A Ten Year Analysis of Fatal Peripheral Vascular Injuries Autopsy Study

Ölümcül Periferik Damar Yaralanmalarının 10 Yıllı Analizi

Periferik Vasküler Yaralanmalar / Peripheral Vascular Injuries

Salim Kemal Tuncer[1], Mehmet Toygar[2], Kenan Karbeyaz[3], Beyza Urazel[4], Umit Kaldırım[1], Yusuf Emrah Eyı[1], Adnan Celıkel[5], Murat Durusu[1], Mehmet Ali Sahın[6], Adem Guler[6], Selahattin Ozyurek[7]
[1]Department of Emergency Medicine, Gulhane Military Medical Academy, Ankara, [2]Department of Forensic Medicine, Gulhane Military Medical Academy, Ankara, [3]Ministry of Justice, Eskisehir Branch of Council of Forensic Medicine, Eskişehir, [4]Forensic Science Departments, Eskisehir Osmangazi University Medical Faculty, Eskişehir, [5]Department of Forensic Medicine, Mustafa Kemal University, Hatay, [6]Department of Cardiac and Vascular Surgery, Gulhane Military Medical Academy, Ankara, [7]Department of Orthopedics and Traumatology, Aksaz Military Hospital, Muğla, Türkiye

Özet

Amaç: Periferik damar yaralanmaları genellikle ölümcül yaralanmalara eşlik eder. Erken tanı ve müdahale periferik damar yaralanmalarında olumlu sonuç alınması için hayati önem taşımaktadır. Bu çalışmada 2003-2012 yılları arasındaki dönemde ölüme neden olan periferik damar yaralanmaları değerlendirildi. Gereç ve Yöntem: 2003-2012 yılları arasındaki 10 yıllık dönemde Eskişehir'de otopsi ve ölü muayenesi yapılan 2845 olgu retrospektif olarak değerlendirildi. Çalışmaya dahil edilen olguların yaş ortalamasının 32,5±7,9 olduğu ve olguların en sık 30-39 yaş grubunda olduğu saptandı. Olguların %89,2'sini erkekler oluşturmaktaydı. Ölümlerin en sık sebebinin %83.8 ile cinayetti. En sık yaralanan periferik damarın 29 olguyla femoral arter olduğu belirlendi (%78,4). Çalışmada 33 olgunun (%89.3) olay yerinde hiçbir tedavi almadan öldüğü belirlendi. Tartışma: Çalışmamıza göre periferik damar yaralanmaları en sık kesici-delici alet yaralanmasına bağlı olarak meydana gelmektedir. Yaralanmaların, erken müdahale edildiği takdirde mortalitesi düşüktür. Yapılan otopsi sadece ölüm nedenlerinin değil, ihmal veya malpraktis iddialarına neden olan tedavi sürecinin aydınlatılması açısından da oldukça önemlidir.

Anahtar Kelimeler

Vasküler Yaralanma; Otopsi; Femoral Arter

Abstract

Aim: Peripheral vascular injuries are usually associated with fatal injuries. Early diagnosis and intervention are so vital for improving a favorable outcome for traumatic vascular injuries. As a preventable cause of death, we aimed to evaluate peripheral vascular injuries in overall deaths in ten year period, 2003-2012. Material and Method: A retrospective evaluation was made of 2845 death cases which had post-mortem examination and autopsy from the 10-year period of 2003-2012 in Eskisehir, Turkey. The mean age of the cases included in the study was 32.5±7.9 years with the highest rate of cases occurring in the 30-39 years age group. Males constituted 89.2% of the victims. The most frequent manner of death was homicide 83.8%.The femoral artery was the most commonly injured vessel 29 cases (78.4%). In this study it was identified that, 33 patients (89.3%) died before any medical intervention could be performed. Discussion: Our study shows that, peripheral vascular injuries most commonly caused by sharp objects. The injuries have a low mortality rate when early intervention is made. Autopsies are conducted is very important to explain not only the cause of death but also the treatment process, which would clear the cases of any potential malpractice or negligence claims.

Keywords

Vascular Injury; Autopsy; Femoral Artery

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Corresponding Author: Salim Kemal Tuncer, Department of Emergency Medicine, Gulhane Military Medical Academy School of Medicine, 06018, Ankara, Turkey.
T.: +90 3123043061 F.: +90 3123528181 E-Mail: drskemal@gata.edu.tr, drskemal@yahoo.com

Introduction

Peripheral vascular injures defined as vessels in the upper extremity such as axillary, brachial and branches and vessels in the lower extremity such as femoral, popliteal and branches account for 40% to 75% of all vascular injuries treated in trauma centers [1-2]. In forensic medicine practice, peripheral vascular injuries are usually associated with fatal injuries of head or torso. Isolated fatal peripheral vascular injuries involving upper and lower extremities including vessels such as femoral, popliteal, brachial, ulnar and radial veins and arteries are uncommon [3]. Although peripheral vascular injuries are common injuries, mortality is largely preventable through early intervention and effective treatment [3-5]. These kinds of injuries arising from blunt trauma are particularly more difficult to diagnose than those occurring from penetrating trauma [6,7].

In the cases of peripheral vascular injuries, the vessel causing death has to be detailed in terms of criminal investigation. If the patient was treated, the compatibility of the hospital records with the autopsy findings must be checked.

In this study, fatal peripheral vascular injuries covering a ten-year period in Eskisehir were retrospectively analyzed and compared with the literature.

Material and Method

A retrospective evaluation was made of 2845 death cases which had post-mortem examination and autopsy covering the 10-year period of 2003-2012 in Eskisehir. Peripheral vascular injury was identified as the sole cause of death in 37 cases (1.3%). In this study, isolated peripheral vascular injuries were examined. Multiple trauma cases and/or other any fatal traumas involving head or torso including peripheral vascular injuries were excluded from the study Thus the study is limited to isolated peripheral vascular injuries as the sole mechanism of death.

Cases were evaluated in terms of age, gender, origin of the event, injury type, location of injury, place of death and vascular injury that caused death. All statistical analyses were performed by using the SPSS 16.0 (SPSS Inc., Chicago, IL, USA) statistical package.

Results

1.3% (n=37) of the medicolegal deaths covering ten year period in Eskisehir were found to be due to peripheral vascular injury. 89.2% (n=33) and 10.8% (n=4) of the cases were male and were female respectively (p<0.001).

The mean age of the cases included in the study was 32.5±7.9 years (range, 19- 56 years) with the highest rate of cases occurring in the 30-39 years age group (n=18, 48.6%) (Figure 1).

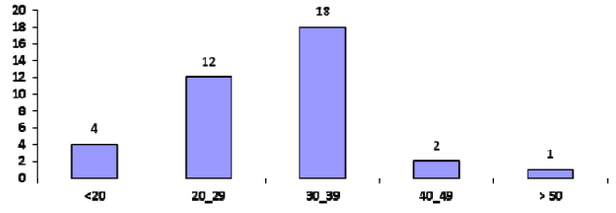


Figure 1. The range of the cases according to age groups.

The assessment of the injury type and origin is presented in Table-1. Sharp object injuries were determined to be the most common type (n = 21, 56.8%). The most common origin of the injury was homicide (n=31, 83.8%). 64.5% of the homicide cases were caused by sharp objects. 12 cases were caused by firearms and all those injuries were caused by handguns. 4 cases (10.8) were due to accidents, 2 of those were due to car accidents, 1 case was due to a train accident and 1 case was due to glass cut which happened at a furniture factory.

Table 1. The Range of Injuries According to Age and Origin

Type of Injury	Homicide		Suicide		Accident		Total	
	n	%	n	%	n	%	n	%
Sharp Object	20	54.1	1	2.7	-	-	21	56.8
Firearms	11	29.7	1	2.7	-	-	12	32.4
Train Accident	-	-	-	-	1	2.7	1	2.7
Car Accident	-	-	-	-	2	5.4	2	5.4
Glass Cut	-	-	-	-	1	2.7	1	2.7
Total	31	83.8	2	5.4	4	10.8	37	100

34 cases (91.9%) and 3 (8.1%) of fatal peripheral vascular injuries involved lower extremity and upper extremity respectively. Of the lower extremity cases, 55.9% (n=19) and 44.1% (n=15) were left sided and were right sided respectively.

It was identified that autopsy was performed in all cases and injured peripheral vessels were described. The range of fatally injured peripheral vessels is presented in Table-2. Femoral artery was the most commonly injured vessel (n=29, 78.4%). Femoral vein injury was accompanied by 86.2% (n=25) of the femoral artery injuries. In 2 cases (75%) of upper extremity injuries, brachial artery injury was accompanied by brachial vein injury. Coexistence of injury of ulnar artery, ulnar vein, radial artery and radial vein were observed in 1 case (25%).

Table 2. Injured Vessels

Extremity	Injured Vessel	n	%
Lower Extremity	A.Femoralis	29	78.4
	V.Femoralis	25	67.6
	A.Poplitea	5	13.5
	V.Poplitea	2	5.4
Upper Extremity	A.Brachialis	2	5.4
	V.Brachialis	2	54
	A.Ulnaris	1	2.7
	V.Ulnaris	1	2.7
	A.Radialis	1	2.7
	V.Radialis	1	2.7

In 8 cases (21.6%) bone fracture accompanied the vascular injury. 3 cases were due to blunt trauma, 2 of those were due to traffic accidents and 1 case was due to a train accident, while 5 cases were due to firearms injuries. Lower extremity was involved in all cases with blunt trauma and 4 cases involved the lower extremity while 1 case involved the upper extremity in the firearms injuries.

It is identified that 1 patient (2.7%) died in hospital, 33 (89.2%) died at the scene and 3 (8.1%) died on the way to hospital. The patient died in the hospital was determined arrest upon arrival

to the emergency department and was pronounced dead after 30 minutes. The mechanism of death in all cases was hypovolemia due to external bleeding.

Discussion

With early intervention and effective treatment, peripheral vascular injuries have a low mortality rate [3-8]. Today, peripheral vascular injuries are accepted as treatable injuries [6-10]. In a study of a ten-year period in Bursa, it was reported that only 0.9% (n=63) of all medicolegal deaths were due to peripheral vascular injury [3]. Similarly, it was identified that 1.3% (n=37) of all medicolegal deaths were due to peripheral vascular injury in the current study covering a ten-year period in Eskisehir.

Deaths due to peripheral vascular injury are more common among males, as in all trauma cases [3-5,11-13]. In a study from Pakistan, it was reported that 86% (n=49) of cases were male, whereas only 14% (n= 8) of cases were female [13]. In a study from Bursa, it was reported that 90.5% of the cases (n=57) were male [3]. In the current study, 89.2% (n=33) of the peripheral vascular injury cases were identified as male and 10.8% (n=4) were female.

In literature, it has been stated that peripheral vascular injuries are more prevalent in young age groups [3, 11-14]. Studies have reported the average age of cases to be 29.4 years in Pakistan [4], 35.6 years in Bursa [3] and 28.9 years in Malatya [16]. In this study, the identified average age was 32.5±7.9 years and the highest rate of cases occurred in the 30-39 years age group (n=18, 48.6%).

In studies on peripheral vascular injuries, sharp object injuries have been determined as the most common injury type [3-5, 13-19]. In the United States, sharp object wounds account for 30% of penetrating peripheral vascular injuries but are a much more common cause in countries in which firearms are more difficult to obtain [20]. In the Bursa study, 58.7% of the cases were reported to be caused by a sharp object [3]. It was determined in accordance with the literature in the current study that injury cases due to a sharp object were the most common type (n=21, 56.8%), 12 injury cases were caused by firearms, the most common origin of injury was homicide (n=31, 83.8%), 64.5% of the homicide cases (n=20) were caused by sharp objects, 35.5% of the homicides (n=11) were caused by firearms and all firearms injuries were caused by handguns.

Although it is easy to diagnose the injury in penetrating traumas, it is more difficult to diagnose in blunt traumas [6,7]. It has been emphasized in studies that bone fractures usually accompany peripheral vascular injuries caused by blunt traumas [21-24]. In a study from Thailand which included 33 blunt traumas, it was reported that bone fractures accompanied the vascular traumas in 26 cases (86.7%) [22]. In the current study, it was identified that the vascular injuries caused by 3 blunt traumas (8.1%) occurred in 2 car accidents and 1 train accident. In all these cases, bone fractures accompanied the vascular traumas. In the car accident cases, femoral bone fractures were accompanied by injuries of femoral artery and vein. In the train accident, it was identified that there was a crush injury involving lower extremity which included a comminuted fracture in the femoral bone which was accompanied by femoral artery and vein ruptures [22].

Studies have emphasized that peripheral vascular injuries can be treated with early intervention [19,21-25]. It was determined in accordance with the literature that 33 cases (89.2%) died at the scene, 3 patients (8.1%) died on the way to the hospital, and only 1 patient who was determined arrest upon arrival to the emergency department died in the hospital.

Injuries were identified to be most common in the left extremity (n=19, 55.9%). Other studies have also identified that peripheral vascular injuries are most frequently seen in the left extremity [3,4,14,18]. Since the majority of injuries have been caused by a sharp object [3-7,11-17] and attackers are usually right handed, the injuries generally involve left extremity. Associated with that is the high rate of injury to the femoral artery (n=29, 78.4%) and femoral vein (n=25, 67.6%). It has been reported that femoral artery and vein injuries are commonly encountered in fatal peripheral vascular injuries [3,4,8,18].

Peripheral vascular injuries are most commonly caused by sharp objects. The injuries might have a low mortality rate when early intervention was made. In this study it was identified that 33 patients (89.3%) died before any medical intervention could be performed. All the death cases were autopsied where peripheral vascular injuries were described and it was identified that none of the patients had the chance of surgical intervention. It is crucial for performing autopsies in terms of clarifying not only the cause of death but also the treatment process and any potential malpractice or negligence claims.

Competing interests

The authors declare that they have no competing interests.

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