

Lessons from practice

Platypus envenomation

Clinical record

A 62-year-old woman presented to an emergency department with severe pain two hours after rescuing a wild platypus, with two penetrating injuries to her right hand (Box 1 and Box 2). There were two deep puncture wounds (one to the right hypothenar eminence and one to the dorsum of the hand) with oedema and erythema spreading proximally. She had a heart rate of 99 beats/min, blood pressure of 181/124 mmHg, respiratory rate of 18 breaths/min and SpO₂ of 95%. She was treated with multimodal analgesia for severe localised pain (paracetamol 1 g, oral; ibuprofen 400 mg, oral; oxycodone 5 mg, oral; and ketamine 7 mg, intravenous) with a reduction in her self-reported pain score from 10/10 to 2/10 over 90 minutes. There were concerns for deep tissue damage and infection risk. Her arm was elevated and she received 4 g piperacillin/0.5 g tazobactam intravenous. She was referred to the plastic surgery team for a planned washout and debridement the following afternoon. The operation was performed under general anaesthetic without local anaesthesia. Operative findings included two deep puncture wounds with a small volume of superficial pus under devitalised skin, with no injury to neurovascular structures. Subsequent cultures grew *Hafnia alvei* and other unidentifiable species. The patient reported being pain-free the following morning. She was discharged on oral 160 mg trimethoprim/800 mg sulfamethoxazole twice a day for five days in accordance with susceptibility results and followed up with a hand physiotherapist. She reported ongoing allodynia and intermittent pain that resolved by the three-month follow-up. She required occasional pain relief with oxycodone (5 mg at night) for up to three weeks after the envenomation.

Discussion

The platypus (*Ornithorhynchus anatinus*) is an aquatic monotreme native to eastern Australia and Tasmania (Box 3). The male has a spur on each hind leg with a crural (venom) gland underneath the thigh muscle (Box 4). Envenomation occurs when the hind legs are used to grasp the victim and the crural gland is squeezed, releasing venom through the spur.¹ There is little known about platypus venom, which contains multiple proteins and peptides.^{1,2} Ornithorhynchus venom nerve growth factor (OvNGF) is thought to contribute to allodynia and pain.¹ Other peptides in the venom are thought to impart greater stability of the venom in vivo, which may contribute to the long duration of pain reported by exposed individuals.¹ In vitro, crude venom causes smooth muscle relaxation, haemolysis and calcium-dependent non-specific cation current into neuronal cells, which in vivo may produce oedema, nerve firing and pain.³

There are few recorded platypus envenomations in humans, of which only two have detailed published accounts.^{2,4} In both cases, severe localised pain and oedema were reported lasting over six days.

Given the relative rarity of platypus envenomation in humans, clinicians may consider using treatment modalities from other Australian envenomations, such as pressure bandage immobilisation (PBI) and hot water immersion. PBI is commonly used in Australia to reduce systemic spread of venom through the lymphatic system in suspected snake or Sydney funnel-web spider (*Atrax robustus*) bites. Case reports for platypus envenomation have identified lymphangitis and pain spreading along lymphatics, but there is insufficient data to confirm that the venom spreads systemically in this manner.

1 Penetrating wound to dorsum aspect of right hand with evidence of swelling to the hand tracking proximally into the forearm



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- 2 Penetrating wound to the volar aspect of right hand between hypothenar and thenar eminencies. There is marked swelling to the hand, with some tracking proximally noted on the ulnar aspect of the forearm



- 3 The platypus (*Ornithorhynchus anatinus*) is an aquatic monotreme native to eastern Australia and Tasmania



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Incorrectly applied PBI can cause rhabdomyolysis and compartment syndrome if applied too tight or if left on for a prolonged period (more than six hours).⁵ As the symptoms of platypus envenomation are localised, there is limited benefit in the use of PBI, which aims to prevent toxin spreading systemically via the lymphatic system. Hot water immersion is recommended in many Australian marine envenomations (eg, bluebottles, fish stings). Theoretically, marine and fish venom is heat labile, with hot water immersion thought to destroy the venom protein; however, it is not uncommon for pain to recur on removal of heat source, which suggests that heat may be analgesic via other means.⁶ It is likely that platypus venom is heat stable as the platypus is a warm-blooded mammal with a body temperature of 32°C. Hot water immersion was attempted for one case of platypus envenomation but was not tolerated due to hyperalgesia.² Hot or cold packs could be tested as part of non-pharmacological adjuvant analgesia,

but are unlikely to have a role in denaturing platypus venom.

Pain management includes simple analgesia (paracetamol, non-steroidal anti-inflammatory drugs) and narcotics (intravenous or oral). Adjuvant agents, such as ketamine, may be of benefit. Pain may be refractory and regional anaesthesia should be considered for this type of pain.^{2,4} Penetrating hand injuries are at a high risk of deep tissue infection and may benefit from surgical washout.⁷ Platypus-related injuries frequently involve the hand or wrist, as they typically occur when handling the male platypus.^{2,4} Although the indication for washout in this patient was to debride tissue and reduce infection, it was later thought by the local surgical team that the post-operative pain reduction may be partly due to reduced venom load in tissues.

Platypus envenomation remains a rare toxicological presentation. The main concerns are refractory pain

4 Platypus spur with 1 cm markings at base of photo for scale



Image provided by the Tasmanian Museum and Art Gallery, specimen number TMAG A4497. ◆

and risk of deep tissue infection following penetrating injury. Pain management should include regional anaesthesia if standard approaches are ineffective. There is no evidence to support the use of PBI. Surgical debridement may be required for penetrating hand injuries, and in this case was associated with a reduction in pain and no further opioid analgesia requirement.

Lessons from practice

- Platypus envenomation presents with severe pain and swelling.
- Pain may be refractory to standard opioid analgesia, and regional anaesthesia should be considered.
- Surgical washout should be considered for significant penetrating injuries, and this may have a role in reducing infection risk and diluting venom.
- There is no role for pressure bandage immobilisation; however, there may be a role for heat as a non-pharmacological analgesic adjuvant.

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