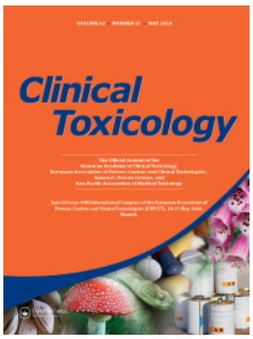

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POISON CENTRE RESEARCH

Fasciotomy following North American pit viper envenomation in Texas 2004–2021

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ABSTRACT

Introduction: North American pit viper envenomation occurs over 4,000 times annually in the United States, with polyvalent Fab antivenom being the primary treatment. Fasciotomy is occasionally performed due to concerns about compartment syndrome. We utilized our direct access to Texas Poison Center Network data to create a new snakebite abstraction form and database on relevant available information between 2004 and 2021 and to identify, describe, and estimate the incidence of fasciotomy following pit viper envenomation in Texas.

Methods: We searched the Texas Poison Center Network database for cases during 2004–2021 using keywords such as fasciotomy, surgery, compartment pressure, and compartment syndrome. Descriptive statistics summarized the data.

Results: Of 16,911 reported envenomations, 0.69 percent involved fasciotomies ($n = 117$). Most common bite sites were digits/hands and lower extremities. Patients who underwent fasciotomy were typically male, aged 20–59, and 10 years younger than the total snakebite population. Only 6 percent of reported compartment syndrome cases had a compartment pressure measurement. Antivenom was administered in 101 (86.3 percent) cases, 92 (91.1 percent) of which received only Fab antivenom product. Patients with bites from rattlesnakes (47.9 percent) were associated with most fasciotomies

Discussion: Our findings suggest a potential increase in snakebite exposures, accompanied by a decrease in fasciotomies. Overall, copperheads constituted the majority of snakebites, but most fasciotomies were from rattlesnake envenomations (47.9 percent). In this cohort, compartment syndrome diagnosis and decisions regarding fasciotomy were primarily based on clinical evaluation/surgeon expertise without compartment pressure measurements. Despite the efficacy of antivenom, only 86.3 percent of patients in our study received antivenom.

Conclusions: Fasciotomy after North American pit viper envenomation in Texas is uncommon (0.69 percent) and has decreased over time, possibly due to increased antivenom use or surgeon comfort with nonsurgical management.

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Antivenom; compartment syndrome; copperhead; envenomation; fasciotomy; pit viper; rattlesnake; snakebite; surgery

Introduction

Envenomation resulting from North American pit vipers, such as copperheads, cottonmouths, and rattlesnakes, is a relatively frequent occurrence in the United States (US), with over 4,000 cases reported annually to America's Poison Centers [1–5]. The primary treatment with either polyvalent Fab antivenom [FabAV, Crotalidae polyvalent immune fab (ovine) – CroFab®, BTG International, Inc.] or Fab2AV [Crotalidae immune Fab2 (equine) – Anavip®, Rare Disease Therapeutics, Inc.], is a generally effective approach [6,7]. However, in exceptional circumstances, patients undergo fasciotomy, a surgical procedure advocated to address or prevent venom-induced compartment syndrome [8]. The occurrence of venom-induced compartment syndrome is rare [9,10]. Diagnosing this emergent condition poses a challenge, as venom causes substantial pain, paresthesias, tenderness, and edema, potentially leading to the loss of palpable pulses. While cases of manometry-confirmed elevated compartment pressures following pit viper envenomation are infrequent, some have been managed through surgical fasciotomy [11]. Notably, there have been instances in which case reports supported the use of fasciotomy without a comparator group [12,13].

Conversely, some medical toxicologists and surgeons advocate antivenom use in managing pit viper snake envenomation [14–16]. They argue that venom-induced compartment syndrome results from venom cytotoxicity, leading to cell lysis and edema that a fasciotomy might not

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effectively address. According to proponents of antivenom use for compartment syndrome induced by snake envenomation, a fasciotomy could potentially harm the patient unnecessarily, while antivenom may terminate venom-induced tissue damage [14–16].

Several animal studies support the resolution of compartment syndrome with elevated compartment pressures after the administration of antivenom alone [17,18]. Additionally, outcomes from animal studies suggest worse results when fasciotomy is performed [19,20]. Previous retrospective studies, case series, and case reports have documented successful resolution of elevated compartment pressure resulting from pit viper envenomation after antivenom administration [15,21,22].

Given that Texas is home to 15 of the 20 species or subspecies of North American pit vipers, our state has a high rate of venomous snakebites [23,24]. Patients with snake envenomation are typically admitted to medical services across most of the United States. However, in Texas, the state trauma system often manages these cases, with surgeons taking a lead role in admission and patient management [25].

Healthcare providers often call the Texas Poison Center Network for a toxicology consult to assist with patient management and to acquire antivenom. The Texas Poison Center Network, comprised of six poison centers within host hospitals and staffed by Specialists in Poison Information (SPIs) offering 24/7 assistance to the public and healthcare providers, receives over 230,000 calls each year, with 32% coming from healthcare providers [26]. These specialists, consisting of board-certified pharmacists, nurse practitioners, registered nurses, and foreign-trained medical graduates with additional national certification, evaluate clinical scenarios, provide medical recommendations for exposure cases, and enter the information into a statewide database called Toxicall®.

America's Poison Centers is responsible for standardizing the National Poison Data System (NPDS) by creating and updating the data definitions, coding guidelines, and decision criteria for all 55 poison centers in the United States. However, NPDS does not have a dedicated field for fasciotomy. Therefore, determining if a case resulted in a fasciotomy, as well as other relevant information for snakebite exposures, is only possible by using the notes, which are restricted to staff of the regional poison center. This manuscript summarizes a retrospective review of North American pit viper exposures reported to the Texas Poison Center Network, resulting in a fasciotomy from 2004–2021.

The study objective was to utilize our direct access to Texas Poison Center Network data to create a new snakebite abstraction form and database on relevant available information and to identify, describe, and estimate the incidence of fasciotomy following pit viper envenomation in Texas.

Methods

The Texas Poison Center Network database (Toxicall® version 4.7.41, 1999–2013) was queried for cases of venomous North American pit viper exposures reported between 2004 and 2021 for which the patient was human, and the caller was from Texas. Archived Toxicall® data are stored in an individual structured query language (SQL) database at the state health department for each year, and exposures were identified using NPDS generic codes for North American pit vipers (codes 137103, 137104, 137105, 137106, 137107). As Toxicall® lacked a dedicated field for fasciotomy, a search for relevant keywords (fasciotomy, surgery, compartment pressure, and compartment syndrome) was performed within the notes field. Records containing any of these keywords were exported into a Microsoft Access database (Microsoft® Access® for Microsoft 365 MSO [Version 2208]).

One author (HS) reviewed the note fields to verify if a fasciotomy, broadly defined in this study as any surgical procedure on a snakebite patient aimed at opening a compartment to relieve tissue pressure, including digit dermotomy, had been performed. Notably, variations in terminology, such as debridement or surgery, were observed among SPIs and medical staff documenting fasciotomy cases. To facilitate accessing the case records, as cases spanned 18 years and archived data are stored in individual databases, the verified fasciotomy cases were chronologically ordered and evenly distributed among four abstractors for initial review and abstraction. Additionally, five reviewer pairs of abstractors were formed for double abstraction as this was a newly created form and database.

To standardize data collection, a fasciotomy data abstraction form, adapted from the North American Snake Bite Registry data collection form, was created by four toxicologists and two surgeons [27]. The North American Snake Bite Registry is a national surveillance database from the American College of Medical Toxicology that prospectively gathers deidentified data from medical toxicologists providing bedside consultation for snakebite patients. Patient demographics, snake type, bite location, swelling progression, antivenom usage, fasciotomy parameters, and hospital course details were documented.

Variables analyzed included both fields directly from the Texas Poison Center Network database, thereby following NPDS coding, and newly created fields in the fasciotomy data abstraction form. Medical outcome is one field from the Texas Poison Center Network database and was used to describe the severity of related or unknown-if-related clinical effects. For cases where medical outcome could be determined with reasonable certainty (follow-up for determination is case dependent), cases were categorized as minor, moderate, and major clinical effects. Minor effects are minimally bothersome clinical findings that resolve quickly (e.g., self-limited nausea and vomiting, skin irritation, minimal pain or edema). Moderate effects are systemic effects in which treatment is needed (e.g., vomiting or diarrhea causing dehydration, or snake envenomation with extensive edema and ecchymosis). Major effects are life-threatening, disfiguring, or disabling consequences (e.g., hypotension requiring vasopressors, ventricular tachycardia with hypotension, cardiac arrest, kidney failure) [1,28].

The four abstractors (toxicologists) received informal training, a data entry guide, and access to a data dictionary. Following training, abstractors were allowed to familiarize themselves with the resources and implement skills from their training through the abstraction of four practice charts. Subsequent discussions among the abstractors and an epidemiologist addressed case specifics, variable limitations, and necessary clarifications that informed updates to the data abstraction documents.

The epidemiologist employed Proc Compare software to identify discrepancies between reviewer pairs and acted as an arbiter for disagreements. If the variable was multiple choice, all choices from both abstractors were included in the final abstraction. Time-based variables were abstracted from the timestamp on the notes and estimated to the nearest hour. Discrepancies were settled as the average of the two captured times.

Cohen's simple kappa determined inter-rater reliability for categorical variables. Descriptive statistics summarized snakebite exposure calls to (our state poison center) and fasciotomy cases by year, snake type, patient demographics, caller site, and medical outcomes. Cochran-Armitage trend tests were utilized to compare the proportion of snakebite calls and those resulting in fasciotomy over the years. Additional fasciotomy data, encompassing clinical course, bite details, hospital course, and antivenom usage, were also summarized. The study was exempt from requiring the approval of our Institutional Review Board.

Results

Snakebite envenomations in Texas

Inter-rater reliability for categorical variables is shown in Table 1. Over the 18-year study period (2004–2021), the Texas Poison Center Network received a total of 3.22 million exposure calls, with 16,911 (0.52%) attributed to North American pit viper bites (Figure 1; Table 2). Most calls originated from healthcare facilities (84.2%), followed by personal residences (12.5%) (Table 3). Among snakebite exposure patients, nearly two-thirds were male (10,595; 62.7%), 35.9% (6,064) were female, and 1.5% (252) were unknown. The age group with the highest representation was 40–59 years (4,873; 28.8%). Copperheads (36.0%) and rattlesnakes (13.2%) were the most commonly reported snake species.

Table 1. Inter-rater reliability scores of fasciotomy variables analyzed.

Variable	Inter-rater reliability scores
Past medical history	0.78
Previous bite	0.78
Bite site	0.93
Swelling progression	0.50
Fasciotomy site	0.30
Fasciotomy surgeon	0.71
Toxicologist consult	0.68
Envenomation progression	0.25
Fasciotomy determination criteria	0.56
Antivenom administration	0.93
Antivenom adverse reaction treatment	0.96
Initial dose	0.67
Maintenance dose	0.51
Dose after fasciotomy	0.57
Total doses received	0.61
Bite to presentation time	0.73
Bite to antivenom time	0.59
Time in intensive care unit	0.33
Time hospitalized	0.64
Fasciotomy complications	0.99
Fasciotomy outcome	0.69

Regarding the severity of clinical findings (NPDS definitions), 26.1% had minor effects, 51.7% of patients experienced moderate effects, and 5.4% exhibited major effects, resulting in five reported deaths (Table 3).

Patients receiving fasciotomy

General characteristics

Among the 16,911 North American pit viper bite exposure cases, 3,695 were identified from the keyword search and reviewed to verify that 117 (0.69%) underwent fasciotomy. The initial year (2004) saw the greatest number of fasciotomies ($n = 15$), with a notable variation in proportions of snakebite exposures and fasciotomies over time ($P < 0.001$) (Figure 1). Rattlesnake bites accounted for almost half (47.9%) of fasciotomy cases, followed by copperheads (16.2%) and cottonmouths (6.0%). Most patients who underwent fasciotomy were male (81.2%), and the age group most commonly affected was 20–39 years (35.8%) (Table 3).

Past medical history

In 76.9% of cases, there was no documented past medical history in the poison center record. Hypertension (6.8%), diabetes (2.6%), and coronary artery disease (1.7%) were among the noted underlying conditions.

Bite information

Five (4.3%) patients had a history of previous snakebites, with one individual experiencing six prior bites. Intentional handling or interaction with the snake led to 10.4% of bites. The hand or digit (49.6%) was the most common bite location, and 28.0% occurred on the lower extremity (Table 4). Major joints (ankle, knee, hip, wrist, elbow, and shoulder) were used to mark swelling progression, with 32.8% (41) of all bites swelling past one major joint, 28.8% past two major joints, and 23.2% remaining localized.

Diagnostic investigations

Laboratory values for cytotoxicity and coagulopathy were examined, with coagulopathy parameters being most frequently reported (Table 5).

Fasciotomy parameters

Most fasciotomies and dermotomies targeted the digit/hand or lower extremity (31.6% each), and in 77% of cases, the compartment opened corresponded to the bite location. The other 23 were bites on hands or feet, and the compartment opened was the connected extremity (Table 4). The subspecialty of the surgeon was largely undocumented (85.5%), but orthopedic surgeons (10.3%) and trauma surgeons (2.6%)

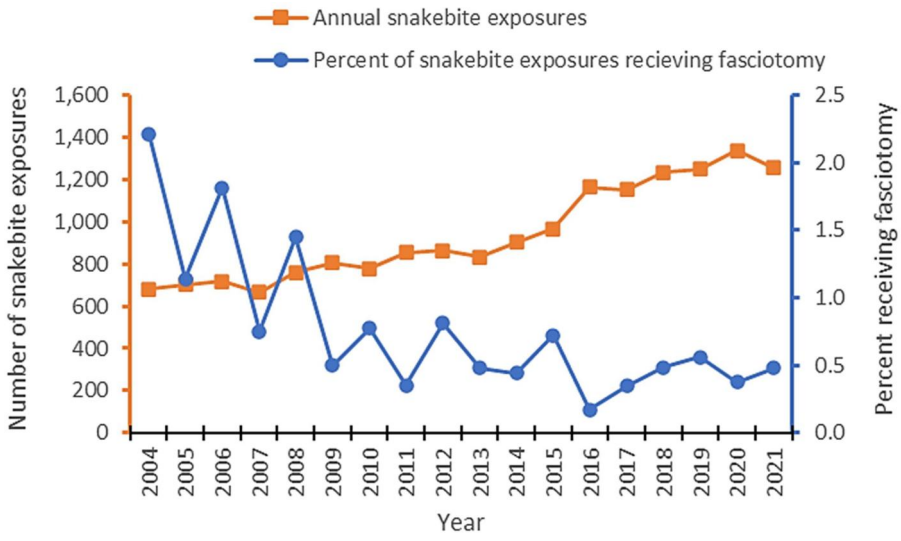

Figure 1. Annual number of snakebite exposure calls (n = 16,911), and percent of those snakebite exposures resulting in a fasciotomy (n = 117) reported to the Texas Poison Center Network 2004–2021.

Table 2. Annual frequency of snakebite cases (total $n = 16{,}911$) reported to the Texas Poison Center Network and exposures resulting in a fasciotomy ($n = 117$), 2004–2021.

Year	Snakebites *n*	Fasciotomy *n*
2004	680	15
2005	701	8
2006	716	13
2007	666	5
2008	759	11
2009	804	4
2010	777	6
2011	853	3
2012	862	7
2013	832	4
2014	902	4
2015	967	7
2016	1,163	2
2017	1,152	4
2018	1,233	6
2019	1,250	7
2020	1,338	5
2021	1,256	6

were involved in some cases. Toxicologist consultation either by phone or at the bedside occurred in 37.6% of cases.

The progression of envenomation was primarily tracked by clinical judgment (73.5%). Some cases documented the monitoring of swelling progression (41%), patient-reported pain (23.1%), or use of the snakebite severity score (0.9%). The majority (94%) of fasciotomies were performed based on surgeon expertise, with compartment pressure readings in only 6% of cases, most of which indicated pressures greater than 30 mmHg. Two cases had severe pain resistant to opioids.

Antivenom

Antivenom was administered in 101 (86.3%) cases, of which 92 (91.1%) received only FabAV, four (3.9%) only Fab2AV, three (2.9%) received both, and two (2.1%) unknown. Patients who received FabAV initially received a median of six antivenom vials, six vials for maintenance, and 11 total vials. One patient received 43 vials (Table 6). Adverse reactions occurred in five (4.3%) patients, leading to antihistamine administration ($n = 3$, 2.6%) or a pause in antivenom delivery with corticosteroid treatment and subsequent antivenom continuation ($n = 2$, 1.7%). Two of the five patients had received morphine, but the temporal relationship to the histaminergic clinical finding was unclear from the record.

Hospital course

Patients ($n = 101$) presented to a healthcare facility within a median of 1.0 h from the bite, with a median time of 3.0 h for receiving the first antivenom dose ($n = 94$). The median hospital stay for 88 patients was four days. In 106 patients, the median stay in the intensive care unit was 48 h. Treatment at the fasciotomy site varied, with closure (24.8%), skin grafting (9.4%), and open wounds with lost follow-up (4.3%).

Three (2.6%) patients experienced adverse events related to the fasciotomy, of whom two manifested hematotoxicity from their envenomation. All three patients had prolonged hospital stays, received little-to-insufficient antivenom (zero to 10 vials of FabAV), did not receive the prescribed FabAV maintenance dosing, and did not have a toxicologist at the bedside.

The first patient was a 61-year-old male with coronary artery disease, stents, and bypass graft surgery, also on clopidogrel for a mitral valve replacement. He had a rattlesnake bite to the right hand and received 10 vials of FabAV. His international normalized ratio was 1.8 without any other coagulopathy, and he was taken to surgery for a fasciotomy. He received blood products and additional FabAV but continued to bleed. He went to the operating room on two more occasions, where two bleeding vessels were found and repaired in the fasciotomy site. The second patient was a 58-year-old male who had been bitten by a rattlesnake on the lower leg three days prior; he was given FabAV and discharged. One day later he returned to the emergency department with increased edema. Contrary to poison center recommendations, he did not receive antivenom but instead was taken to surgery. Fasciotomy site bleeding occurred despite normal

Table 3. General characteristics of snakebites reported to the Texas Poison Center Network and exposures resulting in a fasciotomy, 2004–2021.

	Total snakebites ($n = 16,911$)		Fasciotomy ($n = 117$)	
	n	%	*n*	%
Caller site				
Healthcare facility	14,234	84.2	111	94.9
Personal residence	2,119	12.5	0	
Public area[a]	90	0.5	0	0.0
Other	378	2.2	6	5.1
Unknown	90		0	
Patient age group (years)				
0–5	878	5.2	8	6.8
6–12	1,501	8.9	10	8.5
13–19	1,755	10.4	10	8.5
20–29	2,218	13.1	21	17.9
30–39	2,212	13.1	21	17.9
40–49	2,458	14.5	18	15.4
50–59	2,415	14.3	18	15.4
60+	2,618	15.5	10	8.5
Unknown	856		1	0.9
Type of snake				
Copperhead	6,085	36.0	19	16.2
Cottonmouth	758	4.5	7	6.0
Rattlesnake	2,233	13.2	56	47.9
Unknown	7,835		35	29.9
Medical outcome				
Death	5	0.003	0	
Major effect	905	5.4	50	42.7
Minor effect	4,417	26.1	2	1.7
Moderate effect	8,747	51.7	61	52.1
Not followed: no more than minimal clinical effects	610	3.6	0	
No effect	321	1.9	0	
Not followed: judged as a potentially toxic exposure	1,722	10.2	4	3.4
Unrelated effect, exposure not likely responsible for effect(s)	67	0.4	0	

[a]Public area includes restaurant, school, and work.

Table 4. Body location of snakebite and fasciotomy site for snakebite cases reported to the Texas Poison Center Network resulting in a fasciotomy ($n = 117$), 2004–2021.

	Bite site[a] ($n = 125$)		Dermotomy/ fasciotomy site ($n = 117$)	
Body location	*n*	%	*n*	%
Finger/hand	62	49.6	37	31.6
Upper extremity[b]	4	3.2	15	12.8
Lower extremity[c]	35	28.0	37	31.6
Toe/foot	22	17.6	8	6.8
Not documented	2	1.6	20	17.1

[a]Some exposures had more than one bite, so the total number of bite sites is more than the number of fasciotomy cases.
[b]Upper extremity is shoulder to wrist.
[c]Lower extremity is hip to ankle.

coagulation studies. He received multiple blood products (packed red cells, plasma, cryoprecipitate, and platelets), and after further surgery, the bleeding improved.

The third patient was a 58-year-old female with a rattlesnake bite to the ankle. Her only coagulopathy was a prothrombin time of 22.8 s. She received FabAV four vials and underwent fasciotomy the next day due to increased edema. She had a prolonged hospital stay of over 17 days.

Discussion

The Texas Poison Center Network received an average of 858 venomous snakebite cases annually, with a decreasing number of resultant fasciotomies and dermatomies over the study period 2004–2021. Compared to a previous national study covering 2001 to 2005, Texas contributed 13.6% (3,231) of the reported 23,676 human exposures to venomous snakes in the NPDS [29]. Our findings suggest a potential increase in snakebite exposure cases, accompanied by a decrease in fasciotomies. However, a comprehensive trend analysis is required to validate this observation. Environmental factors, such as rising temperatures facilitating unintentional human-snake interactions, may contribute to this perceived increase, as indicated by a study associating higher daily temperatures with an elevated risk of snakebite [30].

While the current incidence of fasciotomy in the US remains unknown, a comparable study from the North American Snakebite Registry analyzing 1,604 snakebite patients, identified a 0.56% incidence of fasciotomy in cases suspected of native pit viper-induced compartment syndrome [31]. Our study echoes these results, revealing that fasciotomy after North American pit viper envenomation in Texas is infrequent (0.69%) and appears to have declined over time. Nevertheless, understanding its management is crucial for physicians.

Demographically, patients undergoing fasciotomy shared similarities with the overall snakebite population – predominantly male and aged between 20 and 59 years, albeit the fasciotomy group was approximately 10 years younger. This aligns with existing reports in which 69.3–93% of pit viper envenomation cases were male [27,31,32]. Bite locations for fasciotomy cases were consistent with non-fasciotomy patients, with most interventions performed on digits/hands and lower extremities [27,31,32].

Table 5. Measures of central tendency summary statistics of investigations and time-based hospital management variables for snakebite exposure cases reported to the Texas Poison Center Network resulting in fasciotomy ($n = 117$), 2004–2021.

	n[a]	Median	Interquartile range
Investigations			
White blood cell count (x10^9/L)	17	14	12.2-15.4
Creatine kinase activity U/L	13	789	211-1,776
International normalized ratio	83	1.1	1.0-1.4
Partial thromboplastin time	84	27	13.9-32.0
Aspartate aminotransferase activity U/L	3	45	30-58
Fibrinogen concentration (mg/L)	57	242	189-328
Platelet count (10^9/L)	65	211	151-267
Hospital course			
Time from bite to presentation to healthcare facility (h)	101	1.0	1.0-2.0
Time from bite to antivenom administration (h)	94	3.0	2.0-5.0
Time spent in hospital (h)	88	100.8	63-128
Time spent in intensive care unit (h)	106	48	20.5-81.0

[a]Number of cases with investigations documented in poison center records.

Table 6. Type of antivenom given to snakebite exposures reported to the Texas Poison Center Network resulting in fasciotomy ($n = 117$), 2004–2021.

Variable	n[a]	Median number of vials	Interquartile range
Fab antivenom			
Initial dose	83	6	4-8
Maintenance dose	65	6	2-6
Dose after fasciotomy	17	1	0-4
Total doses received	81	11	8-14
Fab2 antivenom			
Initial dose	3	10	10-14
Maintenance dose	0	–	–
Dose after fasciotomy	2	13	10-16
Total doses received	3	20	14-26
Both types of antivenom received			
Initial dose	3	10	10-30
Maintenance dose	1	6	6-6
Dose after fasciotomy	0	–	–
Total doses received	2	16	10-22

Totals will not add up to total patients who received antivenom due to missing dosage in notes.
[a]Number of cases with antivenom documented in poison center record.

Overall, in the study population, copperheads constituted the majority of snakebites, followed by rattlesnakes. This is not unexpected, given that copperheads are the most prevalent pit viper in Texas. Despite this, most cases resulting in fasciotomy were from rattlesnake envenomations (47.9%). Fasciotomies from copperhead envenomations accounted for 16.2%. This differs from a study of 142 copperhead snakebite patients, where none underwent fasciotomy [33].

The methods and thresholds for detecting and defining compartment syndrome are contentious [34]. Our study showed that compartment syndrome diagnosis and decisions regarding fasciotomy were primarily based on clinical evaluation/surgeon expertise (88%) and not based on compartment pressure measurements, which were documented in only 6% of cases. Other studies reported higher proportions of assessed compartment pressure, suggesting variations in practice [27,31]. Prophylactic fasciotomy, once advocated in the early 2000s, has yielded to the current primary treatment of North American pit viper envenomation, involving polyvalent immune Fab products (e.g., FabAV, CroFab® or Fab2AV, Anavip®) and supportive care [27]. Once FabAV and Fab2AV were approved by the US Food and Drug Administration (2001 and 2018, respectively), they became part of routine medical management due to their overall improvement over the antivenom available at the time (whole IgG equine Antivenin Crotalidae Polyvalent by Wyeth) [35,36]. Further analysis is warranted to explore if the observed decrease in fasciotomies is linked to the increasing use of Fab antivenom.

In contrast to trauma patients with compartment syndrome, for which immediate surgical decompression is recommended, symptomatic envenomated patients with suspected compartment syndrome benefit more from antivenom [14–18,21,22]. Garfin and colleagues [19] observed continued muscle destruction even after complete fascia removal, which supports the primary pathophysiological process being the direct and indirect effects of pit viper venom on the tissue. Adequate antivenom administration directly targets this venom-induced pathophysiologic process, which in turn reduces tissue compartment pressures, enhances blood flow, and may obviate the need for fasciotomy [18,22,35–37]. Despite the efficacy of antivenom, only 86.3% of patients in our study received antivenom.

Most administered antivenom was FabAV, with initial median dosing of six vials and six maintenance vials. Recognizing the standard of care for snakebite envenomation, the hesitancy among physicians to use antivenom persists due to uncertainties about its benefits, effectiveness, and impact on outcomes, as well as lack of awareness of ongoing research and available studies that could help inform the management decisions of these patients [31,38]. This reflects a need for increased awareness and education among healthcare providers.

The utilization of poison center records as the primary data source has inherent limitations. Voluntary calls almost certainly under-represent actual exposures and the true incidence of fasciotomy in Texas remains undetermined. Also, specialists in poison information, nurses, and some physicians may inaccurately use the term “fasciotomy” to refer to any surgical procedure to relieve pressure in an extremity even if the fingers do not have fascial compartments. A better term is dermotomy, but the limited poison center records did not always distinguish dermotomy from fasciotomy. In addition, there may be a selection bias with more severe envenomations resulting in calls to the poison center. Data may lack crucial details, including methods used to diagnose compartment syndrome and clinical reasons for fasciotomy. Additional, but, the Texas Poison Center Network database does not capture race or ethnicity information. To mitigate

these challenges, four trained medical toxicologists conducted thorough reviews, utilizing a standardized data entry guide and dictionary. While the findings provide insights into pit viper envenomation practices in Texas, they may not be generalizable to other states. The snakes in our state may have different venom than the snakes described at other locations, and there is variability even within species. Also, not all species respond to antivenom. Further research and collaboration are essential for a more comprehensive understanding of snakebite management practices and outcomes.

Conclusions

In our retrospective review spanning 18 years of Texas Poison Center Network data, we found that 0.69% of pit viper snakebite patients underwent fasciotomy. Of those that underwent fasciotomy, the data revealed deviations from standard snakebite protocols such as lower-than-expected antivenom dosages and a lack of compartment pressure or leading-edge measurements. While our primary focus was to delineate fasciotomy cases reported to Texas poison centers, further analyses are warranted. Future investigations should delve into trends over time and conduct subgroup analyses to delineate differences in the characteristics and outcomes of snakebite exposures resulting in, or not resulting in, fasciotomy.

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Authors' contributions

Shawn M. Varney, Haylea Stuteville, H. Tony Gao, Brett Roth, Sarah Watkins, Aaron A. Alindogan, and Daniel L. Dent contributed to the conception and design of this project. Shawn M. Varney, Sarah Watkins, H. Tony Gao, Brett Roth, and Haylea Stuteville acquired the data. Haylea Stuteville additionally analyzed and interpreted the data. Shawn M. Varney, Haylea Stuteville, and Joseph K. Maddry wrote the manuscript. All authors contributed to manuscript revision. All authors gave their final approval of the version to be published and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Data availability statement

The data supporting this study's findings are available from the corresponding author [SMV] upon reasonable request.

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