The effect of elapid snake envenomation on coagulation factor activities in dogs in the inner west of Melbourne

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Snake venom-induced consumption coagulopathy (VICC) is a common consequence of elapid snake envenomation in dogs which can clinically manifest as haemorrhage at mucous membranes, the gastrointestinal tract, extradural space and pulmonary alveoli.¹⁻³ In elapids, this consumptive coagulopathy is the result of prothrombin activators in the snake venom, leading to thrombin and ultimately fibrin formation; as a by-product, depletion of coagulation factors occurs in a venom-dose dependent fashion.⁴⁻⁷ Thus VICC can be identified by prolongation of in-vitro coagulation times (e.g., PT, aPTT, ACT), hypocoagulant viscoelastic test (e.g., thromboelastography) results and reduced clotting factor activities. In people with VICC, rapid consumption of coagulation factors (F) I (i.e., fibrinogen), FV and FVIII occurs within 1 – 2 hours of snake bite with return to normal activity of FV and FVIII by 15 hours, and fibrinogen by 24 hours post-envenomation.⁸ Whether a similar time course occurs in dogs remains unexamined.

Our study aimed to characterise the coagulation factor changes over time in naturally occurring snake envenomed dogs that presented to our emergency service in Werribee, Melbourne. At that hospital, around 75% of snake envenomations in dogs occurs due to tiger snake bite and the remainder due brown snake bite. Coagulation activities (FI, II, V, VII, VIII, X) at presentation and over the first 24 hours after antivenom administration were compared to a control group of clinically healthy dogs (n=20). We enrolled 19 snake envenomed dogs into the study. Diagnosis was based on appropriate history, clinical signs (lower motor neuron paresis/paralysis, mydriasis, reduced gag),
and at least one of the following: positive snake venom detection kit, CK > 1000 u/L, off scale aPTT or seen bitten by a snake. Citrated whole blood samples were collected at presentation and 3, 12 and 24 hours after anti-venom administration, cool centrifuged and plasma samples stored at -80°C until analysis. Individual coagulation factor analysis (STA Compact Max®, Stago) was performed by the use of factor depleted plasma and a standard curve generated with previously collected pooled control sample of normal dogs. Fibrinogen activity was determined by the Clauss method (STA Compact Max®, Stago). Preliminary results after the analysis of 10 of the cases, showed near absent fibrinogen activity at presentation with progression to normal activity by 24 hours. Similarly, a tendency towards reduced activity of FV and to a lesser extent FVIII during early snake envenomation occurs; while FII, VII and X appear not affected. Availability of the entire data set will allow further insight into the significance of these findings.

This study provides new data on coagulation factor changes in naturally occurring elapid snake envenomation in dogs. Although data analysis requires to be completed at the time of writing, the results suggest that VICC in dogs has a similar effect to people, although to a lesser extent, with fibrinogen most affected followed by FV and FVII. The latter two however, were uncommonly dropped below an activity of 50% and thus constituted only mild reductions. Whether there is a differing effect of tiger versus brown snake envenomation will need to be further elucidated.

References


