LESSONS FROM HISTORY

Struan Sutherland’s “Rationalisation Of First-Aid Measures For Elapid Snakebite”—A Commentary

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The evolution of theory and practice in toxinology and the personalities involved holds as much fascination as the creatures that inflict these potentially mortal injuries. Perhaps the earliest text on snakebite is the papyrus held at the Brooklyn Museum of Art. Dating from Dynasty XXX or the early Ptolemaic Period (305 BC), among other topics it refers to the treatment of the snakebite wounds by lancing.1 By the time of Pliny the Elder’s The Historie of the World (AD 23–79), rhetoric held precedent over experiment: “For poisonous bites, it is customary to employ a liminet made of fresh sheep-droppings, cooked in wine.”2 Fortunately, William Harvey (1578–1657), one of the pioneers in self-experimentation in toxinology,3 also took an interest in first aid for snakebite. Whereas Galen (AD 129–200) had earlier recommended ligatures for snakebite,4 Harvey linked the movement of venom to his hypothesis concerning the circulation of the blood, thus promoting ligature use and amputation for snakebite.3,5 Although Francesco Redi (1626–1697) elaborated on the idea of a ligature, Fontana6 (1730–1805) first demonstrated its efficacy by means of experiment, recognizing the possibility of gangrene if it were kept in place.

Through the 19th and early 20th centuries, little advance had been made on the problem of first aid for snakebite. Martin7 in Sydney and then Fairley8 at the Walter and Eliza Hall Institute of Medical Research in Melbourne probed the value of ligature use for Australian snake venoms in rabbits, sheep, and goats. Martin highlighted the role of both the lymphatics and the veins in the absorption of various venoms. In the 1940s, Barnes and Trueta9 in Oxford extended this important concept by demonstrating that lymphatic obstruction or complete limb immobilization prevented the absorption of venom from black tiger snakes and Russell’s vipers, but not cobras, in an anesthetized rabbit model.

A Boy Scout in Australia in the 1970s would have been oblivious to this history. He would have been instructed at length about the risks from a venomous elapid snake while out in the bush. Such instruction was appropriate in a region that boasts the 11 most toxic snakes in the world10 and where contact between humans and snakes is frequent. He may not have been aware that highly refined, equine-derived, life-saving antivenoms, active against all the common Australian elapid snake species, were widely available. What he did know was the importance of correct first aid for snakebite. He would have carried the standard-issue snakebite kit of the time, which contained a rubber tourniquet, a device for wound incision, and some potassium permanganate crystals. What he did not know was that his first-aid management of snakebite was about to be revolutionized by the work of Struan Sutherland (1936–2002) (Figure 1) and his team in the Department of Immunology Research at the Commonwealth Serum Laboratories in Melbourne.

Sutherland’s group was responsible for many of the advances in Australian venom research. With the publication of his landmark paper in Lancet11 on what has come to be known as the “pressure-immobilization technique or bandage” or eponymously as the “Sutherland wrap,” Sutherland left what is arguably his most important legacy to the field of toxinology in Australia. He appreciated that the conventional teaching of the time—that snakebite should be managed in the field with an arterial tourniquet—was not only impractical but also potentially dangerous. Just as Fontana cautioned, Sutherland left what is arguably his most important legacy to the field of toxinology in Australia. He appreciated that the conventional teaching of the time—that snakebite should be managed in the field with an arterial tourniquet—was not only impractical but also potentially dangerous. Just as Fontana cautioned, Sutherland knew that few patients would be able to tolerate a ligature for more than a short period of time. In rural Australia, where prehospital transport times were likely to be prolonged, its efficacy was irrelevant because it would have to be removed long before definitive care was reached. In this landmark research, Sutherland combined these practical issues of first-aid care with the pathologist’s understanding of the preceding literature that the toxic components of Australian snake venoms are of molecular weights that are preferentially transported by the lymphatics. The impact of the Lancet paper was but-