Deep cutting injury from the edges of a snowboard

T Matsunaga, S Saitoh, H Tanikawa, M Hayashi, M Ohira, T Kimura

A laceration deep enough to reach the bone occurs very rarely in skiing or snowboarding. Two such cases are presented here. In one case, the popliteal fossa of a skier was cut during a collision with a snowboarder. All structures posterior to the knee were severed and the leg became ischaemic. The other case was of a snowboarder who sustained a deep cut to the distal forearm during landing after a jump, resulting in a “spaghetti wrist”.

Snowboarding has become one of the most popular winter sports not only in European countries but also in Japan, especially among young people. Many enjoy snowboarding and skiing on relatively small and crowded public slopes in Japan. As a result, lacerations from the edges of the snowboard can be caused not only to snowboarders themselves during falls but also by snowboarders in collisions. Although several studies on lacerations caused by snowboarding have been published, cutting injuries have never received much attention probably because most can successfully be treated by irrigation and simple closure. There have been no reports on deep lacerations caused by snowboard edges.

We recently encountered two patients who sustained cuts deep enough to reach the bone from snowboard edges, resulting in life or limb threatening injury.

CASE REPORTS

Case 1

A 25 year old female skier was hit from behind by a snowboarder while she was standing on a crowded mountain slope. Her left popliteal region was cut by the edge of the snowboard. She was drowsy from haemorrhagic shock when she arrived at the hospital one and a half hours later with a blood pressure of 73/38 mm Hg, and the pulse was 108 per minute. A tourniquet at the thigh was inflated before the bandage was taken off to avoid massive bleeding from the wound. There was a sharp, transverse, 8 cm long cut in her left popliteal fossa (fig 1), which completely impeded movement of the ankle and toes. The limb distal to the wound was anaesthetic, as well as ischaemic. Plain radiographs revealed air reaching the posterior aspect of the proximal tibia and fibula and a fracture in the neck of the fibula (fig 2).

Surgery started about six hours after the injury. The popliteal artery and vein, the tibial and common peroneal nerves, both heads of the gastrocnemius, and the popliteal muscle were found to have been completely severed by the wound, which reached the posterior aspect of the proximal tibia and fibula and had caused a fracture in the neck of the fibula. The popliteal artery and vein were repaired by end to end anastomosis, and the severed muscles were sutured. The two nerves were repaired by epineural suturing under a surgical microscope.

Haemoglobin concentration and packed cell volume after the operation were 87 g/l and 25.4% respectively; 1600 ml of blood was transfused during surgery, and an additional 800 ml over the next two days. Magnetic resonance angiography two months later showed patency of the repaired popliteal artery with little stenosis (fig 3). The patient became ambulatory with the aid of a short leg brace two years after surgery in conjunction with some recovery in her motor and sensory functions.

Case 2

A 21 year old snowboarder sustained a deep cut to his left forearm from the edge of his own board when he landed after a jump (fig 4). He was wearing only a short sleeved shirt. He had difficulty flexing his thumb and fingers and the median nerve area was anaesthetic. Radiographs showed air deep in the soft tissue (fig 5). During surgery, the wound was found to have reached the radius, and 10 structures comprising the radial artery, median nerve and the tendons of the palmaris longus as well as the flexor carpi radialis, flexor carpi ulnaris, flexor digitorum superficialis (II, III, IV, V), and flexor pollicis longus were completely severed. The median nerve as well as the severed tendons were repaired after thorough irrigation. The wrist was immobilised for four weeks followed by active range of motion exercise to the wrist and fingers. Recovery of motion of the thumb and fingers was obtained in three months. Protective sensation in the median nerve area and functional recovery in the thenar muscles were restored 12 months after surgery.

DISCUSSION

Lacerations incurred during snowboarding or skiing have not received much attention so little information is available.

There are probably two reasons for this. Firstly, the incidence of lacerations is relatively low in Europe and North America compared with other injuries such as sprains and contusions. Chow et al analysed data on 390 injured snowboarders and showed that lacerations accounted for only 5.6% of all injuries. They accounted for about 5–6% of the 487 snowboarding injury cases of Calle and Evans, and only 0.44% of upper extremity snowboarding injuries according to Iezikowski et al. Only one recent paper from England reported a higher incidence of lacerations: 18.8% in snowboarder injuries and 9.6% in skier injuries.

The other reason is that lacerations are less problematic to treat than fractures or dislocations. Most lacerations in skiing and snowboarding are shallow and not contaminated, and can usually be treated successfully by irrigation, debridement, and simple closure. Sacco et al reported that no patients were admitted to hospital for treatment of lacerations. A deep laceration sustained during skiing or snowboarding thus appears to be extremely rare.

Why then did our patients sustain deep lacerations, which rarely occur during skiing and snowboarding? Patient 1 was a skier who was standing still on a mountain slope when a snowboarder hit her from behind with the edge of the snowboard. It was in the middle of December and therefore...
relatively early in the winter season. As it was the beginning of the winter season, young enthusiastic people had rushed to the Hakuba area for skiing or snowboarding. In addition, because of the time of year, there was not much snow, so only a narrow strip of the mountain slope was covered with snow which had been made by artificial snow making machines. As a result, the slope was extremely crowded with both skiers and snowboarders. The snowboarder who collided with the patient came down the crowded, narrow slope too fast to be able to stop himself.

Patient 2 was a snowboarder who sustained the cut when he landed after a jump. It was in the middle of March and was an exceptionally hot day for the time of year so the patient was wearing only a short sleeved T shirt. He was an experienced snowboarder and was trying a difficult routine in the air on a half pipe slope in which he had to touch the edges of the snowboard with his hand. He lost his balance during the routine and hit his forearm with the edge of the snowboard while he landed.
Circulation in the hand was just preserved in patient 2 because the ulnar artery escaped injury, but the affected limb became ischaemic in patient 1. Disruption of major arteries such as the popliteal artery may cause not only massive bleeding but also ischaemia in the distal extremity. To our knowledge, there has been no previous report of a patient severing the popliteal vessels with the edge of a snowboard. Repair of the popliteal artery was essential for this patient to control bleeding as well as to save the extremity distal to the knee. Repair of injured popliteal vessels is also important for microsurgical reconstructive surgery of skin or bone defects that may become necessary afterwards.12

The term “spaghetti wrist” injury has been commonly used for “extensive” volar wrist lacerations with no clear definition of the number of severed structures. Puckett and Meyer13 applied the term to a laceration in which three or more structures were severed, and Katz14 defined it as a laceration in which 10 or more structures out of 15, or 16 if the palmaris longus tendon is included, were transected. Ten structures, including the radial artery and median nerve, were severed in the hand of patient 2, thus satisfying the strict criteria of Katz for the spaghetti wrist. Spaghetti wrists reported to date have been caused by broken glass, knives, machetes, and sharp equipment at work,15–20 but there has been no report of their occurrence during skiing or snowboarding. Gross hand function is reported to recover well because of relatively little adhesion after flexor tendon repairs in zone 5, but functions in the intrinsic muscles and fine finger tip sensation, which depend on recovery of repaired peripheral nerves, do not appear to be restored as satisfactorily.13 16 18

The two cases reported here show that deep lacerations can be inflicted by the sharp edges of a snowboard. Prevention of snowboarding injuries by means of education, training, and protective equipment such as helmets or braces has been advocated.3 Three points may be suggested from this report to decrease deep lacerations from snowboard edges. Firstly, all skiers/snowboarders should understand that collisions and aerial manoeuvres can lead to serious injuries as previous studies on skiing/snowboarding injury suggest. Patient 1 in this study sustained injury during a collision with a snowboarder and patient 2 during landing after a jump. As high running speeds are associated with collisions, skiers/snowboarders should always keep their running speed under control according to their ability, experience, and the conditions of the slope to reduce collisions. Speed reduction may partly be achieved through education or by bringing the attention of skiers/snowboarders on the slopes to the dangers of collisions. Although improvement in slope grooming techniques is generally assumed to reduce injuries during skiing/snowboarding,21 limited grooming that leaves some moguls untreated has been suggested by others to discourage high speeds. Skiers/snowboarders should, of course, keep their routines in the air within certain safety limits in order to decrease accidents during or after manoeuvres.

Secondly, skiers/snowboarders should wear appropriate clothing not only on the lower extremities but also on the arms and hands. Few skiers/snowboarders wear wrist protectors, or even helmets, in Japan. The forearm was exposed in patient 2 as he was only wearing a short sleeved T shirt when he sustained the cut. The cut may have been more shallow if he had been wearing the usual snowboard clothing or protectors such as “wrist guards” which are worn in the United States and have proved to be effective in reducing fractures and sprains around the wrist.22 However, ordinary skiing or snowboarding wear could not have completely prevented injury in either patient. Patient 1 was wearing a pair of ordinary skiing pants which had been cut by the edges of the snowboard. Development of tougher but non-restrictive ski wear is expected in the near future.

Thirdly, measures should be taken to prevent the presence of too many skiers/snowboarders on a slope in order to reduce collisions, although keeping the running speed under control by other measures such as education, limited slope grooming, announcing that the slope is very crowded, or calling for attention to refrain from running down at a high speed are all very important. There should be an

Figure 4 Wound in the left forearm caused by a snowboard in patient 2.

Figure 5 A lateral radiograph of the left arm of patient 2. Air (arrow) is seen deep in the soft tissue of the left forearm suggesting that the cut may have reached the radius.
Take home message

The two cases reported here show that a deep laceration can be inflicted by the sharp edges of a snowboard.

“appropriate” ceiling for a slope to the number of skiers/snowboarders it can accommodate according to its dimensions and the conditions such as amount of snow. Numbers could be monitored at the entrance. This would be realistic, but very unpopular and frustrating not only for enthusiastic skiers/snowboarders but also for those with commercial interests in the slope. However, patient 1 sustained the collision on an apparently overcrowded narrow slope, so some safety measures are called for.

Our report may warn snowboarders about how dangerous snowboard edges can be, not only for themselves but also for others with commercial interests in the slope. However, patient 1 sustained the collision on an apparently overcrowded narrow slope, so some safety measures are called for.

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