Clinical Aspects and Emergent Management of Snake Bites Presented to Emergency Department

Acil Servise Başvuran Yılan Sokmalarının Klinik Özellikleri ve Acil Yönetimi

Snake Bite / Yılan Sokması

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Özet

Amaç: Acil servise başvuran yılan sokmalarının epidemiyolojik özellikleri ve yönetiminin değerlendirilmesi. Gereç ve Yöntem: Bu çalışmada 2008-2009 yılları arasında Diyarbakır Eğitim ve Araştırma Hastanesi Acil Servisi'ne başvuran 74 vaka retrospektif olarak değerlendirildi. Bulgular: Hastaların 46'sı (%62.2) erkek ve 28'i (%37.8) kadındı. Çalışmaya alınan hastaların yaş ortalaması 34.85±19.17 (min 7- mak 80) yaştı. Yılan sokmalarının çoğu 18.00-06.00 saatleri arasında ve evde (%73) meydana gelmişti. %79.7'si üst ekstremitelerdeydi. Vakaların %93'üne tek doz intravenöz antivenin uygulandı. Hastaların hiçbirinin tekrarlayan antivenin uygulamasına ihtiyacı olmadı. Tartışma: Yılan sokmaları özellikle kırsal alanda hala büyük bir halk sağlığı sorunudur. Acil servis doktorlarının yılan sokmalarına multidisipliner yaklaşımı bilmeleri gerekmektedir.

Anahtar Kelimeler

Acil Servis; Yılan Sokması; Tedavi

Abstract

Aim: Evaluating the epidemiologic characteristics and management of snake bites presenting to emergency departments. Material and Method: In this retrospective study 74 cases of snakebites admitted to Emergency Department of Diyarbakır Training and Research Hospital between 2008 and 2009 were retrospectively evaluated. Results: Fourty-six (62.2%) of patients were male and 28 (37.8%) were female. Mean age of the study population was 34.85±19.17 (min 7- max 80) years. Most of the snakebites occurred between 18.00 to 06.00 hours and at home (73%). 79.7% of snake bites occurred to upper extremities. %93 of cases had intravenous administration of antivenin (one dose). Neither none of the patients needed recurrent administration. Discussion: Snake bites are still a major public health problem especially in rural areas. Particularly emergency care physicians should be adequately capable and sophisticated in multidisciplinary management of snake bites.

Keywords

Emergency Department; Snake Bite; Treatment

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Introduction

Increased urbanization and the reduction of the natural environment has not reduced the threat of animal attacks on humans. Contrarily they continue to be an important public health problem by creating severe medical conditions due to their toxins as with hymenopteras, spiders, scorpions, snakes and transmission of infectious agents to humans as with domestic animals like rabies.[1,2]

There are 3000 venomous snake species known worldwide but only 200 of these are potentially life-threating for humans owing to venom characteristics or tooth structure. The venomous snakes include Elapidae, Viperidae, Hydrophiidae, Colubridae and Antractaspididae families. In Turkey 15 snake species are known to be poisonous [14 in the family Viperidae and one in the family Elapidae] and 4 are semi-venomous in the family of Colubridae. Geographically the climate in southeast of Turkey of is arid and contains mostly vipers, especially Vipera lebetina and Vipera xanthina, as most venomous snakes.[3,4,5,6]

The clinical picture of a snake bite can include symptoms and signs secondary to cytotoxic, hypotensive, neurotoxic, or anticoagulant effects of the specific snake venom or the course after the attack can be limited to a sole dry bite without systemic or local symptoms when the snake cannot inject its venom.[3,4]

Conventional management of snake bites includes supportive care (fluid infusion, analgesic drugs, antibiotics, elevation of extremities) and antivenom therapy, the latter being the cornerstone of management.[3]

We aimed in this study to investigate the demographic and clinical properties and outcomes of patients admitting to emergency department with snake bite and to review the available treatment approaches.

Material and Method

In this study 74 patients suffering from snakebite who were admitted to the Emergency Department of Diyarbakır Training and Research Hospital between 2008 and 2009 were retrospectively evaluated. Besides demographical data the time periods of the bites occurred, type of the bite, area of the body bitten, the presence of symptoms suggesting systemic toxicity, local symptoms and antivenom use were analyzed. Because almost all of the bites were quick and defensive the exact snake species could not be identified.

All patients were evaluated in terms of severity of envenomation due to Grade 1-4 scoring method and that means severity of the reaction to the snakebite depends on the degree of envenomation.[7,8]

Statistical analyses of the study data were performed with the help of the Statistical Package for the Social Sciences (SPSS) v. 16.0 software package. Descriptive data were expressed as frequency and percentage.

Results

A total of 74 snakebite patients were analyzed in the 2 year period from January 2008 to December 2009. 46 (62.2%) of these were male and 28 (37.8%) were female. Mean age of the study population was 34.85±19.17 (min 7-max 80) years. Male to female ratio was 1.64. Most of the snakebites occurred between 18.00 to 06.00 hours and at home (73%). Regarding the bite sites, 59 patients (79.7%) were bitten from their hands, whereas 12 (16.2%) were bitten from their foot and 3 were bitten from the other sides of their body (face and trunk). All characteristics of cases were summarized in Table 1.

The most common complaints at presentation were pain, erytema and edema (swelling). Five (6.8%) of the patients had dry bites at iniatially and 4 of them developed to Grade 0 envenomation during their observation (Tablo 2).

On admission after examining the bite site and performing wound care; prophylaxis with tetanus toxoid and/or tetanus immune globulin at a dosage of 250 IU intramuscularly was administered all of the patients, the injured extremity was immobilized and elevation was performed. All cases received supportive and symptomatic treatment with analgesics, antiallergics, mild sedatives and fluid resuscitation.

Except the 5 dry bites remainder of cases had intravenous administration of antivenin (one dose). During emergency department observation 4 of 5 dry bites who developed local symp-

Table 1. Baseline and epidemiological characteristics of patient

Characteristics		n (%)
Gender	Male	46 (62.2)
	Female	28 (37.8)
Age	Pediatric	15 (20.27)
	Adult	59 (79.73)
District	Urban	22 (29.7)
	Rural	52 (70.3)
Bite months	April	4 (5.4)
	May-July	35 (47.29)
	June-August	31 (41.89)
	September-October	4 (5.4)
Bite hours	06.00-18.00	31 (41.9)
	18.00-06.00	43 (58.1)
Place where the bite occured	Indoor	54 (73)
	Outdoor	20 (27)
Bite site	Upper extremity	59 (79.7)
	Lower extremity	12 (16.2)
	Face	2 (2.7)
	Trunk	1 (1.3)

Table 2. Severity of the snakebite according to the Grade 1-4 scoring system

Grade			n	%
0	no envenomation	Fang marks, minimal pain, swelling and erythema around the fang marks <2.5 cm, no systemic sypmtoms	6	8.1
I	Minimal envenomation	Fang marks, immediate pain, swelling and erythema of 2.5-15 cm during the first 12 hours, no systemic signs	67	90.5
II	Moderate envenomation	Fang marks, immediate severe pain,swelling and erythema of 15-40 cm during the first 12 hours, mild systemic signs	_	
III	Severe envenomation	Fang marks, immediate severe pain,swelling and erythema >40 cm in the first 12 hours with systemic signs	_	
IV	Very severe envenomation	Fang marks, immediate severe pain, severe systemic signs including shock and coma,	_	

toms had also one dose antivenin treatment. Neither none of the patients needed recurrent administration of antivenin nor developed complications of antivenin administration.

Discussion

Snake bite is a public health issue, particularly in rural populations with low socioeconomic level, which is often neglected. Certain factors such as climate conditions, ecological characteristics, biodiversity, geographical distribution of venomous snakes, density of human population, economic activities, and types of human dwellings affect the reported rates of snake bites in a given geographic region. Although it is not entirely known how many snake bites occur annually, estimates suggest that it occurs to 1,2-5 million people each year with up to 421 thousand to 1.8 million envenomings.[9,10]

Currently, snake bites have become an occupational disease in developing countries because automatization and mechanization of agriculture has reduced the rates of snake bites. The incidents most commonly occur accidentally from close encounter between humans and snakes when snakes have no time to flee away, are crushed inadvertently, or feel threatened. Indeed, most snake species do not exhibit aggressive behavior to humans with a few exceptions.[3,11,12]

From a demographic point of view, men are more than two times at increased risk of being bitten by a snake than women and preschool children (age 0–5) are relatively spared, although snake bites are seen at all ages.[13,14] In agreement with literature, in our study the number of male patients was higher than that of females and there were no preschool children, with the youngest victim being 7 years old (Table 1).

Snakes have a seasonal life cycle. They lose body temperature and are unable to regulate it at cold weather and hence they become stiffer, their movement ability is reduced and their metabolism slows down. Thus, they hibernate in pits, crevices to protect themselves from cold in winter. Their body temperature starts to increase with temperature rise in spring, and they return to their natural environment in summer when their metabolism is fully activated. Therefore, majority of snake bites are seen in summer months when both humans and snakes are active outdoors.[15] In a study from Southeastern Anatolia region[7] it was reported that all snake bites occurred between April and October. Another study from Diyarbakır reported that the cases were distributed between May and September.[14] Another study from Diyarbakır about reptiles indicated that people generally sleep on the roof and balcony or in the summer house because of the excessive heat between June and August, and the incidence of stings higher during this time period.[16] Similarly, we observed that all of our cases occurred between April and September. This is because the temperature ranges between 35 to 50 degrees celsius in summer, which is in compliance with snakes' seasonal pattern. We also observed that 58.1% of our cases occurred at evening or night (between 18:00 and 06:00) as mentioned in the literature (Table1).

Snake venom is composed of an admixture of pharmacologically active enzymatic and non-enzymatic protein and peptide toxins. Snake venom contains more than 20 separate enzymes. However, each snake species have a unique venom composition. The elapids predominantly contain neurotoxins while vipers secrete venoms with cytotoxic and anticoagulant / procoagulant properties and venoms of Viperidae family is usually associated with hematologic effects exerted by protease inhibitors, factor X activators, protein C activators and disintegrins. Apart from systemic effects, venoms cause local tissue damage through TNFα, phospholipase A2, and xantine oxidase mediated inflammatory response.[14,17,18]

The clinical picture following a snake bite may be either in the form of a "dry bite" where the snake is not venomous or has no chance to inject its venom, or local or systemic signs and symptoms depending on pharmacologic actions of combined effects of toxic and non-toxic components of the venom. All snake bites appear as a dry wound on skin but the snake envenomation is a dynamic process. Factors influencing the severity of snake envenomation include patient age, the bitten body region, activity of the patient after the incident, the length of the snake, the size of the venom sac of the snake, the injected venom dose and its strength, and the diffusion rate at which the venom enters general circulation. Nevertheless, identical bites may produce greatly different systemic toxicity signs depending on the patient's body mass.[4,8,19] In our study 6.8% of the patients had a dry bite at the time of admission, with 4 of them developing local symptoms during their emergency service follow-up. This shows that snake envenomation is a dynamic process.

Hands and upper extremities are the subject of snake bites in about two thirds of all incidents.[5] However, one study reported that snake bites more commonly occurred on lower extremities.[12] Although there are conflicting results in literature with regard to rates of upper and lower extremity envenomations, snake bites occur more frequently in extremities, most commonly feet, hands, and arms.[12,14] We also observed that 79.7% of snake bites occurred to upper extremities.

The local inflammation and toxicity is the earliest manifestation of a snake bite, which occurs within 5-8 minutes and includes local pain with radiation as the earliest symptom. This is followed by tissue swelling, bleeding, myonecrosis, and ultimately tissue softening due to snake venom, especially of viper family. The entire limb may be swollen and a resultant compartment syndrome may ensue.[19]

Systemic signs and symptoms following a snake bite may include tachycardia, bradycardia, arterial hypotension, shock, nausea-vomiting, sweating, abdominal pain, diarrhea, cardiac ischemia and arrhythmias, rhabdomyolysis, and acute renal failure. Especially viperidae family may cause diffuse thrombosis and bleeding all over the body owing to their venom effective on the coagulation cascade and thrombocyte functions.[20,21] Neurological manifestations caused particularly by elapidae and sometimes viperidae include cerebral hypoxia, stroke, neuromuscular disorder as a result of peripheral nerve injuries, and convulsions.[3] Almost all patients in our study had local signs specific to Grade I (pain, erythema, edema, tingling, numbness) but none had systemic signs.

The treatment process should preferentially begin with an assessment of the severity of poisoning in conjunction with a clinical staging using vital signs at admission (blood pressure, pulse rate, number of respiration), local tissue signs, presence of systemic signs and laboratory data.[3,22]

Routine tetanus immunization is recommended. A major compli-

cation of snake bites with local effects is soft tissue infections that result from extensive tissue destruction and necrosis as a result of the proteolytic properties of the venom. This creates tendency to local infections from snake's oral flora. Despite the fact that bacteria frequently cause wound infection following snake bites, the benefits of prophylactically given antibiotics is still controversial. Even so, wide-spectrum antibiotics effective against S.Aureus and anaerobes can be used prophylactically to prevent colonization, although such a practice is doubted in Grade 0 and 1.[3,22,23]

The cornerstone of the treatment of snake bite envenoming is antivenoms of animal origin. These agents are produced by immunization of certain animals, most commonly horses, with venom of a single or multiple medically-relevant snake species. This therapy has substantially reduced mortality rate of snake envenomations but since it is also associated with certain complications and side effects, it should be used only in patients with systemic signs of envenomation. In severe cases, antivenoms are vital. Repeated doses may sometimes be required owing to delayed absorption of the venom from the bite site to general circulation, a condition called recurrent envenomation.[3,24] There are three commercially available antivenoms in Turkey: (i) "European Viper Venom®" (Intervax Biological Ltd., Toronto, Zagreb, Croatia), (ii) "Pasteur Ipser Europe®" (Pasteur Merieux, Lyon, France) and (iii) "Polyvalent Snake Venom Antiserum®" (Vacsera, Giza, Egypt).[5]

The affected limb should be absolutely brought under close monitorization to decrease the severity of tissue necrosis. The diameter of the affected extremity below and above the level of snake bite site should be measured every 15 minutes until swelling vanishes. Serial measurement of compartment pressures may prove useful against development of compartment syndrome. In case of tissue necrosis, debridement is indicated; however, fasciotomy is only rarely required.[35]

Symptomatic treatment of snake bite victims include antiemetics and antihistaminics; hemorrhage fresh frozen plasma, cryoprecipitate, and platelet infusions may be used; hypotensive patients are treated with crystalloids and/or vasopressors; pain management include non-steroidal anti-inflammatory drugs; muscle spasms and seizures require calcium gluconate. In such patients adequate respiration should be maintained.[20]

Conclusion

As the rest of the world, snake bites are also a major public health problem in Turkey with regard to their mortality and morbidity risks. Management of these medical emergencies requires a multidisciplinary approach. Particularly emergency care physicians should be familiar with but most importantly excel in the management of snake bites.

Competing interests

The authors declare that they have no competing interests.

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