



The clinical profile of musculoskeletal injuries associated with the 2011 Van earthquake in Turkey

Türkiye'deki 2011 Van depremi ile ilişkili kas iskelet yaralanmalarının klinik profili

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Objectives: In this study, we aimed to evaluate the clinical profile of the patients with musculoskeletal injuries associated with the 2011 Van earthquake and treatment modalities applied.

Patients and methods: Between 23.10.2012 and 28.10.2012, a total of 285 patients (151 males, 134 females; mean age 38.6 years; range 1 to 84 years) with musculoskeletal injuries associated with the earthquake who were admitted to Emergency Department of Van Training and Research Hospital were retrospectively analyzed. Medical records including the profile of injury, injury type, site of injury, treatment modalities applied and prognosis were evaluated.

Results: Ninety-five of 285 patients had soft tissue damage, while 144 had fractures. Of these fractures, 81 required surgical treatment. Forty-six patients had crush injury, while 28 had compartment syndrome. Open and multiple fractures and fragmented fractures were common. The majority of the fractures involved limbs, indicating higher incidence of lower limb involvement rather than upper limb involvement. The incidence of infection was lower in the patients who experienced the earthquake.

Conclusion: Orthopedic surgery is of utmost importance for the patients with musculoskeletal injuries associated with the earthquake. Appropriate triage should be performed and then the patients with open fractures and compartment syndrome should be given priority for surgery. In such cases, debridement, open reduction and internal fixation are the most common surgical treatments.

Key words: Earthquake; musculoskeletal injuries; profile of injury.

Amaç: Bu çalışmada 2011 Van depreminde kas-iskelet yaralanması olan hastaların klinik profili ve uygulanan tedavi yöntemleri değerlendirildi.

Hastalar ve yöntemler: 23.10.2012 ile 28.10.2012 tarihleri arasında deprem sırasında kas-iskelet yaralanması nedeniyle Van Eğitim ve Araştırma Hastanesi Acil Servisine başvuran 285 hasta (151 erkek, 134 kadın; ort. 38.6 yıl; dağılım 1-84 yıl) retrospektif olarak incelendi. Yaralanma profili, hasar tipleri ve yerleşim yerleri, uygulanan tedavi yöntemleri ve prognoz bilgilerini içeren tıbbi kayıtlar değerlendirildi.

Bulgular: İki yüz seksen beş hastanın 95'inde yumuşak doku zedelenmesi, 144'ünde ise kırık vardı. Kırıkların 81'i cerrahi tedavi gerektirdi. Kırık altı hastada ezilme tarzı yaralanma, 28 hastada kompartman sendromu vardı. Açık, çoklu ve parçalı kırıklar yaygındı. Kırıkların büyük bir kısmı ekstremiteleri kapsamakla birlikte, alt ekstremitte kırıklarının görülme sıklığı üst ekstremiteye göre daha fazla idi. Enfeksiyon oranı depremi yaşayan hastalarda düşüktü.

Sonuç: Deprem sonrasında kas-iskelet yaralanması olan hastaların tedavisinde ortopedik cerrahinin önemli bir yeri vardır. Hastalara uygun triaj yapılmalı ve sonrasında açık kırık ve kompartman sendromu olan hastalar öncelikli olmak üzere tedavi edilmelidir. Bu tür olgularda, en sık uygulanan cerrahi tedaviler, debridman ile açık redüksiyon ve internal tespittir.

Anahtar sözcükler: Deprem; kas-iskelet yaralanmaları; yaralanma profili.

On October 23, 2011, an earthquake registering 7.2 on the Richter scale struck Van, Turkey. This earthquake was an enormous devastating disaster and caused mass casualties. The widespread effect of the quake destroyed many buildings, and hospitals in the earthquake zone were completely or partially destroyed. There were 604 deaths reported and 72.242 buildings were damaged. Thousands of injuries required immediate treatment.

In the present study, we report the injury pattern and management of musculoskeletal injuries after the Van earthquake.

PATIENTS AND METHODS

We recorded the musculoskeletal injuries of patients, a total of 285 cases, who had been transported to hospital.^[1] Eighty-one of the patients underwent emergency operations: Debridement, fasciotomy, amputation, open reduction and fixation of fracture. The severity of injuries was determined by Injury Severity Score (ISS). Mild (ISS ≤ 8), moderate ($9 \leq \text{ISS} \leq 14$) and severe (ISS ≥ 15) wounds were classified according to the ISS scores.^[2,3] We conducted an injury profile of all patients with musculoskeletal injuries, and recorded the age, gender, fracture site and types, infections and treatments.

RESULTS

Two hundred and eighty-five patients with a musculoskeletal injury were admitted to Van Training and Research Hospital due to injuries resulting from the earthquake. The mean age of the patients was 38.6 years (range 1 to 84 years). One hundred and fifty-one

victims (53%) were male and 134 (47%) were female. Twenty-five percent (n=72) (41 females and 31 males) were over the age of 60. Of the 285 patients, 36.6% had an ISS score < 8 , 44.2% had an ISS score between 9 and 14 and 19.2% had an ISS score > 15 .

Of the 285 patients with a musculoskeletal injury, 75 had superficial lacerations with minor soft tissue contusion, 20 had major soft tissue injuries, and 144 had fractures which 81 necessitating surgery. Forty-six patients were determined to have crush injuries, and 28 of them had compartment syndromes. Seventeen patients had concurrent hemopneumothorax and 17 had concurrent abdominal injury. Twenty-two patients suffered from acute renal failure, 14 from head injury, and four had paraplegia associated with vertebral fractures. Twenty-one patients had open fractures, 74 had multiple fractures and 47 had comminuted fractures. The distribution of fractures based on anatomical site is seen in Table 1.

There were 21 patients (7.4%) with infection among the 285 patients with musculoskeletal injuries. Nine of them were treated with antibiotic therapy and 12 needed debridement.

The most common procedure performed was debridement (n=45), followed by open reduction and internal fixation with plates and screws (n=30). The number of procedures performed in patients is seen in Figure 1. The mean follow-up duration in the hospital was 16 days (range, 5-24 days).

There were 46 patients with crush injury, and 28 of them had compartment syndrome. Of these, 21 were treated by fasciotomy (17 lower extremity, 2 upper extremity, and 2 both upper and lower extremity) and seven were treated with amputation.

TABLE I

Distribution of fractures based on anatomical site

Localization	Frequency	%
Upper limb fractures	65	23
Humerus	17	6
Radius	20	7
Ulna	17	6
Metacarpal-bones of fingers	13	4
Lower limb fractures	135	46
Acetabulum	4	1
Femur	12	4
Tibia-fibula	77	26
Calcaneus	21	7
Talus	5	2
Metatarsal bone-toe	16	6
Spine	28	9
Pelvis	47	16
Skapula	6	2
Clavicle	12	4

DISCUSSION

Earthquakes are the most destructive of the natural disasters. Over 500.000 earthquakes are reported each year worldwide, and every year 8.000 people die and 26.000 are injured due to earthquakes.^[4] In the Van earthquake most medical centers in the disaster area were damaged. Our first-aid teams experienced short delays reaching patients. The coordination between the pre-hospital trauma care services and the emergency medical center was successful.

After a natural disaster orthopedic and surgical staff are the main needed medical disciplines.^[5-10] Most orthopaedic injuries during earthquakes involve the extremities.^[11-13] In our study a great proportion of fractures involved the extremities followed by pelvic fractures. The number of lower limb fractures was more than upper limb fractures as seen in 2009 Western

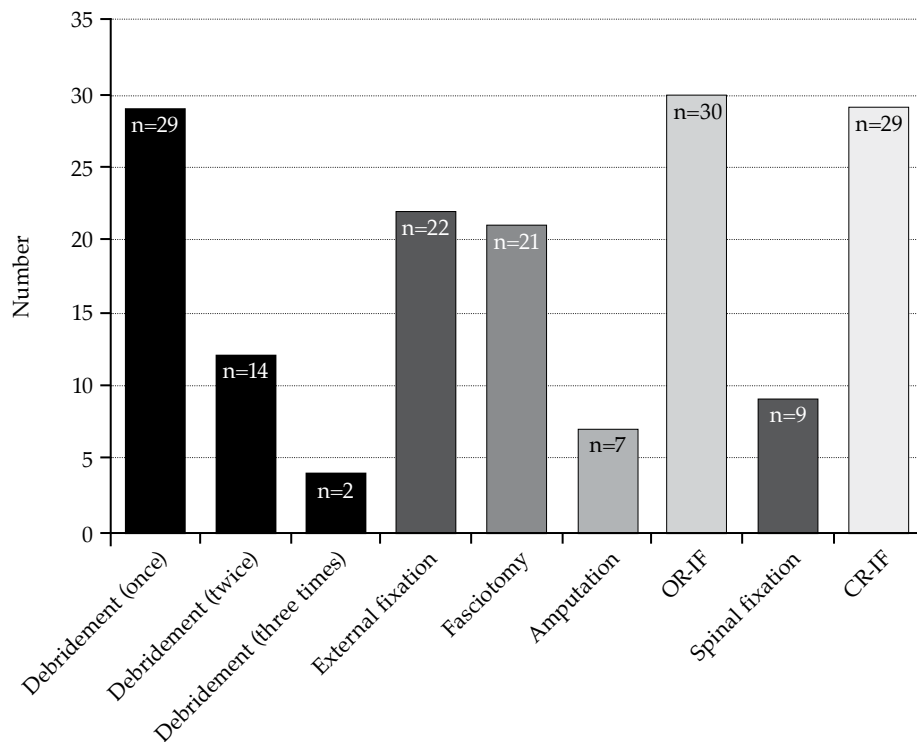


Figure 1. Numbers of procedures performed in patients. OR-IF: Open reduction-internal fixation; CR-IF: Closed reduction-internal fixation.

Sumatra earthquake.^[14] When the earthquake occurs in the early morning and most victims are asleep, proximal bones are more commonly involved.^[11] The Van earthquake occurred in the afternoon and distal bones were commonly involved. Multiple fractures and comminuted fractures were common in all fractures.

Debridement, external fixation and amputation are the most important orthopaedic procedures after a disaster.^[13] After the Van earthquake the most common procedure was debridement (n=45) followed by open reduction and internal fixation (n=30). After earthquakes orthopedic treatment is one of the important treatment procedures.

The infection rate was lower than 1999 Marmara earthquake and 2009 western Sumatra earthquake.^[14,15] Our team adhered to the principles of managing open fractures (tetanus update, aggressive debridement and irrigation removal of foreign body, antibiotic therapy) using skeletal stabilization with external fixators. These achieved a low rate of wound infection (7.4%).

Some authors suggest fasciotomy should not be the first treatment in crush injuries because it makes victims more vulnerable to the risk of infection.^[16,17] Fasciotomy gives the best chance for optimal salvage of the extremity in mass injuries and has an important part in the management of possible crush syndrome.^[18-21] Most

of the fasciotomies performed in the Van earthquake involved the lower extremity (n=17/19). Duman et al.^[22] performed lower extremity fasciotomies on 10 of 16 patients in the Marmara earthquake.

In the postoperative period, anticoagulant therapy should begin to prevent deep venous thrombosis. The late treatment of complications is important to reduce mortality and morbidity.

In conclusion, a great ratio of fractures involved the extremities, distal bones were commonly involved, multiple and comminuted fractures were a substantial proportion of all fractures and infection rate was lower in the Van earthquake.

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