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Point of care testing in snakebite: an envenomed case with false negative coagulation studies

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Early detection of venom induced consumption coagulopathy (VICC) in Australian snake bite is important for early antivenom administration.\(^1\) However, many patients present to smaller or rural hospitals where on-site laboratory coagulations studies are not available. Point-of-care (POC) devices for an international normalized ratio (INR) and D-dimer have become available and have been used in this setting.

A 43 year old female presented to a small rural hospital in southwest Western Australia an hour after being bitten while putting her hand in a fish pond. She immediately saw “blood on her knuckle”, felt unwell with nausea and vomited twice, experienced chest tightness and felt faint. She did not apply first aid and washed the bite site. She was well on arrival to hospital, with no bleeding, no ptosis and normal vital signs. An INR was performed with a POC device (Alere\(^\text{TM}\) INRatio2) which was 1.3 on admission and 1.5 half an hour later. A pressure bandage was applied and she was transferred to the regional base hospital.

On arrival at the base hospital 4 hours post-bite the patient felt better and the INR was 0.9 on a second POC device (Roche\(^\text{TM}\) CoaguChek). Blood collected at the same time was sent to the on-site laboratory where the INR was unrecordable. On examination there was oozing from the venipuncture site and no neurotoxicity. A snake venom detection kit was positive for tiger snake venom on urine. Two vials of Tiger snake antivenom were given and the patient enrolled in the Australian Snakebite Project (ASP) randomised controlled trial of fresh frozen plasma (FFP).\(^2\) The patient was randomised to receive 4 units of FFP given immediately after antivenom. Additional serum and citrate samples were collected for ASP. A D-dimer performed on a POC device (Roche\(^\text{TM}\) Cobas H232) was 0.38 mg/L (< 0.36). The patient had no immediate adverse reaction to antivenom or FFP and had an uneventful recovery being discharged on day 3. Serial INR results are shown in figure 1. Serial D-dimers
done on the POC device ranged from 0.24 to 0.73 mg/L. The creatine kinase peaked at 432 IU/L. On follow up, the patient had symptoms consistent with mild serum sickness.

Tiger snake venom (*Notechis* spp.) was detected at a concentration of 5.1ng/mL in serum prior to antivenom and was undetectable post-antivenom. Repeat coagulation studies on admission gave an INR >12, activated partial thromboplastin time (aPTT) >180 seconds, undetectable fibrinogen and a D-dimer of 812 mg/L (<0.25). At 9 hours post-bite the INR was 2.2, aPTT, 39.5 seconds, fibrinogen. 0.4 g/L and D-dimer, 458 mg/L.

POC testing results for the INR and D-dimer were incorrect and misleading in this patient with tiger snake envenoming. This may have resulted in delayed treatment if the patient had not been transferred to a hospital equipped for laboratory confirmation of the INR. In addition to identifying problems with POC testing in VICC, the case underlines the importance of the history of a suspected snake bite and early systemic symptoms in the patient.

Misleading POC INR results have been reported previously with laboratory confirmed severe VICC.3, 4 This suggests that POC testing for INR and D-Dimer are likely to be unreliable in VICC and formal laboratory testing is recommended until POC testing devices are formally assessed in VICC. Patients with suspected snakebite should be managed in hospitals with laboratory based INR and aPTT testing available or be transferred to a larger hospital.

It remains unclear whether this problem applies to all POC testing systems. Currently no other bedside clotting test is available, including the 20 minute whole blood clotting test which has also been shown to be unreliable5 and glass tubes are not readily available in Australia. There is an urgent need for a rapid bedside clotting test for VICC.
Figure 1: Time course of the laboratory INR compared to the INR derived from the POC testing devices.
References


