

Evaluation of Extremity Injuries Presented to Emergency Department

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Abstract

Objective: In this study, we aimed to review cases with firearms injury of extremities presented to our hospital.

Methods: After approval by Institutional Board, electronic database was retrospectively screened for firearms injury of extremities between 2012 and 2015. Overall, 600 cases with firearms injury of extremities were included in the study. Cases were assessed for demographic and clinical characteristics, Mangled extremity severity score (MESS), Glasgow Coma Scale (GCS), costs and outcomes.

Results: Totally, 552 (92.0%) cases were men and 48 (8.0%) were women. Mean age was 29.97 ± 10.40 years (range: 5–64 years). A significant difference was detected in gender distribution. Of the cases, 96.6% (n = 580) were Syrian war casualties. Lower extremity injury was the most frequently seen injury (n = 312; 52.0%). Mean MESS score was 4.71 ± 1.32 (range: 2-9). GCS score was <8 in 3 fatal cases (0.5%) whereas it was 15 in 597 cases (99.5%). It was found that 66 cases (11.0%) underwent amputation after they arrived in the hospital as a result of crush injury due to mine and blast. In cases who underwent amputation, a positive correlation was detected in MESS scores ($P = 0.00$). Mean cost was estimated to be 6,936 TL (280-32,232 TL).

Conclusion: Young male and lower extremity injuries were most commonly encountered. Amputation was performed in the early period in cases with highest MESS scores. It was seen that amputation was common in crush injuries due to mine and blast. It was found that patient volume at emergency department and hospital and costs were increased due to war.

Keywords: Cost, extremity injury, firearm, intensity, Mangled Extremity Severity Score (MESS)

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Introduction

Extremity injuries and amputation can be seen as a result of trauma, firearm injury, complications, chronic infections, malignancy and congenital anomalies. Diabetes mellitus and vascular disorders are commonly seen in elder individuals while trauma is the leading cause in younger age group.¹ Extremity is one of the most commonly involved areas of the body. Mangled Extremity Severity Score (MESS) is the most frequently used scoring system for extremity involvement and prognosis.² Here, we aimed to present an overview of the patients with firearms injury of extremities in Syrian civil war and its effects on emergency department and hospital.

Materials and Methods

After approval by Institutional Board, electronic database was retrospectively screened for firearms injury of extremities between 2012 and 2015. Overall, 600 cases with firearms injury of extremities were included in the study. Non-extremity firearms injury and extremity injuries due to trauma mechanisms other than firearms were excluded. Cases were assessed for demographic and clinical characteristics: age, gender, mechanism of injury, localization of injury, length of hospital stay, Mangled extremity

severity score (MESS), Glasgow Coma Scale (GCS), presence of amputation, interventions, additional non-extremity injury, cost and outcomes. Data were analyzed using SPSS version 16.0. Mann Whitney U test was used to compare median values. A P value < 0.05 was considered statistically significant.

Results

Totally, 552 (92.0%) cases were men and 48 (8.0%) were women. Mean age was 29.97 ± 10.40 years (5–64 years). A significant difference was detected in gender distribution. Of the cases, 96.6% (n = 580) were Syrian war casualties. Other case groups included occupational accident, accident and intentional injury (n = 20; 3.4%). Table 1 presents the types of arms used in firearm injuries.

When extremity injuries were stratified as lower and upper extremity, lower extremity injury was seen in 312 cases (52%), upper extremity injury in 246 cases (41%), and both lower and upper extremity injuries in 42 cases (7%). Table 2 presents areas involved and pathologies. Figures 1 and 2 show humerus and femur open fractures.

Mean MESS values used in the clinical decision making for amputation was found to be 4.71 ± 1.32 .²⁻⁹ Amputation was considered in 66 cases (11.0) whose MESS score was considered to be 7 or above. Amputation involved lower extremity in 36 cases (54.5%) and upper extremity in 30 cases (45.5%). A positive correlation was detected between MESS scores and cases who underwent amputation. GCS score was <8 in 3 fatal cases (0.5%) whereas it was 15 in 597 cases (99.5%). Open reduction internal fixation was performed in 408 cases (68.0%). Table 3 presents treatment methods employed.

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Table 1. Gun types.

Gun	n (count)	%
Bomb and other explosives	552	92.0
Mine	30	5.0
Rifle	18	3.0
Total	600	100.0

Table 2. Lesion localization and pathologies.

Lesion localization	n (count)	%
Femur (open-closed fracture, foreign body)	144	24.0
Humerus (open-closed fracture)	120	20.0
Tibia (open-closed fracture, foreign body)	114	19.0
Forearm (open-closed fracture, subtotal amputation, radial nerve lesion)	90	15.0
Hand (amputation, metacarpal fracture, foreign body)	72	12.0
Foot (amputation, metatarsal fracture)	60	10.0
Total	600	100.0

Table 3. Treatment methods.

Treatment	n (count)	%
Open reduction internal fixation	408	68.0
Miscellaneous (wound care, suture, removal of foreign body)	96	16.0
Disarticulation-graft	66	11.0
K-wire	30	5.0
Total	600	100.0

**Figure 1.** Humerus open fractures after gunshot wounds.**Figure 2.** Femur open fractures after gunshot wounds.

Mean length of hospital stay was 15.27 days (range: 1–99 days). Mean cost was estimated to be 6,936 TL (range: 280–32,232 TL). No correlation was detected between mean cost and length of hospital stay ($P = 0.43$).

Mean cost was estimated to be 3565 ± 35 (322–11,374) in cases with war casualties. Thus, it was found that patient volume and costs were increased in emergency department and hospital after Syrian civil war. Of the cases, 597 (99.5%) were discharged while 3 (0.5%) died in hospital. It was found that general status were

poor and amputation was near-total in 3 fatal cases. A significant relationship was detected between death and amputation ($P = 0.00$).

Discussion

Extremity injuries and amputation are most frequently seen after trauma in younger age and due to diabetes mellitus, vascular disorders and infections in elder individuals.¹ Firearm injuries are

rarely encountered causes in general; however, it is frequently seen in young males with increasing incidence during war.³⁻⁹ In addition, compared to other organs, extremity injuries are more commonly seen in cases of social events such as natural disasters or blasts.^{10,11} In our study, it was seen that extremity injuries were seen frequently when casualties arrived in our hospital from Syrian civil war. It was also found that young males injured by bomb or shrapnel were common.

Lower extremity injuries are 3 or 4 times more common than upper extremity injuries.^{5,12} Extremity injuries were frequently reported in past experiences of World War II, Vietnam, Korea, and Somali.¹³ In particular, open-closed fractures of femur and tibia are the most common afflictions of the lower extremity.⁵

There are several scoring systems to predict prognosis of extremity injuries. These systems include limb salvage index (LSI), predictive salvage index (PSI), nerve injury, ischemia, soft tissue, skeleton, shock and age (NISSA), Hannover fracture scale-97 (HFS-97) and mangled extremity severity score (MESS).¹⁴ The MESS is the most commonly used scoring system.^{4,5} The organ can be saved if MESS score is ≤ 6 . There is a relative indication for amputation if the score is 7 or 8. Amputation is suggested in cases with MESS score ≥ 9 .^{2,14-16} In previous studies, amputation was recommended in cases with MESS score >7 .^{17,18} However, in another study, it was suggested that the extremity could be saved after re-plantation in cases with MESS scores of 8 or 9.¹⁹ In our study, amputation was performed in 66 cases with MESS score ≥ 7 . In this context, there was a significant relationship between outcomes of amputation and death occurred in 3 patients.

Social events such as natural disasters, war and blasts lead to increased workload, difficulty in maintaining functionality and increased costs in hospitals and emergency departments. In these situations, disaster plans are implemented in hospitals. However, unintentional events affect cost assessments and estimations.^{3,10} In our study, it was found that cost was increased by 2-folds by war casualties when compared to cases with injury unrelated to war. It was found that this negatively affected hospital budget as well as overall budget.

In conclusion, young male and lower extremity injuries were most commonly encountered. Amputation was performed in the early period in cases with highest MESS scores. It was seen that amputation was common in crush injuries due to mine and bombing. It was found that patient volume at emergency department and hospital and costs were increased due to war.

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