

NEWS FROM THE PIT

Arizona Poison and Drug Information Center



Cut and Suck: Good for Limes, but Bad for Snake Bites

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It's 2006 and the iconic movie "Snakes on a Plane" has just been released. At one point in the movie a small child gets bitten on the hand while on the plane and a nearby adult decides she must act quickly to save the child's life. She takes off her earring to cut open the bite site and then begins sucking out the venom with her mouth. She had to do this to save his life, right? Well...it turns out not everything you see portrayed on television and in movies is true. Shocking, I know. In a past NEWS FROM THE PIT issue I discussed electrotherapy as a pre-hospital treatment, now it's time to discuss two more interventions: *Cut and Suck*.

NEWSLETTER HIGHLIGHTS

Why is the "cut and suck" method not recommended to treat envenomations?

Image 1: Mojave in the front yard of an Arizona resident.

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Bloodletting

While cutting the bite site is slightly alarming, it should not be too surprising. Throughout the course of human existence, the concept of therapeutic bleeding has deep roots: Bloodletting. Many sources date the concept of bloodletting back 3000 years ago with the Egyptians. However, it really gained traction in ancient Greece with Hippocrates, the father of healthcare worker's oath "to do no harm". Hippocrates believed humans were made up of four humors: blood, phlegm, black bile, yellow bile. The concept of illness occurred because one of the humors was out of sync and needed to be balanced. Since blood was viewed as the most abundant humor in humans, it was believed that removing it would remove illness. The practice of bloodletting continued to be commonplace until the 1800's when it came under scrutiny, but it was not until in the mid-1900's when it stopped being recommended for treating disease.

While bloodletting was seen as a treatment for snake bites in our early history, the idea of cutting the site changed in the 1900's. Instead of the act of cutting being about bloodletting, it was actually starting to be about the physical removal of venom. The thought of incision was that it would allow for isolation of a venom depot thus cutting off the venom's ability for systemic circulation. You would then use some form of suction to physically remove the venom and thereby avoid or minimize consequences of envenomation. Surgeons in the 1960s even suggested that a piece of flesh be cut out of the site to remove the venom depot.

"Healthcare providers and the public alike have tried many pre-hospital first aid measures over the last hundred years in an attempt to thwart the potential injury and death due to a rattlesnake bite."

Cut and Suck

Healthcare providers and the public alike have tried many pre-hospital first aid measures over the last hundred years in an attempt to thwart the potential injury and death due to a rattlesnake bite. I'll admit that prior to my time and education at the AzPDIC, the notion of "cut and suck" was considered a go-to first aid treatment in my mind. Turns out I wasn't alone and in the United States "cut and suck" has deep roots in public and medical history as well. In 1911, the Boy Scouts of America put out their 1st edition handbook recommending several first aid techniques to include squeezing or sucking out the venom following a snakebite. The recommendation was continued through the 11th edition of the handbook with use of a device called a venom extractor. Venom extractors claim to remove poison by sucking it out the same cavity where it was injected. Extractors were touted as a kit people should carry in the event a venomous creature was encountered. It wasn't until the 12th edition in 2009 when the recommendation of venom extraction for snakebite was removed.

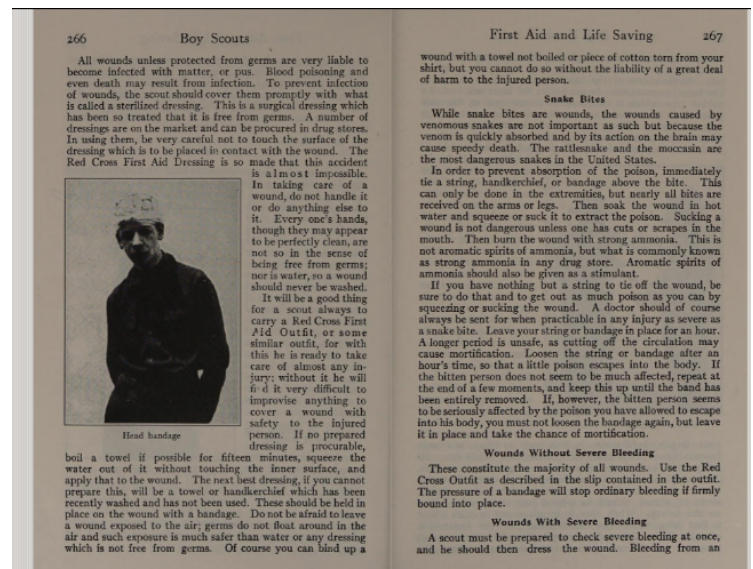


Image 2: The first edition of the Boy Scouts Handbook. This edition was in use from 1911-1914.

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Even before extractors hit the market, medical professionals were advocating for venom extraction as not only a first aid measure in the field, but also early on during the clinical course as an intervention performed in healthcare facilities. The idea of using a device to suck out the venom can be traced back to the 1920's where scientists injected venom subcutaneously into canines, then excised the bite site and used a rubber bulb attached to an inverted glass funnel to suck out the venom. It's important to note in their procedure a tourniquet was applied five minutes after the venom injection and suction was applied over a 20-hour period with suction performed for a total of 1 hour and 40 minutes... meaning it's not a one and done treatment after being bitten. Throughout the multiple experiments where they used incision and suction two of the canines took a significantly longer time to die. Next, they took the venom-infused blood they suctioned from the previously envenomated canine and injected it into another canine. In the second set of experiments, they reported that the death that occurred matched the symptoms one would expect from an envenomation. Armed with this information, the authors concluded that incising and suctioning results in a large amount of venom extracted. Otherwise, all the dogs in the first studies would have died in a similar time frame to their controls and the canines receiving the suctioned blood of the previously envenomated dogs shouldn't have died at all. Research in the 1960's showed when injecting venom into rabbits subcutaneously and intramuscularly and then using suction on the site yielded 34% of venom removed. In the 1970s, Findlay Russell, an expert in snake envenomation suggested suction should be applied to any envenomation within 60 minutes of occurrence. He and others believed within this time frame, incision and suction at the bite-site would result in up to 90% venom extraction. Any attempts to perform this therapy outside this time frame would not be considered as effective due to venom diffusion into tissues over time.

Problems Surrounding Cut and Suck Method of Venom Extraction

There are three main issues of why the "cut and suck" method fails to aid rattlesnake envenomation: lack of efficacy, tissue injury, and risk of infection. So why does the suck method, suck (pun intended)? Rattlesnakes have front-mobile and curved fangs, so when they penetrate there is no straight path of injection into tissue, but rather at a curved trajectory. When struck by a snake, fangs penetrate soft tissue and venom deposits into the tissue. With the aid of hyaluronidase and other venom toxins the venom will begin to spread. Many, but not all venom components are too large to directly enter through capillary vessels, thus enter via the lymphatic system. As such, cutting the wound around the bite site would have very little effect as most of the venom is not likely to circulate in the blood during the immediate phase of envenomation. If this is true, why did animal models in the past show different results? A letter to the editor in the Annals of Emergency Medicine suggests that the design of those studies was flawed. Rabbits have far less subcutaneous tissue than a human, lending itself to different distributive properties observed. In the canine research studies, they had no way of actually measuring the venom load removed and relied on envenomation effect strictly through observation. Later studies in pigs and even humans displayed that while venom extractors can retract blood, the mean venom load only decreased 2%.



Image 3: The curved fangs of a baby Mohave rattlesnake

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The risk of injury that increases while using these devices is another concern. In both animal and human subjects, circular lesions formed, then later turned necrotic, sloughed, and led to prolonged healing times on the exact area where the extractor was applied. In addition, depending on where the bite site is located, you may be cutting in areas with increased or larger areas of superficial vasculature. Cutting at the depth required to reach the end of the initial venom pocket could very well result in further tissue, tendon, and circulatory damage especially, if you are not a well-trained healthcare provider/surgeon.

Snake venom itself is bactericidal, however, poor first aid measures (cut, suck, electrocute, etc.) with good intentions increase the risk of infection. It's quite likely that most people probably do not have the necessary sterile equipment or circumstances of when incision and suction could be applied. Human skin naturally houses bacteria and depending on hygiene or the environment when envenomated, the amount and type of bacteria being introduced may vary. Additionally, cutting the area introduces the opportunity for even more bacteria to enter via a much larger surface area. In the event someone used their mouth to try and extract the venom, now different bacteria the mouth is being deposited on the open wound. Our data shows that incidence of infection in a snakebite is rare and confirmed cases of infection only happened in <1% of our patients. Of those who did have an infection, at least 10% manipulated the bite site in some way or another. All in all, attempting to cut or suck out the venom hurts in more ways than one.



Images 4 & 5: Pictured is an example of a venom extractor; this particular one is made by Sawyer Products called The Extractor™. There are many venom extractors out on the market under different manufactures or under different names. Based on current research and understanding of snake envenomations, we do not recommend the use of any venom extractors.



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Cut and Suck Method Today

Despite modern medical literature advising against the “cut and suck” method of first aid, it is still a widespread belief in some people. At the AzPDIC, we continue to receive cases every year where patients incise the bite site and attempt to suck out venom. Based on data from our center, about 2% of patients use the cut and/or suck method each year.

While sometimes we do not always get reports regarding the circumstances as to why patients perform first aid measures, some reasons include border crossers being told to by their coyote, remnant boy scout knowledge, or using extractors still available from a retail store. While the first two stem from misinformation and outdated science, the third reason I find more alarming. When searching for first-aid measures in snake envenomation you can find multiple major retailers selling these venom extractors without warning of the ineffectiveness or even potential harm these could pose. This risk of this belief holds the idea because something is commercially available/promoted, it has been deemed safe for use.

The best thing anyone can do after a rattlesnake bite is call for help and be brought to the closest healthcare facility for evaluation and treatment. In the spirit of Hippocrates to “do no harm” (NOT bloodletting), a safe first aid measure while in transport or waiting for help is to clean the wound with soap, water, and a dry, clean towel... and of course, calling your local Poison Control Center at 1-800-222-1222.



References

- Alberts MB, Shalit M, LoGalbo F. Suction for venomous snakebite: a study of "mock venom" extraction in a human model. *Ann Emerg Med.* 2004 Feb;43(2):181-6. doi: 10.1016/S0196064403008138. PMID: 14747805.
- Henry M. Parrish & Robert H. Hayes (1970) Hospital Management of Pit Viper Venenations, *Clinical Toxicology*, 3:3, 501-511, DOI: 10.3109/15563657008990122
- McCollough NC, Gennaro JF. Treatment of venomous snakebite in the United States. *Clin Toxicol.* 1970 Sep;3(3):483-500. doi: 10.3109/15563657008990121. PMID: 4937764.
- Russell FE. Snake venom poisoning in the United States. *Annu Rev Med.* 1980;31:247-59. doi: 10.1146/annurev.me.31.020180.001335. PMID: 6994610.
- JACKSON D, HARRISON WT. MECHANICAL TREATMENT OF EXPERIMENTAL RATTLESNAKE VENOM POISONING. *JAMA.* 1928;90(24):1928-1929. doi:10.1001/jama.1928.02690510012004
- Shulov A, Ben-Shaul D, Rosin R, Nitzan M. The efficacy of suction as a method of treatment in snake venom poisoning. *Toxicon.* 1969 Jun;7(1):15-8. doi: 10.1016/0041-0101(69)90156-1. PMID: 5804761.
- Bush, S. P., & Hardy, D. L. (2001). Immediate removal of extractor is recommended. *Annals of Emergency Medicine*, 38(5), 607-608. <https://doi.org/10.1067/mem.2001.119280>
- Bush SP, Hegewald KG, Green SM, Cardwell MD, Hayes WK. Effects of a negative pressure venom extraction device (Extractor) on local tissue injury after artificial rattlesnake envenomation in a porcine model. *Wilderness Environ Med.* 2000 Fall;11(3):180-8. doi: 10.1580/1080-6032(2000)011[0180:eoanpv]2.3.co;2. PMID: 11055564.