Echis coloratus envenomation in a dog, clinical, hemostatic and thromboelstomeric findings and treatment

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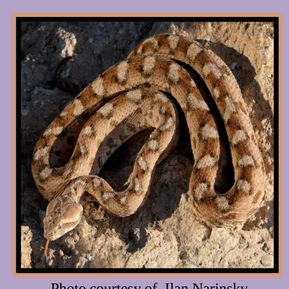

Photo courtesy of Ilan Narinsky

Introduction:

Echis coloratus (Viperidae), is endemic to the Middle East. Its envenomation induces systemic effects, attributed to neurotoxicity and coagulopathy, and local effects. The coagulopathy results in venom-induced consumptive coagulopathy (VICC), characterized by thrombocytopenia, prolonged clotting times and hypofibrinogenemia. Reports and studies of this envenomation in humans are scarce, and there are no clinical reports of naturally occurring envenomation in animals. This report describes a confirmed *E. coloratus* envenomation in a dog, including novel findings of a comprehensive hemostatic status investigation, including thromboelastometry (TEM).

Fig. 1 – Thremoboelastometry (INTEM and EXTEM) traces of a dog envenomed by *E. coloratus* ~ 24 hrs. post envenomation.

Fig. 2 – Thremoboelastometry (INTEM and EXTEM) traces of a dog envenomed by *E. coloratus* ~ 48 hrs post envenomation, and treated with polyvalent antivenom and fresh frozen plasma.

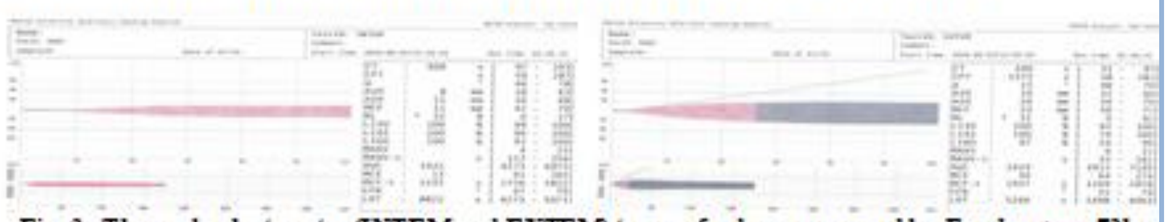

Fig. 3 - Thremoboelastometry (INTEM and EXTEM) traces of a dog envenomed by *E. coloratus* ~ 72hrs post envenomation and treated with polyvalent antivenom and fresh frozen plasma.

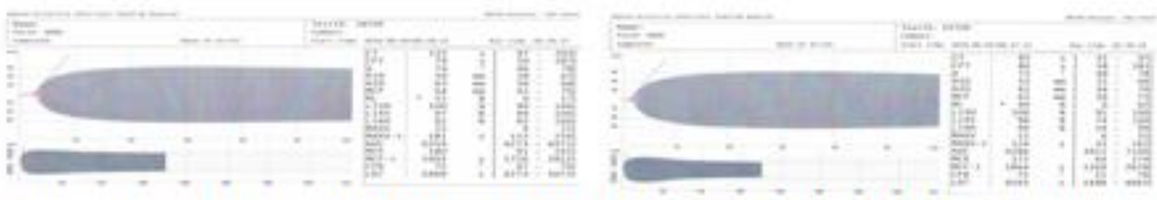

Fig. 4 - Thremoboelastometry (INTEM and EXTEM) traces of a dog envenomed by *E. coloratus* ~ 7 days post envenomation.

Conclusions:

This is the first reported naturally-occurring *E. coloratus* envenomation in a dog. It led to VICC, manifested by markedly prolonged clotting times and severe hypofibrinogenemia. Marked general hypocoagulability was noted in both the EXTEM and INTEM. Based on the present TEM results, the venom-induced hypocoagulability components responded to antivenoum and FFP. The efficacy of a given antivenom is largely considered restricted to envenomations by the same snake species whose venom was used for producing this same antivenom, due to ubiquitous venom composition variations at the species taxonomy level. Evidence shows that anti-*E. ocellatus* monospecific antivenom EchiTabG neutralized the lethal effects of venoms of *Echis* species, representing each taxonomic group within this genus in Africa. In our hospital, specific *E. coloratus* antivenom was unavailable at the time, however, a polyvalent F(ab') snake antivenom against a variety of Mediterranean and North African snake venoms (including Viperidae) is used, recommended by the manufacturer against *E. ocellatus* and *E. pyramidum* envenomations was available. Based on the present favorable response to the administration of this antivenom, it possibly has some neutralizing activity against *E. coloratus* venom. This should be cautiously interpreted because treatment also included FFP and tranexamic acid, which might have also positively affected hemostasis and the overall good outcome.

To conclude, this is the first report of a naturally occurring *E. coloratus* envenomation in dogs, and the first report of TEM resuls in such envenomation. TEM was useful for monitoring the overall hemostatic status and planning therapy. The snake species responsible for an envenomation when the envenoming snake species is uncertain, the identity of the snake species can be presumed based on the different TEM characteristics of *D. palaestinae* and *E. coloratus* envenomations, thereby guiding the specific antivenom therapy. In absence of adequate data of the evenoming snake species, clinical decisions regarding FFP or polyvalent antivenom therapy, should be based on the clinical signs and laboratory abnormalities, while TEM provides additional useful information.

Case report:

A 6-year old, 27 kg, female neutered Belgian shepherd dog, was presented in shock, with oral mucosal bleeding and swelling due to a snakebite. At that point, the envenoming snake's species was unclear. Laboratory tests showed mild hemoconcentration, platelet count within reference interval (RI), mild azotemia and prolonged prothrombin time (PT) and activated partial thromboplastin time (aPTT). As the envenoming snake species was unclear, and since *Daboia palaestinae* is by far the most prevalent venomous snake in Israel, the dog received 1 unit of monovalent immunoglobulin (Ig) G *D. palaestinae* equine serum-based antivenom. Clinical improvement was noted 14 hours from initiation of treatment, although PT and aPTT were both infinitely prolonged (hence unmeasurable), while fibrinogen concentration was below detection limit. The owners elected to discharge the dog against medical advice. It was readmitted 5 hours later, due to active bleeding from the envenomation site on the oral mucosa, and the previous IV catheter site and in shock. At that time, the snake's carcass was brought, which was identified as *E. coloratus*.. The hematocrit was 0.38 L/L (RI, 0.37-0.55) and total plasma protein concentration (TPP) was 50 g/L (RI, 55-77). The PT and aPTT were infinite and fibrinogen concentration was below detection limit. Whole blood TEM with kaolin and tissue factor as activators (INTEM and EXTEM, respectively) showed severe hypocoagulability with prolonged clot formation times (Fig.1). Treatment included 1 unit (10 mL) of polyvalent antivenom containing antibodies against venoms of several Mediterranean snakes, which is also recommended by the manufacturer for treating other Viperidae (i.e., *E. ocellatus* and *E. pyramidum*) and elapid snake envenomations. Additionally, canine fresh frozen plasma (FFP; 2 units) was administered IV over 8 hours. Although the dog had improved clinically after 4 hours of treatment, bleeding persisted. The dog became progressively more anemic (hematocrit 0.23 L/L) and hypoproteinemic (TPP, 41 g/L) 1 day later. Therefore, an additional polyvalent antivenom unit was given IV, as well as 1 canine packed red blood cells unit. Within 5 hours from administration of the second antivenom dose, bleeding had markedly decreased, and vital signs had improved. Nevertheless, anemia had progressively worsened (hematocrit 0.18 L/L at 37 hours post initial presentation). Repeat INTEM and EXTEM (Fig. 2) still showed marked hpyocoagulability. It was then administered IV a third polyvalent antivenom unit and a third canine FFP unit. Bleeding ceased completely 12 hours later, and the hematocrit (0.22 L/L) and TPP (60 g/L) had improved. Stained blood smear microscopic examination showed evidence of erythroid regeneration. Repeat EXTEM and INTEM showed improvement of most parameters (Fig. 3). The dog was then discharged at his owner's request. It was presented 3 days later for recheck, and was bright, alert and responsive, with normal vital signs. The hematocrit (0.31 L/L) and TPP (72 g/L) had improved. The PT, aPTT, fibrinogen concentration and INTEM and EXTEM analytes had all normalized (Fig. 4). D-dimer concentration was normal. A week later, the owners reported that the dog was normal.