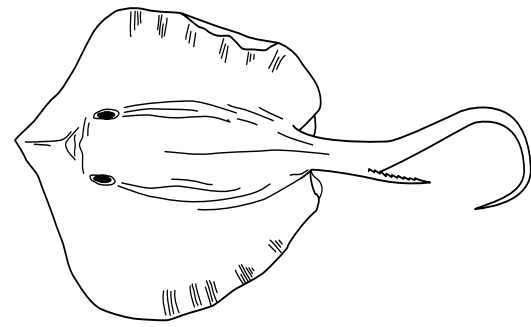


Survivor of a stingray injury to the heart

Beatrix F Weiss and Hugh D Wolfenden



Injuries to the extremities from stingray barbs are not uncommon along the Australian seaboard. Cardiac injuries from stingray barbs are rare, even worldwide, and all but one have been fatal.

We report a survivor of a cardiac injury caused by a stingray barb. Penetration of a body cavity by a stingray barb requires early surgical referral and management. (MJA 2001; 175: 33-34)

AUSTRALIAN COASTAL WATERS contain many species of stingrays, and injuries to the extremities caused by the barb or barbs on a stingray's tail are not uncommon. These wounds are painful, and may develop necrosis and secondary infection. Penetration of a body cavity by a stingray barb may cause major morbidity and even death, particularly with cardiac injury, and requires early surgical referral and management.

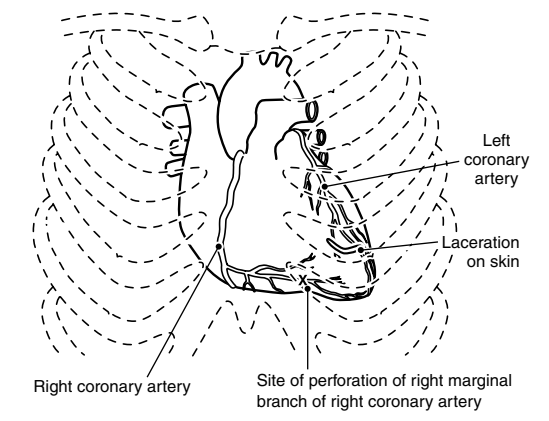
Clinical record

A 33-year-old man was snorkelling at Coogee, a popular Sydney swimming beach, when he was noticed to be in distress. He was rescued by lifeguards, and found to be unconscious, not breathing, and had an increased heart rate (150 beats/min). After a short period of expired-air resuscitation performed on the beach, he regained consciousness and said he had been struck by the tail of a stingray. He complained of difficulty breathing and severe, left-sided chest pain where the tail had struck.

When paramedics arrived he was cyanosed, with a systolic blood pressure of 75 mmHg and sinus tachycardia (heart rate, 150 beats/min), but with a normal level of consciousness. He was given 500 mL of Haemacel (Aventis Pharma, Sydney, NSW) on the way to hospital, with no improvement in haemodynamics.

On arrival at the emergency department, he remained in cardiogenic shock, with a systolic blood pressure of 70 mmHg, sinus tachycardia (heart rate, 140 beats/min), hypothermia (temperature, 31°C), poor peripheral perfusion and central cyanosis. His Glasgow coma score had deteriorated from 15 (normal) at the beach to 10 on arrival at hospital. Initial arterial blood gas results on oxygen 14 L/min

Entry point of the stingray's barb in relation to the point of injury



were pH, 7.15 (normal range, 7.38–7.42); PaO₂, 74 mmHg; PaCO₂, 61 mmHg (normal ranges breathing room air, 75–99 mmHg and 35–45 mmHg, respectively); and base excess, -16 (a finding indicative of metabolic acidosis with partial respiratory acidosis). The patient was administered 1 L of Haemacel with little haemodynamic effect, and was intubated. He had a 2 cm laceration in the lower left parasternal region, and distended neck veins. A central line was inserted and his central venous pressure measured at 20 mmHg (normal range, 0–8 mmHg). After

the administration of 1 mg of adrenalin intravenously, his systolic blood pressure increased to 150 mmHg, but his peripheral perfusion remained poor and his heart rate remained raised at 130 beats/min.

Transthoracic echocardiography revealed a moderate pericardial effusion with diastolic collapse of the right atrium and right ventricle, consistent with tamponade, and what appeared to be stranded foreign material was seen in the pericardial space. An echocardiography-guided pericardiocentesis was performed, and 150 mL of dark blood was drained. This resulted in prompt restoration of blood pressure to 170/80 mmHg, and reduction of both heart rate (to 100 beats/min) and central venous pressure (to 11 mmHg).

Because of the possibility of foreign material in the pericardial space and the known necrotic effects of stingray venom, the patient was transferred to the operating theatre, where a median sternotomy and exploration of the pericardial space and left pleural cavity was performed. A puncture wound that had spontaneously sealed over was found in the right marginal branch of the right coronary artery. There was no injury to the right ventricular muscle. No foreign material, only strands of fibrin, and no barb remnants were found. There was moderate ecchymosis of the left extrapericardial and extrapleural tissues, but no breach of the left pleural space.

The pericardial space and extrapericardial tissues were copiously irrigated to remove all potential venom. The site of barb entry into the chest was similarly irrigated, explored and debrided. The patient was given intravenous cefotaxime 1 g three times a day and metronidazole 500 mg three times a day for five days.

Illustrations courtesy A Vlachoulis, Prince of Wales Hospital, Medical Illustrations Unit, Sydney, NSW.

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Current management principles for stingray injuries*⁸

- Immersion of the affected part in hot water for at least 30 minutes for pain relief (relief is generally only effective while the affected part remains immersed).
- Radiography of the affected body part to exclude the presence of cartilaginous barb remnants.
- Local infiltration of plain lignocaine (the use of lignocaine with adrenalin is contraindicated, as it delays microvascular clearance of venom from the wound and thus further increases the risk of necrosis).
- Systemic analgesia.
- Careful wound examination, removal of foreign material, irrigation and debridement.
- Heal by secondary intention; consider use of an alginate-based dressing.¹⁴
- Antibiotic cover using broad-spectrum antibiotics for large or established wounds, or for penetrating wounds (eg, doxycycline 100 mg daily, or ciprofloxacin 500 mg twice daily, or as dictated by wound cultures). (NB: It is important to specify seawater involvement when submitting a swab or specimens for culture.¹⁴)
- Tetanus prophylaxis.¹⁵
- Early referral of confirmed or suspected penetrating injuries of chest or abdomen.

*Based on the knowledge of the effects of venom and sequelae of barb injury.

His recovery was uncomplicated. He was discharged home on the sixth day after operation and was well at the two-month follow-up.

Discussion

Stingrays are the largest of the venomous fish, and there are many species in Australian coastal waters.¹ The tail of the stingray carries at least one barb or spine that may be up to 37 cm long.² The barbs are cartilaginous and retroserrate, and covered by a film of venom and mucus contained within an integumentary sheath.³ Two longitudinal ventrolateral grooves contain venom-secreting glands.³ Stingrays usually lie in sand on the seabed. When disturbed by pressure over the dorsum of the body, the tail is thrust upward and forward, driving the barb into the victim.⁴ Rupture of the integumentary sheath on penetration allows the venom to be released.

The venom contains toxic proteins, including phosphodiesterases, 5' nucleotidases and serotonin,^{3,5} and many other unidentified components. The effects of the venom may be local and/or systemic. Local effects include severe pain at the site of injury, and tissue necrosis.⁵ Systemic effects include nausea, vomiting, salivation, sweating, respiratory depression, muscle fasciculations, convulsions, cramping abdominal pain, arrhythmias (first-, second-, third-degree heart block, and asystole), myocardial ischaemia, and, rarely, death.^{4,7} Many of the systemic effects have been documented only in patients with viscous penetration, and not in those with peripheral stingray injuries.

Local venom effects are usually more troublesome in peripheral stab injuries, but if the barb pierces a vital organ or structure mechanical damage may be more dangerous than the venom effects.

Instances of serious, penetrating, non-cardiac injuries include a pyopneumothorax three days after netting a stingray and sustaining a thoracic barb injury;⁸ penetration of the liver;⁹ multiple bowel perforations;⁶ and laceration of a femoral artery, with death caused by exsanguination.¹⁰

Penetrating cardiac stingray barb injuries have generally been fatal.

■ In 1938, an adult woman in New Zealand died after a stab wound to the heart by a stingray. At autopsy her ventricles were found to have been completely transfixated by the barb.¹¹

■ In 1945, an Australian soldier died after a stab wound to the left ventricle, sustained while swimming in seawater baths near Melbourne, Victoria.¹²

■ In 1989, a 12-year-old boy in Queensland died six days after a penetrating chest injury from a stingray barb. Death was caused by venom-induced myocardial necrosis, with subsequent perforation of the right ventricle and tamponade.⁸

There has been one documented survivor of a cardiac stingray barb injury.¹³ The victim was a 28-year-old fisherman who sustained two barb injuries to the left side of the chest from a stingray caught in a fishing net. Both barbs broke off in the chest wall; one lodged in subcutaneous tissue only, and the other had penetrated the pleura and pericardium into the muscle of the right ventricle, but not into the ventricular cavity. There was no haemopericardium or haemothorax. Both barbs were removed under local anaesthesia, and the patient was discharged from hospital 18 days after admission.

Our patient was fortunate to have sustained an injury to a coronary artery rather than to the myocardium. The artery, by bleeding, immediately washed the venom away, whereas injury to the myocardium is difficult to debride and carries a risk of delayed necrosis and perforation.

Current management principles for stingray injuries are listed in the Box.

Acknowledgements

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