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Cases with periodic increase: Approach to snakebites in plastic surgery

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Ethics Committee Approval
This study was approved by the Kahramanmaras Sutcu Imam University Medical Research Ethics Committee, date: June 20, 2023 and number: 05. All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

Conflict of Interest
No conflict of interest was declared by the authors.

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Abstract

Background/Aim: Snakebite injuries are common in rural areas, particularly among individuals involved in outdoor activities. In Kahramanmaras, Turkey, snakebites may be considered an occupational hazard, especially for cotton pickers.
Methods: This retrospective case series includes 20 snakebite patients who were consulted by the Department of Plastic, Reconstructive, and Aesthetic Surgery at Kahramanmaras Sutcu Imam University Hospital. Patient data were collected retrospectively between 2020 and 2022.
Results: The majority of the patients were male (60%, n = 12), while 40% (n = 8) were female. The mean age of the patients was 38.15 years. The mean D-dimer level was 16.02 units, with a range of 1.12–80 units. The mean platelet count was 175,220/µL, with a range of 65,000–325,000/µL. Upper limb involvement was the most common, observed in 65% of cases, compared to 35% with lower extremity involvement. In 60% of the cases, relaxation incisions were performed, while 40% of the patients were managed conservatively. The mean duration of ICU stay and hospitalization in the plastic surgery ward were 3.7 days and 3.55 days, respectively. Two patients developed complications other than scarring: One developed subclavian vein thrombosis, and another developed finger bone necrosis requiring amputation.
Conclusion: Snake venom contains a variety of enzymes and toxins that cause not only local tissue damage but also systemic effects. In cases of snakebite, a multidisciplinary approach is essential—beginning with field management and involving a team that includes emergency physicians, internal medicine specialists, anesthesiologists, psychiatrists, and plastic surgeons—to address both the physical and psychological needs of the patient. Importantly, early surgical consultation can help prevent severe complications.

Keywords: snake bite, compartment syndrome, fasciotomy

Introduction

Snakebite injuries are common in rural areas, particularly among individuals involved in outdoor activities. In Kahramanmaras Province, Turkey, cotton, along with corn and vines, are major agricultural crops. Many villagers work as cotton pickers, making snakebites a potential occupational hazard for both the workers and their children. Complications from snakebite injuries can include cellulitis, local gangrene, bleeding manifestations, regional lymphadenopathy, compartment syndrome, and other systemic effects [1,2].

This study is a retrospective case series of 20 patients with snakebite injuries who were referred to the Department of Plastic, Reconstructive, and Aesthetic Surgery at Kahramanmaras Sutcu Imam University Hospital, Kahramanmaras, Turkey. The aim of this study was to investigate specific risk factors, relevant biomarkers, the extent of limb involvement, duration of hospitalization in the intensive care unit (ICU) and general ward, and the incidence of secondary compartment syndrome among these patients.

Materials and methods

After obtaining ethical approval from the Kahramanmaras Sutcu Imam University Medical Research Ethics Committee (Session No: 2023/07, Decision No: 05), data from all patients who were consulted by the Plastic Surgery Department were collected retrospectively between 2020 and 2022. All procedures were conducted in accordance with the ethical standards of the Institutional Research Committee and the principles outlined in the Declaration of Helsinki. Written informed consent was obtained from each patient prior to enrollment.

The primary assessment included measurement of vital signs and examination of the bite wound. Injury sites were cleaned and dressed with sterile gauze by emergency department physicians. All patients were evaluated for tetanus immunization status and vaccinated accordingly. Hemodynamic and biochemical parameters were closely monitored. Antivenom therapy was administered according to the Turkish Ministry of Health protocol. Patients were consulted by the Plastic Surgery Department both during initial assessment and after ICU admission. Evaluation for the need for emergency fasciotomy was primarily based on clinical examination, focusing on the six classic signs of compartment syndrome (the 6 Ps): pain, paresthesia, pallor, paralysis, perishing cold, and pulselessness, along with the ability to perform a pinch test. Notably, there were no mortalities among the patients included in this series.

Case Series

Case 1

A 63-year-old male was snake bitten in the fifth metacarpal bone of the right hand in September 2020. On presentation, platelet count was 77,000/L, and D-dimer measured 59.91 units. An emergency fasciotomy was performed (Fig. 1), and the patient was followed up in the ICU for three days. Subsequently, he was referred to the inpatient plastic surgery ward for further follow-up and reconstruction where he was hospitalized for nine days. Negative pressure wound therapy (NPWT) and approximation sutures (Fig. 1) were used to decrease wound tension before closing the wound by primary suturing.

Figure 1: Snakebite in the fifth metacarpal bone of the right hand

Case 2

A 67-year-old male was snake bitten in the index finger of the right hand in August 2020. On presentation, his platelet count was 131,000/L and D-dimer measured 2.12 units. Emergency fasciotomy was performed (Fig 2), and the patient was followed up in the ICU for two days. Afterwards, he was referred to the plastic surgery ward for further follow-up and reconstruction where he was hospitalized for 11 days. He received daily paraffin dressings and tangential debridement before the wound was closed by primary suturing before discharge.

Figure 2: Snakebite in the index finger of the right hand

Case 3

An 11-year-old male was snake bitten in the medial area of the lower third distal section of the left leg in September 2020. On presentation, his platelet count was 97,000/L, and his D-dimer measured 4.74 units. Emergency fasciotomy was performed. The patient was followed up in the ICU for three days and subsequently was referred to the inpatient plastic surgery ward for further follow-up and reconstruction. He was hospitalized for ten days where NPWT and approximation sutures were used to decrease the wound tension before closing the wound by primary suturing (Figure 3).

Figure 3: Snakebite in the medial aspect of the distal third section of the left leg

Case 4

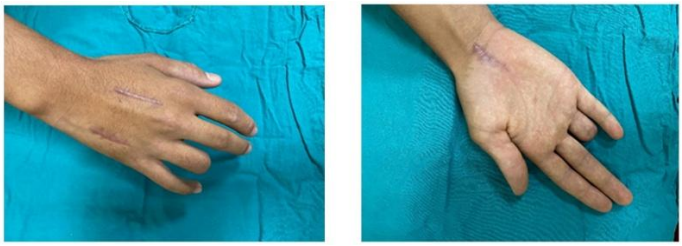
A 14-year-old female was snake bitten in her left medial malleolus in August 2020. On presentation, her platelet count was 135,000/L, and her D-dimer measured 11.06 units. Emergency fasciotomy was performed, and the patient was followed up in the ICU for 13 days. She was then referred to the inpatient plastic surgery ward for further follow-up and reconstruction where she was hospitalized for four days. NPWT was used to decrease wound tension before closing the wound by primary suturing (Figure 4).

Figure 4: Snakebite in the left medial malleolus

Case 5

A 14-year-old male was snake bitten on the ring finger of the right hand in July 2020. On presentation, his platelet count was 216,000/L, and his D-dimer measured 2.10 units. Emergency fasciotomy was performed. The patient was followed up in the ICU for seven days and then referred to the inpatient plastic surgery ward for further follow-up and reconstruction. Total necrosis of the intermediate and distal phalanges was detected and amputation was performed; one day later he was discharged (Figure 5).

Figure 5: Snakebite in the ring finger of the right hand



Case 6

A 13-year-old male was snake bitten in the right medial malleolus in September 2020. On presentation, his platelet count was 186,000/L, and his D-dimer measured 2.03 units. Emergency fasciotomy was performed. The patient was followed up in the ICU for six days and subsequently was referred to the inpatient plastic surgery ward for further follow-up and reconstruction where he was hospitalized for one day (Fig 6).

Figure 6: Snakebite in the right medial malleolus

Results

According to the data collected from our sample, the majority of patients were male (60%), while 40% were female. The mean age of the 20 patients was 38.15 years (SD: 23.69). Adult patients outnumbered pediatric patients (Chart 1).

The mean D-dimer level was 16.02 units (SD: 24.23); two patients were excluded from this calculation due to missing or invalid data. The mean platelet count was 175,220/µL (SD: 70,140). Thrombocytopenia, defined as a platelet count below 150,000/µL [2], was present in eight patients upon admission.

Upper limb involvement was more common than lower limb involvement (65% vs. 35%). Relaxation incisions were performed in 60% of cases, while the remaining 40% were managed conservatively (Chart 2).

The mean duration of ICU hospitalization was 3.7 days (SD: 2.77), and the mean length of stay in the plastic surgery ward was 3.55 days (SD: 5.00). Details, including case number, age, gender, affected limb, presence of relaxation incision, complications, and month of presentation, are summarized in Table 1. The highest number of cases occurred in August, with most cases presenting during the summer and autumn months (Chart 3). It is important to note that only descriptive statistics were applied in this analysis; no formal statistical comparisons were conducted.

Chart 1: The proportion of age groups

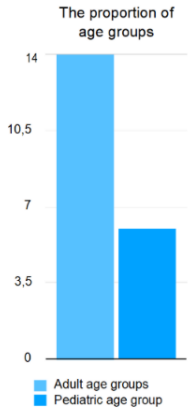


Chart 2: Treatment approach of cases

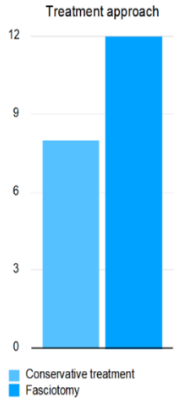
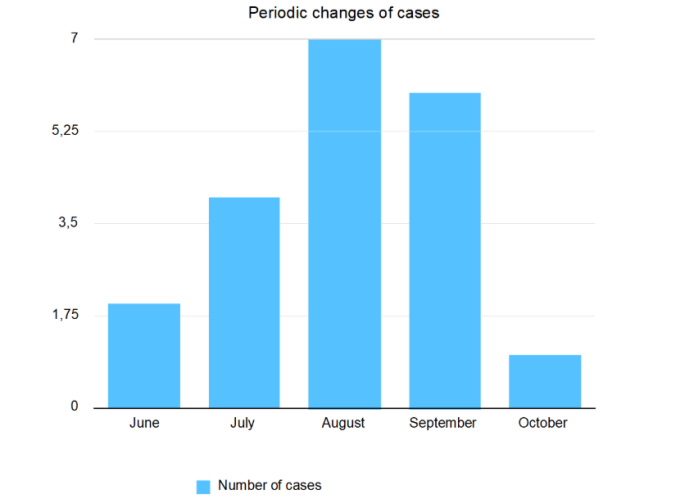


Table 1: Details about cases

Case no	Age	Gender	Affected limb	Treatment method	Additional intervention	Month	Complication
1	63	male	Upper extremity	Relaxation incision	NPWT followed by primary closure	Sept 2020	None
2	67	male	Upper extremity	Relaxation incision	Necrotic tissue debridement followed by primary closure	Aug 2020	None
3	35	female	Upper extremity	Relaxation incision	Necrotic tissue debridement followed by primary closure	Aug 2020	None
4	49	female	Upper extremity	Relaxation incision	Primary closure	Sept 2020	Subclavian vein thrombosis
5	11	male	Lower extremity	Relaxation incision	NPWT and approximation sutures followed by primary closure	Sept 2020	None
6	14	male	Upper extremity	Relaxation incision	Primary closure	Aug 2021	None
7	14	female	Lower extremity	Relaxation incision	NPWT followed by primary closure	Aug 2020	None
8	14	male	Upper extremity	Relaxation incision	Finger amputation	July 2020	Finger amputation
9	92	female	Upper extremity	Relaxation incision	Primary closure	Aug 2021	None
10	13	male	Lower extremity	Relaxation incision	Primary closure	Sept 2020	None
11	42	male	Upper extremity	Conservative follow- up	PRF	July 2021	None
12	42	female	Upper extremity	Conservative follow- up	Necrotic tissue debridement, NPWT,PRF followed by reconstruction with ingunal flap	Sept 2021	None
13	47	male	Upper extremity	Relaxation incision	polyhexanid gel dressings followed by primary closure	Oct 2021	None
14	62	female	Lower extremity	Conservative follow- up	polyhexanid gel dressings	July 2022	None
15	3	female	Lower extremity	Relaxation incision	Primary closure	Aug 2022	None
16	24	male	Upper extremity	Conservative follow- up	polyhexanid gel dressings	June 2022	None
17	19	female	Lower extremity	Conservative follow- up	polyhexanid gel dressings	July 2022	None
18	42	male	Upper extremity	Conservative follow- up	polyhexanid gel dressings	Aug 2022	None
19	57	male	Lower extremity	Conservative follow- up	polyhexanid gel dressings	Sept 2022	None
20	53	male	Upper extremity	Conservative follow- up	polyhexanid gel dressings	June 2022	None

Chart 3: Periodic changes of cases



Discussion

In Kahramanmaras Province, the number of snakebites reported to our clinic is likely lower than the actual incidence, as many individuals initially opt for traditional remedies before seeking medical care. In the present case series, we report 20 snakebite cases referred to the Plastic Surgery Department.

Montivipera albizona is a mountain viper endemic to Kahramanmaras, which was first described by Nilson et al. (1990; originally as Vipera albizona) based on two specimens from the Kulmac Mountain Range, near the "Anatolian Diagonal" [1]. However, identifying the snake species in bite cases is often not feasible, so all bites should be managed as venomous due to the high potential for serious complications.

Snakebites primarily affect the working population in rural areas, with children and the elderly at higher risk of mortality. Nevertheless, such incidents have been increasingly reported in developed regions as outdoor leisure activities become more popular [2]. Snakebites typically involve the extremities, with upper limbs more commonly affected than lower limbs [3].

Once venom is injected, patients may experience intense pain, numbness, swelling, and hemolysis in the affected limb. Significant swelling can cause vascular compression, potentially leading to compartment syndrome. The capillary leak induced by venom results in plasma and red blood cell extravasation, causing ecchymosis and tissue edema. Although various classification systems for snakebites are commonly used in emergency departments for initial evaluation, a standardized algorithm specifically guiding fasciotomy decisions is lacking [4]. In this study, we aimed to investigate potential risk factors, relevant biomarkers, the extent of limb involvement, durations of ICU and ward stays, and the proportion of patients who developed secondary compartment syndrome.

In adults compartment pressure higher than 40 mmHg is considered a clear indication for surgical intervention [2]. When pressure measurement is unavailable, clinical signs of compartment syndrome remain the best guide, though ischemic signs—aside from severe pain—are considered late indicators and should not delay the intervention [5]. If left untreated, compartment syndrome can lead to neurovascular compromise, tissue necrosis, and may ultimately result in limb amputation or, in severe cases, death [6].

Systemic and local complications of snakebites can include acute kidney injury, osteomyelitis, myositis, chronic wound infections, muscle and tendon contractures, and physical deformities that may require reconstructive surgery. In our series, one patient developed subclavian vein thrombosis, and another developed necrosis of the intermediate and distal phalanges, resulting in amputation [7,8]. Korambayil et al. [9] described three tissue zones at the bite site: a central zone of envenomation with potentially irreversible damage, an intermediate zone where tissue may recover if inflammation is controlled, and an outer zone of minimally injured tissue susceptible to secondary damage.

Previously, wound incisions and suction were believed to help remove venom, but current evidence shows that this approach worsens patient outcomes, and it is no longer recommended [10]. Instead, relaxation incisions can aid in pressure relief and venom drainage, enhancing lymphatic and venous return; in our series, relaxation incisions were performed in 60% of cases [5]. Empirical antibiotic therapy—such as a combination of amoxicillin/clavulanate and ciprofloxacin—is recommended to reduce infection-related complications [10,11]. Postoperative healing may be improved with adjunctive treatments like negative pressure wound therapy (NPWT), hyperbaric oxygen therapy (HBO), and platelet-rich fibrin (PRF) [9]. Once compartment pressures normalize, wound closure can be achieved through primary suturing or reconstructive techniques.

Conclusion

In conclusion, snakebite incidents peak during the summer season, particularly in August. The majority of affected individuals are adults, with males being predominantly affected—likely due to the occupational and outdoor activities common in the Eastern Mediterranean population. Snake venom components cause not only local tissue destruction but also systemic effects. Therefore, effective management of snakebites requires a multidisciplinary approach, starting with pre-hospital care and continuing through specialized hospital treatment. Care teams should ideally include emergency physicians, internists, anesthesiologists, psychiatrists, and plastic surgeons to address both physical and psychological consequences. Importantly, early surgical consultation can help prevent serious complications.

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