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RESEARCH ARTICLE

Management of Poisonous Snake Bites: Analysis of 29 Cases

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ABSTRACT

Objectives: The objective of this retrospective study is to provide contribution for management of the poisonous snake bites by comparison results of this study with the literature data.

Patients and Methods: This study retrospectively analyzed the demographic and epidemiologic characteristics of 40 patients who presented due to snake bites. 29 patients were included in this study. Patients' age, sex, month of admission, duration of follow-up in the emergency room, laboratory outcomes, the regions of snake bite, number of the bites, local and systemic symptoms, and treatment received were assessed. Patients aged under 18 years were excluded from the study. Also patients were excluded if the snakes were not seen after the patients were bitten or if they developed no local or systemic symptoms within four hours after the bite. In addition, patients in whom adequate data could not be obtained were also excluded from the study.

***Results*:** Out of the 29 patients included in this study, 15 (51.7%) were females. When the patients were examined according to local and systemic findings; local symptoms were observed in 18 patients (62.1%) and systemic symptoms in 11 patients (37.9%). There was a positive correlation between elevated ALP and diffuse edema in the bite area and hypotension findings. When durations of hospitalization were analyzed, the mean duration of hospitalization was 2.3±1.5 days.

Conclusion: We believe that, symptomatic and supportive treatment could be sufficient in majority of the patients with snake bites in our region, and a low dose antiserum therapy would be reasonable when antiserum is needed.

Keywords: snake bite, antivenom, treatment

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INTRODUCTION

According to the World Health Organization (WHO) approximately 50.000 persons die every year from snake bites [1]. There are 40 species of snakes in Turkey. These snakes are from the familia viperidae, colubridaea, and boidae. The most common species seen in our region are Viper ursinii, Vipera xanthina, and Dolichophis jugularis [2,3].

If no local or systemic symptom is developed within 4 hours after the snake bite, it can be said that the snake is non-poisonous or the bite is a "dry bite" [4]. Local symptoms occurring due to snake bites include regional pain, swelling, edema, change of the skin color, bulla, and skin necrosis. Systemic symptoms include more serious findings such as discomfort, sweating, numbness around the mouth, diffuse edema, abdominal pain, nausea/vomiting, hypotension, changes in heart and respiratory rates, regional lymphadenopathy. Hemorrhage, disseminated intravascular coagulation (DIC), muscle fasciculations, acute renal failure (ARF), somnolence, shock, respiratory distress, convulsion and mortality may be seen in severe cases [5].

Snake venoms include non-enzymatic peptides, hydrolytic enzymes, organic and inorganic particles [6,7]. Hydrolytic enzymes in the snake venoms such as phosphatases, proteases, phospholipase A2 are known to cause both local and systemic

effects. Toxinologists does not show sufficient interest to these enzymes, because they assume that they are only take place in digestion and are not harmful. However, after the discovery that hydrolytic enzymes are endogenously released purines that act like multitoxin, there is them a new interest among toxinologists, recently [6,7]. Purines are thought to increase paralysis and hypotension through purine receptors in individuals who are bitten by poisonous snakes [7,8].

In this study, we aimed to provide contribution to the literature in management of the snake bite cases by analyzing demographic and clinical characteristics and laboratory outcomes of the snake bite cases occurring in our region.

PATIENTS AND METHODS

This study retrospectively analyzed the demographic, epidemiologic and clinic characteristics of 40 patients who presented to our emergency department due to snake bites between 1 January 2013 and 31 December 2015. 29 patients were included in this study. Patients' age, sex, month of admission, duration of follow-up in the emergency room, laboratory outcomes, the regions of snake bite, number of the bites, local and systemic symptoms, and treatment received were assessed. Our hospital was located in Aydin province in the western region of Turkey. The population of the province is 1,050,000. Patients aged 18 years and over who presented at the ED for treatment due to snake bite were included in the study. Because patients younger than 18 years of age were taken to the pediatric ED for treatment, they were excluded from this study. Patients were also excluded if the snakes were not seen after the patients were bitten or if they developed no local or systemic symptoms within four hours after the bite. In addition, patients in whom adequate data could not be obtained from the files were also excluded from the study. Following taking the medical histories, the patients were monitored, their physical examinations were completed. This study was approved by the institutional review board. (Number and date: 2016/751-213/15.01.2016.).

Statistical Analysis

Descriptive statistics for categorical variables were stated as number (n) and percentage (%). The Chi-square test was used to compare data between groups. The fit of continuous variables to normal distribution was assessed using the Kolmogorov-Smirnov test. Descriptive statistics were stated as median values (25–75%), as none of the variables conformed to normal distribution. The Mann Whitney U-test was used for group comparisons. Intergroup differences were analyzed using Fisher's test or Chi-square test based on the nature of the data. A p value <0.05 was considered statistically significant.

RESULTS

Forty patients were analyzed during the study for two years. Eight patients who presented with a claim of snake bite, but had no any teeth mark detected in the physical examination, and did not develop any local or systemic symptom were excluded from the study. In addition, 3 patients were excluded due to missing data. Out of the 29 patients included in this study, 15 (51.7%) were females. The mean age of the patients was 42.4±16.2. Considering months of the admission, the most common presentations were made in June by 8 (27.6%) cases, and the least by only each one case in March and October (3.4%). Of all patients, five (17.2%) presented from the province center, 14 (48.3%) from the districts, and 10 (34.5%) from the villages. Patients who presented from the province center were younger than those admitted from the villages, and the difference was statistically significant (p=0.034) (Table 1).

Table 1. Sociodemographic characteristics of snake bite patients

Patient characteristics		n (%)
Gender		
	Female	15 (51.7%)
	Male	14 (48.3%)
Age		42.4±16.2
Months		
	January	0 (0%)
	February	0 (0%)
	March	1 (3.4%)
	April	2 (6.9%)
	May	5 (17.2%)
	June	8 (27.6%)
	July	3 (10.3%)
	August	5 (17.2%)
	September	4 (13.8%)
	October	1 (3.4%)
	December	0 (0%)
Site		
	Province	5 (17.2%)
	District	14 (48.3%)
	Village	10 (34.5%)

Regions of the snake bite were found as upper extremity in 16 (55.2%), lower extremity in 8 (30.6%), trunk in one (3.4%) patient, and head/neck in three (10.2%) patients. There were multiple bites in 1 (3.4%) patient. Bite marks were observed in 28 (96.6%) of all bites. 1 (3.4%) patient presented with the complaint of being bitten from within the mouth, but no teeth mark was observed (Table 2).

When patients were examined in terms of local and systemic symptoms; local findings were observed in 18 (62.1%) and systemic findings in 11 (37.9%) patients (Figure 1 and Figure 2). Whereas snake antiserum with symptomatic and supportive treatments were administered in 5 (17.2%) patients, only symptomatic and supportive therapies were needed in 24 patients (82.8%). As the symptomatic and supportive therapies; avil+dekort were given to 25 (86.2%)

Table 2. Clinical and treatment characteristics of snake bite patients

Patient characteristics		n (%)
Average length of stay / day		
	Antivenom applied	3.0±2.5
	Antivenom not applied	2.2±1.3
Site of bite		
	Upper extremity	16 (55.2%)
	Lower extremity	8 (27.6%)
	Head & Neck	3 (10.2%)
	Trunk	1 (3.4%)
	Multiple site	1 (3.4%)
Findings		
	Local findings	18 (62.1%)
	Systemic findings	11 (37.9%)
Treatment		
	Only symptomatic and supportive therapies	24 (82.8%)
	Antivenom	5 (17.2%)

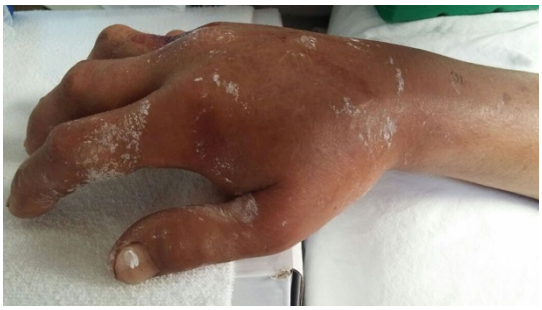

Figure 1. Redness, bruising and edema due to venomous snake bite on the hand

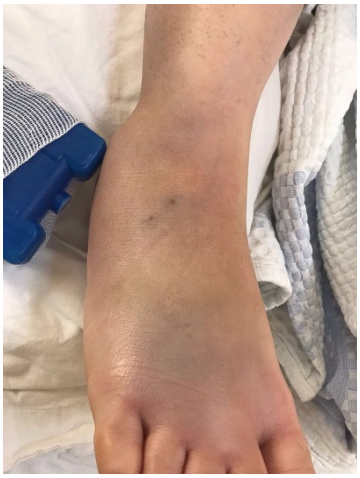

Figure 2. Redness, bruising and edema due to venomous snake bite on the foot

patients, antibiotics to 12 (41.4%) patients, fresh frozen plasma to 1 (3.4%) patient, tetanus shot, analgesics, cold application and elevation in the bitten extremity were administered in all patients. Of the 5 patients who received antivenom; 2 vials were applied in one (3.4%) patients, 4 vials in two (6.9%) patients, 5 vials in one (3.4%) patient, and 9 vials of antivenom were administered in one (3.4%) patient. When laboratory values were examined; white blood cell count was high (3.8-10^{33}/ µL) in 26 (89.6%) patients, hemoglobin was low (11.2-15.7gr/dL) in 3 patients (10.2%), platelet count was low (160-450 thousand) in 1 patient (3.4%), glucose was high (70-105 mg/dL) in 16 (54.4%) patients, and INR was long in 2 patients (6.9%). According to our results, diffuse edema was statistically ahead of the other findings for initiation of antiserum (p=0.003). When laboratory values were compared among the patients with diffuse edema, elevated alcaline phosphatase (ALP) was statistically significant (p=0.022). We found a positive correlation between elevated ALP, and tension findings (P=0.029).

Considering durations of hospitalization; the mean duration of hospitalization was found as 2.0 (1.0-3.0) days in our patients. Whereas, durations of hospitalization were found as 2.0 (1.0-3.0) and 3.0 (2.0-4.0) days in the patients with local and systemic symptoms; respectively. Duration of hospitalization was longer in the patients who received antivenom compared with the patients who did not receive 3.0 (1.0-5.0) vs 2.0 (1.0-3.0) days. Our the longest duration of follow-up was 7 days.

DISCUSSION

Studies conducted in Anatolia have reported that, 15 venomous snake species (14 belonging to the family Viperidae) live in Anatolia [9]. Most of the venomous snake species in our country are the members of familia Viperidae [3]. Viperidae mostly lead to hematotoxic effects and local poisoning findings.[4] Hypotension, thrombocytopenia, muscle fasciculations, cardiac dysfunction and rhythm disorders, ARF, DIC or shock might be seen in serious poisonings [10,11]. The most common surgical complication due to snake bite is local skin necrosis. The incidence of necrosis is 10% on average [12]. Although 90-98% of the bitten areas are the extremities, the most dangerous area of the bite is head and neck [13,14]. In a study by Altun et al. with 25 patients; 13 patients were bitten from the upper extremities, 10 from the lower limbs, and 2 from the neck region. Four patients developed cellulitis, nine soft tissue necrosis, and two hand finger amputation, while no mortality was seen [15]. In a study by Büyükbebeci O. et al. nine of 12 patients were bitten from the upper extremities, and three from the lower extremities. One patient developed thrombocytopenia, four compartment syndrome, four soft tissue necrosis, and one total necrosis, while one patient died [16]. Viper xanthina species of the vipers were responsible from the venomous snake bite cases in our study. Sixteen of our patients were bitten from the upper extremity, eight from the lower extremity, one from the trunk and three from the head/neck region. There were multiple bites in one

patient. Local symptoms were seen in 62.1% and systemic symptoms in 37.9% of our patients. None of our patients developed compartment syndrome, tissue necrosis and mortality. One reason of the low rate of serious complications in our study is the species living in our region being less venomous than the species living in south and south-eastern regions of our country, and another reason is that no problem was encountered in availability of antiserum in our clinic, and antivenom therapy was efficiently used by our clinic.

Thrombocytopenia, leukocytosis, glucosuria, proteinuria, and prolongation in prothrombin time and partial thromboplastin time may be seen due to the procoagulant impact of the toxin. This has been associated with poor prognosis and mortality [17]. Leukocytosis is a commonly seen finding in snake bites [18]. In the study by Açıkalın et al. the average thrombocyte score was found to be low, PT was longer than 18 seconds, and APTT than 45 seconds in 7 patients [19]. When laboratory values were examined; white blood cell count was high in 89.6%, hemoglobin was low in 10.2%, platelet count was low in 3.4%, glucose was high 54.4%, and INR was long in 6.9% of our patients. We attributed a part of these laboratory changes to the stress and inflammatory response of the body, and the other part of the impact of the snake toxins. Laboratory values returned to normal in all of our patients with antivenom and/or supportive treatment.

Phosphatases are enzymes, which non-specifically hydrolyze phosphate esters. Uzawa defined for the first time the presence of non-specific phosphatases in snake venoms [20]. ALP seems to be more widespread and large amount in snake venoms than acid phosphatases [21,22]. ALP activity has been examined among a wide variety of snake toxins and found to be distributed ubiquitously [6,23]. Hydrolytic enzymes including proteases, phosphatases, nucleases and nucleotidases, are all ubiquitously found in almost all snake venoms, and they are responsible for local tissue damage, leading to necrosis, hemorrhage, and edema [6,24,25]. ALP level was high in 79.3% of our patients, and according to our results, diffuse edema was found in all patients in whom snake antiserum was initiated, and diffuse edema was statistically ahead of the other findings for initiation of snake antiserum (P= 0.003). It could be reasonable to more closely monitor the patients with a high level of ALP who did not develop diffuse edema yet, in terms of the development of severe local and systemic symptoms.

In the past, it has been estimated that mortality from venomous snake bites approached 25%. Today, mortality rates are <0.5%, and approximately five deaths occur per year because of the availability of antivenom, and advances in emergency and critical care [26]. In a study by Gold BS et al. determining indications of snake antiserum; it was stated that antivenom should be administered in the patients with systemic poisoning symptoms or severe local tissue reaction [27]. Initial dose of snake antiserum is reported as 5 to 10 vials in the publications from the America and Asia [28,29], while this dose is recommended as 2 vials in the reports from the Europa and our country and it is recommended that it should be increased when necessary based on the general status of the patient [3,30]. Roberts et al. formed a staging system and this system facilitated management of snake bites [31]. Roberts and Otten proposed the use of 4 to 10 vials for patients with moderate-envenomation and 10 to 40 vials of antivenom for severe-envenomation [31]. Scharman et al. developed the clinical staging system with four gradual and recommended the use of 0 to 4, 5 to 9, 10 to 15, and 15 or more vials of antivenom for stage 0, stage 1, stage 2, and stage 3 patients; respectively [32]. Açıkalın A et al. did not use antivenom in stage 1 patients, however they were used about 2.7 and 4.9 vials of antivenom in stage 2 and in stage 3 patients, respectively. Açıkalın A et al. reported that, a complete recovery was observed with low-dose antivenom treatment in all patients. Their study suggested that there was no significant difference between low and high dose antivenom treatment in snake bites [21]. In our clinic, we administer only symptomatic and supportive therapy to stage 1 patients, and we started the treatment with 2 vials antiserum in stage 2 patients and 4 vials antiserum in stage 3 patients as the initial dose. We repeat the antiserum dose if necessary. We apply symptomatic and supportive therapy in addition to antiserum in stage 2 and 3 patients. In this study, none of the patients developed complication and all of our patients were discharged with full recovery.

CONCLUSION

According to our results, we believe that symptomatic and supportive treatments are sufficient in majority of the patients in the cases of snake bite in our region for reducing both the costs and adverse effects of antivenom treatment. We recommend to initiate the treatment with a low dose antiserum (2 vials) when antiserum is needed and to administer additional doses in the cases where the desired treatment outcomes could not be achieved. Furthermore, we believe that elevated ALP levels in the cases of venomous snake bites, could warn the clinician for progression of the local symptoms to more serious findings.

Limitations of the Study: The main limitation of this work is single-centered study and retrospectively analyzed. Also our study was relatively small number of participants and scope of a certain period.

Declaration of interest: The authors report no conflicts of interest.

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