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RESEARCH ARTICLE

GENERAL OVERVIEW OF GUNSHOT INJURIES IN KARS IN TURKEY PROVINCE

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ABSTRACT

Aim: We aimed to review and present our data on gunshot injury cases that presented to the Kars State Hospital and Kafkas University Hospital emergency department in this study.
Material and Method: Gunshot injury cases that presented to the emergency service between January 2012 and December 2016 and were admitted to various clinics for surgical treatment were included in the study. The demographic characteristics, type of firearm, location of gunshot injuries, duration until presentation to the hospital, injured organs, the treatments used, post-treatment complications and mortality rates were evaluated together with the rate of gun licensing per year. The patients who presented to the emergency service were treated according to the physical examination, laboratory tests and imaging results at presentation.
Results: The 71 gunshot injury cases that presented to the emergency service consisted of 9 females (12.7%) and 62 males (87.3%). The mean age was 39 years for the males and 24 years for the females. There were 53 cases from the villages (75%), 13 from the district centers (18%), and 5 (7%) from the province center. We also observed an increase in applications to obtain a gun license to both hospitals in Kars center from 2012 to 2016. The duration of presentation to the hospital after the injury was most commonly 2-4 hours (23 patients, 32%). The most commonly injured organs were the extremities, followed by the abdominal region and cranial region. Open fracture injury patients underwent appropriate debridement, external fixator, and plaque screw, intramedullary nail osteosynthesis; soft tissue injury patients received debridement; and abdominal injury patients underwent laparotomy and appropriate treatment according to the injured organ. Patients who presented with cranial hemorrhage and 4 patients with massive abdominal hemorrhage died. The complications were injury site infection in 5 (5.63%) patients, shortness of extremity in 3 (4.22%) patients and eventration in 2 (2.81%) patients.
Conclusion: Gunshot injuries have become more common in rural areas and regions with a lower socioeconomic level in our country together with an increase in the rate of acquiring gun licenses. Gunshot injuries require a long hospitalization duration and can result in high mortality and morbidity rates if prompt intervention is not possible.

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INTRODUCTION

Gunshot injuries (GI) are growing in number globally each passing day due to the increase in military conflicts, terrorism, easy acquisition of gun licenses, individual weapon possession, and crime (Zebib *et al.,* 2017; Çetinkaya *et al.,* 1998). Increasing terrorist incidents in our country as well as increased rates of gun possession and carrying require better identification and treatment of gunshot injuries. A US study has reported gunshot injuries to rank second after traffic accidents in the 10-19 years age group and first among black people under the age of 19 residing in the suburbs (Nance *et al.,* 1997).

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Gunshot injuries are difficult to treat and have high mortality and morbidity rates. There is inadequate statistical information from the various regions of our country on this subject and we did not come across any study on gunshot injuries in Kars province. We therefore aimed to review and present our data about the cases presenting to the Kars State Hospital and Kafkas University Hospital emergency departments due to gunshot wounds in our study.

MATERIALS AND METHODS

A total of 71 patients who presented to the Kars State Hospital and Kafkas University Hospital due to gunshot wounds between 2012 and 2016 were included in the study.

The demographic characteristics as well as the type of firearm, the place where the event took place, the time between the event and presentation to the emergency service, the number and location of the injured organs, the treatment methods used and the postoperative complications and mortality cause were identified. The annual rate of gun licensing was also determined. The patients underwent biochemical blood tests and appropriate imaging methods after physical examination, taking the site of the injury into account. In addition, they received tetanus toxoid and immunoglobulin and gas gangrene antiserum. Appropriate prophylactic antibiotic treatment was started for the patients to be taken to surgery. The antibiotic type was determined individually. Surgical treatments used included debridement for cases with soft tissue injury, and debridement. external fixator, plate screw, and intramedullary nail osteosynthesis according to the location and type of the fracture for cases with fractures. Abdominal injury patients underwent laparotomy and surgery according to the injured organs.

RESULTS

The 71 gunshot injury cases presenting to the emergency service consisted of 9 females (12.7%) and 62 males (87.3%). The mean age was 39 years in the males and 24 years in the females. We had 53 cases from the villages (75%), 13 from the district centers (18%), and 5 (7%) from the province center presenting to the emergency service of the two hospitals. The subjects from the villages generally worked with livestock and agriculture while the cases from the provincial and district centers were self-employed. The weapon causing the injury was a gun in 39 (55%), hunting rifle in 29 (41%), long-barreled weapon in 2 (%3), and a mine in 1 (1%).

The number of subjects who applied to the Kars State Hospital and Kafkas University Hospital to obtain a firearm license by year is presented in table 1 and it can be seen that the number of gun licenses increased over the years.

Table 1. Number of gunships by years

Year	Kars State Hospital	Kafkas University Hospital
2012	170	-
2013	318	15
2014	598	44
2015	425	40
2016	550	55

The duration from the time the injury occurred until the patient presented to the emergency service is given in Table 2.

Table 2. The duration from the time the injury occurred until the patient presented to the emergency service

Duration (hours)	Number of Cases and Percentages
0-2	22 (31%)
2-4	23 (32%)
4-8	18 (25%)
8-10	8 (12%)

The duration after the event for the cases brought to the hospital was most commonly 2-4 hours, followed by 0-2 hours. After the cases presented to the emergency service, surgery was decided on according to the results of the physical examination, laboratory tests and radiologic imaging methods. The distribution of the injured organs and the interventions performed are presented in Table 3.

The complications that occurred in the patients are presented in Table 4.

Table 4. The complications that occurred in the patients

Complications	Number of Cases and Percentages
Wound infection	2 (2.8%)
Shortness of extremity	3 (4.2%)
Eventration	2 (2.8%)

An extremity injury was present in 49 (69%) of our patients while 4 (6%) cases had vessel injury. The most common pathology in those with extremity injuries was a tibial open fracture. All extremity injuries underwent laboratory tests as well as x-ray and Doppler ultrasonography. Abdominal region injuries were prepared for surgery as soon as laboratory samples were obtained. Patients with extremity injuries underwent debridement, removal of the foreign bodies (bullet core, buckshot particles), stabilization with external stabilization, plaque screw osteosynthesis, (Figure 1-2), and Kirschner wire and cerclage wire osteosynthesis (Figure 3) as surgical treatment. One patient underwent amputation following stepping on a mine. Of the 4 vessel injuries, 2 involved the femoral artery, 1 the axillary artery and 1 the popliteal artery. Vessel repair was performed in patients with vessel injury. No infection was seen in patients with extremity injuries following radical debridement was performed and appropriate antibiotic treatment was initiated according to the culture results.

Table 3. The distribution of the injured organs, Number of Cases and Interventions Performed

Organs Injured	Number of Cases and Percentages	Interventions Performed
Lower Extremity soft tissue	16 (%23)	Debridement
Open comminuted tibia fracture	12 (17%)	Stabilization with external fixator + debridement
Humerus fracture	6 (9%)	Debridement + plaque screw osteosynthesis + stabilization with external fixator
Femur fracture	7 (10%)	Stabilization with external fixator + plaque screw osteosynthesis
Patella fracture	1 (1%)	Osteosynthesis with Kirschner wire and cerclage wire
Ulna Fracture	1 (%1)	Plaque screw osteosynthesis
Fibula Fracture	1 (1%)	Plaque screw osteosynthesis
Vascular injuries	4 (6%)	Vessel repair
Food	1 (1%)	Amputation from the metatarsophalangeal joint
Cranial injuries	4 (6%)	Death
Kidney	3 (4%)	Nephrectomy
Gallbladder	3 (4%)	Cholecystectomy
Liver	4 (6%)	2 cases primary repair + 2 cases right hepatectomy
Small intestine	6 (9%)	Resection+ anastomosis
Pancreas	1 (1%)	Distal pancreatectomy
Retroperitoneal massive bleeding	1 (1%)	Laparotomy

Figure 1. External stabilization

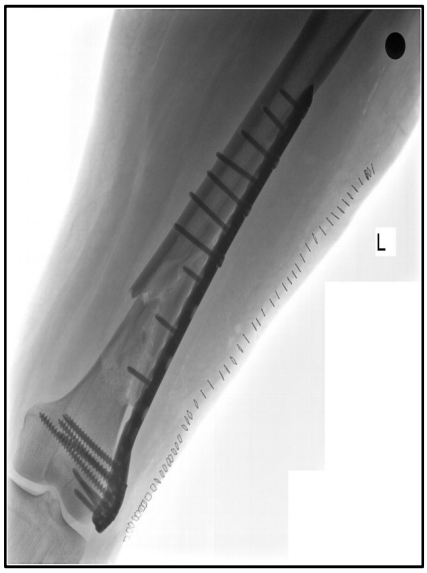

Figure 2. Plaque screw osteosynthesis

Figure 3. Kirschner wire and cerclage wire

Extremity shortness (about 1.5 cm) was present in 3 patients. No mortality was seen in patients with extremity injury. Eighteen of our patients had abdominal injury. Small intestinal injury was the most common, followed by liver injury. Wound site infection developed in 2 patients. Eventration was present in 2 patients. Two patients died during the intraabdominal intervention; one due to massive retroperitoneal hemorrhage and the other due to massive right liver lobe hemorrhage. Four patients had cranial injury and all were dead on arrival to the emergency service. The mean hospitalization duration of the patients in general was 15.2 ±14.3 days.

DISCUSSION

Gunshot injuries are more common in rural areas due to increased individual weapon possession, familial pressure, families with low socioeconomic status, and insufficient social life and job opportunities as geographical characteristics. Studies conducted in the United States have reported an increase in rates of gunshot injuries in regions with various traditions due to racial differences, low socioeconomic level, neighborhood pressures, high unemployment rate, insufficient social life, and high rates of individual weapon possession. The ratio of gunshot injury was seen to be higher in young and middle age groups and males in the evaluation conducted in terms of mean age and gender in the same study (Zebib *et al.,* 2017, Biafora, F. and Warheit, G.2007, Wintemute, G.J. 2015, Weisburd, D *et al*). Conflicts due to pasture and agricultural lands have increased the rates of gunshot injuries because of the increase of gun possession, traditional cultural and familial pressures, insufficient social life and job opportunities, and widespread animal husbandry at Kars province center, districts and villages with a population of 289.786. Young and middle-aged males have been reported to carry weapons more commonly than females in studies conducted in the United States. Consistent with the literature, gunshot injuries were more common in young and middle-aged subjects as well as males in our study. The rate of carrying a personal weapon has also increased over the years (Zebib *et al.,* 2017). We similarly saw increased personal weapon possession over the years in our study. The duration between the event and presentation to hospital covered a short duration of 0-4 hours in the study of Çetin Kaya *et al*. (1998).

The cases in our study were also seen to present to the emergency service of our hospital within a maximum duration of 0-4 hours. The reason is thought to be the law enforcement agencies such as police and gendarmerie being informed early, quick contact with the 112 emergency service, and the 112 service becoming more coordinated each passing day. Extremity injury was the most common problem in our study. After initial evaluation at the emergency service was conducted for patients who presented with an extremity injury, superficial foreign bodies were removed from the wound and debridement was performed. Whether any vessel injury would develop was evaluated with Doppler ultrasonography. While complications and infections occurred in patients undergoing minimal debridement, no complications occurred in patients who underwent radical debridement after low-energy injuries (Stromberg, 1978). We kept patients with low-energy injuries under observation for at least 24 hours by hospitalization and radical debridement was performed in these cases. The reason was to take the necessary measures against a probable infection and compartment syndrome. The treatment in cases with gunshot injury-related fractures is surgery as they are open fractures. This type of fracture is called Type III based on the Gustilo Anderson classification. However, some are also classified as Type I and II according to the status of the injury in low-energy injuries (Joseph Tejan *et al.,* 1998). The treatment in long bone fractures without intra-articular injury following low-energy injuries is debridement, intramedullary nail and/or plate screw osteosynthesis (Gellman *et al.,* 1996; Lucas *et al.,* 1993; Doğan *et al.,* 2000). The joint should be reduced in intra-articular fractures and debridement performed in patients at risk for infection, foreign bodies removed, and osteosynthesis should performed with a Kirschner wire, cannulated screws and plate screws (Pape *et al..,* 2002). The primary use of an external fixator is seen appropriate when the soft tissue condition is not good in case of high-energy injuries. Afterwards the fractures should be reduced with a plaque screw or intramedullary nail osteosynthesis according to laboratory tests and the situation of the wound and soft tissues (Bowyer and Rossiter, 1997; Subası *et al.,* 2001). We used Kirschner wire and cerclage wire osteosynthesis in patella fractures, and debridement and external fixator implementations in upper and lower extremity fractures as treatment options according to the type of the fracture and

anatomic location of the bone. Plaque screw osteosynthesis was then performed according to the condition within 3 weeks in our cases, consistent with the literature. Evacuation of hematoma, removal of foreign bodies and radical debridement and soft tissue repair were performed according to the status of the hematoma and foreign body in soft tissue injuries only.

The most commonly used treatment in mine injuries is long amputation under the knee. The choice of amputation level depends on pathologic, anatomic, surgical, prosthetic and biomechanical factors. To minimize energy expenditure, the most distal level that can heal and provide a functional stump is selected (Doğan *et al.,* 2000). Foot injury due to stepping on a mine was present in one of our cases and amputation at the metatarsophalangeal joint level was performed. Laparotomy should be performed for the diagnosis and treatment of abdominal gunshot injuries. We also performed laparotomy for abdominal gunshot injuries in our study. The most commonly injured organs have been reported as the small intestine, colon and liver in the literature (Çetinkaya *et al.,* 1998). The most commonly injured organ in our study was the small intestine, followed by the liver. The treatments are listed in table 3. Intraabdominal infection rates are about 1-10% in the literature. Besides, the wound site infection rate has been reported as 2-6% and was 2.8% in our study. Complications related to soft tissue injuries can be listed as vessel, nerve, and soft tissue losses. Vessel injury should be treated immediately while acute treatment is not recommended for nerve injuries as 69% recover spontaneously within 3-9 months. When the nerve is subjected to surgical treatment in the acute period, the success rate is low (Omer and Spinner, 1984). Vessel injury was present in 4 patients in our study. These cases needed immediate intervention and vessel repairs were performed. No nerve injury occurred in any of our cases. The general mortality rate in gunshot injuries is 3 to 20% in the literature (Çetinkaya *et al.,* 1998). This rate was 8.5% in our study. In conclusion, gunshot injuries are more common in rural areas where family pressure and different traditions are present together with lower socioeconomic status and less social life and in areas where personal firearms are increasing in our country. We believe that gunshot injuries that have high mortality and morbidity rates can be decreased by taking some state-supported measures and providing other social benefits such as job opportunities in these regions.

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