

Propeller and jet-ski injuries during Christmas and New Year in Western Australia

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This is the first published case series of patients with injuries from watercraft propellers and jet skis. Five patients presented to the level-one trauma centre of Western Australia with such injuries over 10 days during the 2010–2011 Christmas holidays; all required surgery, and all but one sustained multiple, severe injuries.

Clinical records

Patient 1

A 61-year-old man was pushing his boat into the water when he lost his footing and struck the propeller, sustaining a laceration to the lateral aspect of his left ankle. He presented to the emergency department (ED) of a peripheral hospital where his wound was irrigated and sutured.

The patient presented to a general practitioner four days later with a painful and erythematous ankle. Erythromycin was commenced and sutures were removed. Four days later, he presented to our ED with worsening pain and spreading erythema and feeling generally unwell. At this time, his wound was intact. He was diagnosed with cellulitis and commenced on doxycycline and cephazolin. The infection abated marginally on the antibiotic therapy, with a decrease in inflammatory markers (the C-reactive protein level and white cell count), but the infection failed to resolve completely. Subsequent intraoperative wound exploration revealed several pockets of debris or soil contamination, and after washout, the wound was closed. The patient subsequently recovered well.

Patient 2

A 28-year-old man was riding his jet ski at high speed when he lost control, hit some rocks and was thrown, landing on his right side. He sustained an open fracture of the middle third of the right ulna, fractures of the right distal radius and ulnar styloid, an extra-articular comminuted fracture of the right scapula, right-sided posterior fractures of ribs 9–12 and a dislocation of the right patella with rupture of the anterior and posterior cruciate and medial collateral ligaments.

Reduction of the dislocated patella was performed in the ED before the patient was transferred to theatre. Debridement, washout and open reduction with internal fixation of the ulnar shaft and distal radius fractures were performed. The cruciate and medial collateral ligaments were reconstructed 2 weeks later. Antibiotic therapy with cephazolin, metronidazole and ciprofloxacin was provided for 6 days, as advised by an infectious diseases specialist.

The patient was discharged from hospital with plans for ongoing physiotherapy and rehabilitation for his knee.

Injury to Patient 3 and surgical amputation of the leg



A. Surgical amputation just below the level of the tibial tubercle (insertion of the patellar ligament).
B. X-ray showing postoperative anteroposterior view.
C. X-ray showing postoperative lateral view.

Patient 3

A 23-year-old man was injured while he and his colleagues were riding jet skis after a Christmas party. A colleague collided with him at high speed, crushing his left leg between their jet skis and causing a subtotal amputation just below the knee; only a small bridge of skin remained. The leg was deemed unsalvageable and the amputation was completed in theatre (Box). Several debridements and washouts were performed before the stump was covered with a latissimus dorsi flap. Antibiotic therapy with intra-

venous meropenem and ciprofloxacin was given for 22 days on the advice of a clinical microbiologist.

The patient will require extensive physiotherapy and occupational therapy during his rehabilitation. He will also need a prosthesis, which will be challenging to develop because of the fastidious nature of the flap and the very short stump (Box).

Patient 4

A 35-year-old man's left leg was caught by the propeller of his newly acquired speedboat as he attempted to connect its anchor. He bled profusely and the earliest recorded systolic blood pressure at the scene was 60 mmHg. In the ED, the primary threat to his life was severe hypovolaemic shock from exsanguination, and aggressive fluid resuscitation was instituted, involving multiple units of packed red blood cells. A comminuted fracture of the inferior pole of the left patella and extensive soft tissue injury to the posteromedial aspect of the left thigh were noted before the patient was transferred urgently to theatre.

Surgical exploration showed division of the patellar tendon and medial quadriceps tendon as well as transection of the left superficial femoral artery, which was on view.

Saphenous vein graft repair was performed, and coverage was achieved with the viable proximal two-thirds of the adductor longus muscle. Intraosseous repairs of the patellar and quadriceps tendons were also performed. After repeated debridement and washout, the large soft tissue defect was covered with a flap.

Patient 5

A 21-year-old woman was riding in a large rubber tube being towed by a powerboat when she fell out of the tube. When she attempted to climb into the boat, both her legs made contact with the propeller. She sustained limb-threatening soft-tissue damage to both proximal thighs including bilateral sciatic nerve transection, left superficial and profunda femoris artery transections and incomplete left femoral nerve disruption. A displaced open comminuted fracture of the proximal right femur further complicated her injuries.

Left superficial femoral artery saphenous vein graft and left leg fasciotomy were performed. Her femur fracture was controlled with an external fixator.

Multiple debridements, washouts and vacuum-assisted wound closure dressing changes were undertaken on both legs for wound management. One week later, when the wounds were clean, bilateral sciatic nerve repairs were performed using sural and common peroneal nerve grafts.

The patient has been without any lower limb function since arrival at the hospital and the success of her bilateral sciatic nerve repair remains to be seen over the coming months to years.

Discussion

This cluster of incidents occurred over a short period of time in a city whose population has ready access to a range of recreational activities involving watercraft. Western Australia has seen a trend in recent years towards smaller, propeller-driven boats, possibly as a result of the global

financial crisis. The number of newly registered large cabin-cruiser boats in WA dropped steadily from 572 in 2006 to 332 in 2010. During the same period, the number of new jet and racing boat purchases remained largely unchanged (17 in 2006 and 18 in 2010, with moderate fluctuations in between these years).¹ Furthermore, in the period from December 2006 to March 2011, there were 72 boat and watercraft accidents in WA, seven of which were caused by the propeller (unpublished WA watercraft injury statistics for 2006–2010 held by the Royal Perth Hospital trauma registry). This occurred despite appropriate legislation for licensing, speed restrictions and operating watercraft under the influence of alcohol.

Watercraft and propeller injuries are often characterised by severe initial injury and physiological insult, including severe haemorrhage. The cutting nature and high speed of propellers results in repeated wounding of the body at multiple levels, greatly multiplying the risk of irreparable damage to deep neurovascular structures. Also, serious complications can ensue after the initial damage control period, particularly uncontrollable wound infection, often with unusual bacteria which may not be detected by routine culture methods.^{2,3} This may necessitate amputation, even if a limb may initially appear to have been saved.

There has been little progress in the design of safety features for power boats in recent years, with the primary focus on fire management and warning signage around the hull. One maker of jet skis has developed promising features, including a "learner key" which limits speed and a "braking" system. Such innovations may reduce injuries, but the problem of the exposed propeller remains.

A concept worth mentioning is that of a propeller guard.⁴ The guard provides a barrier to the cutting edge of the blades and eliminates the risk of a person making contact with a running propeller. We believe that this is still a relatively unknown idea in Australia, and some retailers suggest that uptake may not be universal among new boat owners. Staff at a major Perth boating retailer believe that people purchasing a boat for speed or associated recreational activities like skiing may be deterred by the potential loss of speed.

This case series highlights the issue of injury from boating and small watercraft activities, as well as the need for increased public awareness of these risks. Currently, there is little coverage of this issue in the Australian literature. We believe that the medical community should provide accurate and relevant data, and embrace our role as leaders and health advocates by working with government and other non-governmental organisations to build effective public awareness campaigns and to drive manufacturers and retailers to produce and sell safer products.

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