies suggest stabilization of rib fractures with operative methods for shortening the hospitalization duration and for preventing complications [11]. No operation was performed for rib fractures in any of our study cases. In addition to medical treatment, thoracic epidural catheter application for analgesia was performed in 48 of 215 cases in whom three or more rib fractures were monitored due to severe pain. In all of the cases to whom a thoracic epidural catheter was applied, there was a significant decrease in pain and a significant increase in mobilization and respiratory exercise capacities.

Conclusions

Most of the rib fractures occurring due to blunt trauma can be treated with medical treatments and conservative approaches and do not need advanced surgical treatments. We suggest that, apart from operations to be performed for preventing thoracic organ injury in displaced rib fractures, it is appropriate to try alternative methods such as thoracic epidural catheter application. This should be used primarily for intercostal blockage or analgesia for rib stabilization operations that are performed, but only if there is a pain indication. Additionally, we recommend that cases of minimal pneumothorax and hemothorax occurring secondary to blunt trauma should be treated with close clinical and radiological follow-up instead of performing tube thoracostomy. Larger-scale research studies should explore surgical intervention application for cases where pneumothorax and hemothorax continue to progress.

Competing interests

The authors declare that they have no competing interests.

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