

BRIEF REPORT

Long-Term Complications of Rattlesnake Bites: A Telephone Survey From Central California

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Objective.—The purpose of this institutional review board-approved, cross-sectional study was to identify residual symptoms and signs of envenomation reported by snakebite survivors via a telephone survey.

Methods.—Victims of rattlesnake bite who were treated at a single hospital center during a 10-year period were contacted through a telephone survey. Study subjects were included through a diagnosis-based retrospective chart review of snakebite victims, and excluded if they did not receive rattlesnake antivenom. Data collection was done using a standardized form that included sections about residual, recurrent, or new pain, weakness, paresthesias, or other limitations of the bitten limb.

Results.—We identified 46 snakebite cases including 5 of 46 “dry” bites. The remaining cases (41 of 46) all received Crofab. Interviews were completed for 31% of these patients (13 of 41), and the remainder were lost to follow-up. Most bites occurred in men (12 cases, 92% males) and on the arms (9 cases, 69%). Six of the 13 respondents (46%) reported residual symptoms from the bite. Persistent symptoms described included localized pain at the bite site (3 cases), numbness or paresthesias (2 cases), abnormal skin peeling and discoloration at the bite site (2 cases), and persistent weakness of the bitten extremity (1 case). Among patients reporting persistent symptoms, the bite-to-survey interval ranged from 7 months to 12 years, with a median interval of 4 years.

Conclusions.—Our study population demonstrated a notable incidence (43%) of self-reported persistent symptoms related to their rattlesnake bites, although the overall level of disability from these injuries seems low.

Key words: snakebite, long-term complications, reflex sympathetic dystrophy, complex regional pain syndrome, envenomations, central California

Introduction

In the United States, snakebites are a commonly encountered form of environmental trauma with approximately 10,000 bites annually presenting to emergency departments.¹ The majority (98%) of venomous snakebites, at an estimated incidence of 4500 envenomations per year, arise from the family Crotalinae.¹ Although there are 10 different kinds of rattlesnakes found in California (7 species, 2 of which have subspecies), the predominant species found in the great central valley of California is *Crotalus oreganus*, the Northern Pacific Rattlesnake.²

Many published reports focus on the management of venomous snakebite or the short-term morbidity related to such injuries. Long-term sequelae related to snakebite are less well defined in the literature. A study conducted

by Cowin et al³ found that patient-reported sequelae at 1 to 3 years after snakebite ranged from 30% to 70%. After a detailed review of the relevant literature, it appears that our report may be the first and only one available outlining long-term complications of snakebite. Our aim was to identify residual symptoms and signs of envenomation reported by snakebite survivors via a telephone survey in central California by performing a 10-year retrospective review of envenomation cases presenting to a tertiary-care, level-1 trauma center.

Methods

Data collection and study design were approved by the authors' institutional review board. A retrospective chart review of victims of rattlesnake bite who were treated at our medical center during the 10-year period was performed, and these patients were subsequently contacted through a telephone survey.

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STUDY SITE AND PATIENT POPULATION

The study population consisted of all snakebite victims seen and treated with a crotaline antivenom, during the study period of 2000 to 2010, at our tertiary-care medical center. Dry or minor bites were excluded as they could have been caused by a misidentified snake (ie, gopher snake), and this study aimed to focus on the long-term complications of crotaline envenomation. Subjects were excluded if they did not receive rattlesnake antivenom, or sustained snakebites by nonvenomous or non-Crotalinae species.

RETROSPECTIVE DATA COLLECTION

For the chart review, patients were identified using 2 methods to ensure all study subjects would be included over a period during which written records were replaced by electronic recordkeeping systems. First, all snakebite victims were identified by review of medical records using the *International Classification of Diseases, Ninth Revision* (ICD-9) codes E905.0 (“venomous snake and lizard bites”) and 989.5 (“toxic effect of venom”) between 2000 and 2010. Secondly, our electronic pharmacy database was queried to identify all cases in which antivenom was dispensed in the emergency department. The investigators analyzed each chart to ensure the accuracy and completeness of these diagnostic codes, as well as to eliminate redundancy in patient selection using these search methods.

All cases were deidentified, and patients were assigned a unique numerical identifier to protect identity for initial chart review. Data abstracted included patient age, sex, comorbid conditions, serum laboratory values, total doses of antivenom, and length of hospital stay. Antivenom was provided based on the treating provider’s judgment regarding the presence of significant envenomation or a coagulopathy of clinical concern. A grading system was not consistently used or documented by providers. The trends and results of this chart review have been previously published.⁴

TELEPHONE SURVEY

The investigators were blinded to the historical details of each patient’s care when performing the interview, for which they were given only name and contact telephone information. If patients verbally consented to the telephone questionnaire, survey data collection was done using a standardized form, which included sections about residual, recurrent, or new pain, weakness, paresthesias, or other limitations of the bitten limb (Table). Spanish-language speakers were interviewed by a native Spanish

speaker. The only languages encountered were English and Spanish.

Results

There were 46 snakebite cases admitted during the study period. All cases were from crotaline envenomations from wild snakes. The species is presumably *C. oreganus*, given the natural ranges of rattlesnake species found in California.² Of the 46 cases, 5 were dry bites, and the remaining cases (41 of 46) all received Crofab antivenom based on the treating provider’s judgment. This correlated to a dry bite rate of 11% in the study population. Overall, there was both a male (83%) and an adult (90%) predominance, with only 4 pediatric patients (ages 4, 10, 17, and 17 years). Upper-extremity bites were more common, comprising more than three fourths of all bites (32 of 41 upper vs 10 of 42 lower extremity). One patient sustained bilateral bites to the hands. There was no sex difference in the proportion of bites to the upper extremities (females sustained bites 5 of 7 (71%) to the upper extremities, males sustained a similar proportion 26 of 35 (74%) to the upper extremities). There were no surgical interventions in our study group.

Interviews were completed for 32% of these patients (13 of 41), and the remainder were lost to follow-up. Six of the 13 respondents (46%) reported residual symptoms from the bite. Persistent symptoms described included localized pain at the bite site (3 cases), numbness or paresthesias (2 cases), abnormal skin peeling and discoloration at the bite site (2 cases), and persistent weakness of the bitten extremity (1 case). None of the study participants had any prior history of diabetes or stroke. All the participants attributed their symptoms to the sequelae of the snakebite.

Among patients reporting persistent symptoms, the bite-to-survey interval ranged from 7 months to 12 years, with a median interval of 4 years. Despite reporting persistent symptoms, there were no delays in returning to work and otherwise performing all activities of daily living that were attributable to the bite for any patients interviewed.

Discussion

Snakebite victims may experience persistent disability after these injuries.⁵ Longitudinal investigations on victims of envenoming rattlesnake bites are warranted to better treat this population and provide accurate anticipatory guidance on the resolution of their injury. The present study provides some additional insights into the long-term course and persistent complications associated with crotaline envenomations in central California.

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