Skating on thin ice: a study of the injuries sustained at a temporary ice skating rink

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Abstract In recent years, ice skating and temporary ice skating rinks have become increasingly popular. Regular elite competitors are known to be at risk of both acute and chronic injuries. It may be postulated that skaters at the temporary rinks are at high risk of acute injuries from falls due to both their lack of expertise and the inherent dangers of ice skating. Injuries sustained at skating rinks present a significant burden to local healthcare resources, in particular orthopaedic departments. For the first time, Cambridge hosted such a facility from November 24, 2007 through January 6, 2008. We sought to identify the most common injuries encountered and to quantify the orthopaedic burden. All Emergency Department or Fracture Clinic attendances for an eight-week period from the opening of the rink were investigated. Details of age, sex, injury and management were recorded for the 84 patients who sustained ice rink related injuries. A total of 85 injuries were recorded in 84 patients. Of these injuries 58% were fractures, of which 98% involved the upper limbs. Seven patients (8% of all injuries) required admission for operative fixation. On average, two injuries per day were seen in the Emergency Department or Fracture Clinic, with an average of one orthopaedic admission per week. It is evident that the ice rink in Cambridge has had an impact on local healthcare resources. The vast majority of injuries affected the upper limbs and were sustained following a fall on the out-stretched hand. We therefore encourage the education of skaters as to how to break their falls more safely and recommend the use of wrist protectors as a primary preventative measure.

Introduction

The competitive and recreational sport of ice skating has seen a rise in popularity recently, with around 4% of the UK population taking part each year. This increase is at least in part due to temporary ice skating rinks becoming more and more commonplace in UK towns over the Christmas period. As with most other elite athletes, those who participate regularly in the sport are known to be at risk of chronic and overuse injuries such as tendonitis, stress fractures, muscle strains and lower back problems. In one large study of elite figure skaters [1], the incidence of stress fracture was found to be 16.7% in females and 13.8% in males, with a higher incidence in singles skaters attributable to their different training regimen with emphasis on difficult jumps and resultant high impact landing. Other overuse syndromes reported in elite junior skaters include patellar tendonitis and Osgood Schlatter disease [2].

Due to its very nature, the main danger in ice skating is falling on the ice, with a consequent risk of acute injuries such as fractures, abrasions and sprains. In a study of over 500 synchronised skaters [3], 42% had sustained an acute injury at some time during their career, with the majority affecting the limbs. Similarly, just over 25% of junior figure skaters [2] had sustained an acute injury during their relatively short careers. It is evident that even elite skaters in regular training can succumb to acute injuries and fractures resulting from falls on the ice. Although these falls may follow difficult jumps or manoeuvres, it may be assumed that recreational skaters attending temporary rinks will be at increased risk of acute injuries due to their lack of expertise in addition to the inherent risks of skating.

From late November 2007, Cambridge hosted a temporary ice skating rink for six weeks. Previous studies of temporary ice skating rinks have reported an increase in

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workload in local emergency and orthopaedic departments [4–6]. The aim of this study was to evaluate the acute injuries sustained at the ice rink to determine their impact on local healthcare services and to make recommendations to minimise future injuries.

Materials and methods

Data for this retrospective study were obtained from the electronic medical records of all patients presenting to Addenbrooke's Hospital Emergency Department and coded as 'Fall/ Ice/ Sports/ Other/ Skating/ Parkers Piece' between 24 November 2007 and 7 January 2008, as well as fracture clinic attendances from 24th November 2007 to 21st January 2008. To ascertain whether the injuries were sustained at the ice rink, 1,344 Emergency Department discharge letters and any subsequent clinic letters were reviewed. Of the 84 patients identified as having sustained ice rink related injuries, information on age, sex, injury and management of each patient was recorded.

Results

Over the 42 days during which the ice rink was in operation, there were 8,052 Emergency Department attendances, 84 (1%) of which were due to injuries sustained at the rink. Sixty one of these patients attended orthopaedic fracture clinic follow-up with skating-related injuries. A total of 85 injuries were sustained in the 84 patients, one child having sustained bilateral distal radius fractures. Sixty eight (80%) of these injuries were of the upper limb, and 11 (13%) of the lower limb. Other injuries included one eye, one back, one nose, one chest and two head injuries, one of which required neurosurgical admission after having suffered frontal contusions and subarachnoid bleeding.

Of those injured, 62% were female and 38% male. Age range was from 5 to 71 years, with a mean age of

33.8 years. The majority of injuries ($n = 27$, 32%) were in the 0–16 years age range (Fig. 1).

There were 49 fractures (58% of all injuries), 35 (71%) of which involved the distal radius (Table 1). There was only one fracture affecting the lower limb—a bimalleolar ankle fracture.

A total of seven patients (8% of all injuries) required in-patient orthopaedic management for operative fixation of their fractures. The bimalleolar ankle fracture was fixed. Four patients underwent MUA (manipulation under anaesthetic) plus K-wiring of the distal radius. Three patients underwent ORIF (open reduction internal fixation) of a distal radius fracture, one of which was a revision from a previous MUA plus K-wire. Other significant orthopaedic injuries sustained were an anterior cruciate ligament rupture which was subsequently reconstructed and an acromioclavicular joint disruption which did not require intervention.

Discussion

In this study the majority of ice skating injuries affected the upper limbs, usually as the result of a fall onto the outstretched hand. These results concur with previous reports by Radford et al. [7], Murphy et al. [8] and Clarke et al. [9]. Our findings are, however, in contrast to those of Lam et al. [10] and Freeland [4], both of whom have found the lower extremity to be most frequently injured. The reasons for this are unclear, but may reflect differences in measures taken by skaters to break their falls. Upper limb injuries are likely to ensue if the outstretched hand is used to break one's fall; however, if a skater attempts to keep their balance and resist a fall, they are more likely to sustain an injury, usually of a twisting nature, to the lower limb. The differing results in these studies may therefore simply reflect differences in skater behaviour and education.

The cost of an overnight hospital stay is currently £415, and an 'intermediate' operative procedure, such as an ankle

Fig. 1 Body regions injured for each age group

Table 1 Incidence of each type of injury according to age group

Injury		Age groups (years)						Total
		0–16	17–30	31–40	41–50	51–60	>60	
Fractures	Distal radius	12	2	5	8	4	4	35
	Radial head/neck		1	1	3	1		6
	Triquetral	1			1			2
	Supracondylar humerus	2						2
	Humeral neck				1			1
	Phalangeal	1						1
	Metacarpal		1					1
	Ankle					1		1
Total fractures		16	4	6	13	6	4	49
Soft tissue	ACL rupture					1		1
	ACJ disruption		1					1
	Wrist injury	7		4	4		1	16
	Elbow injury	1				1		2
	Shoulder injury		1					1
	Knee injury	1	1		1	1		4
	Ankle injury	2	1	1	1			5
	Head injury				1	1		2
	Eye injury		1					1
	Chest injury						1	1
	Back injury			1				1
	Nose injury		1					1
Total soft tissue		11	6	6	7	4	2	36
Total (all injuries)		27	10	12	20	10	6	85

ACL anterior cruciate ligament,
ACJ acromioclavicular joint

ORIF or wrist fixation, is £516. We estimate the total financial cost to the NHS of those patients who were admitted to be £11,183. This figure does not include the considerable further cost of out-patient follow-up and the socio-economic cost of days lost from work.

Previous work by Murphy et al. [8] found that soft tissue lacerations of the hand were common injuries; and they went onto recommend the use of protective gloves to prevent lacerations. Our study found there to be no lacerations which presented to the Emergency Department. The most common injury in our study was to the wrist/distal forearm. Cadaveric biomechanical studies [11, 12] have shown a significant reduction in forces transmitted through the forearm bones when wrist protectors are worn. A perceived risk of wearing wrist protectors is an increase in fractures more proximally due to the transmission of forces to the edge of the protector. These biomechanical studies have shown no evidence of increased bone strain at the proximal end of the protectors. Clinical studies in snowboarders [13, 14] and in-line skaters [15] have shown a significant reduction in wrist and forearm injuries both in those wearing wrist protectors and in more experienced participants. Again, there was no increased incidence of

more proximal forearm fractures. We would therefore recommend the use of wrist protectors as a relatively simple method to reduce the number of these injuries in future years. Skaters should be educated as to how best to break their falls, and wrist protectors should be freely available at the ice rink.

Conclusion

From this and previous studies, it is evident that the presence of a temporary ice rink in the area may lead to an increase in the workload of both the local emergency and orthopaedic departments. On average, during the period for which the ice rink was open, two accident and emergency attendances per day were attributable to skating injuries. This translated to just over one orthopaedic admission per week and an additional 61 fracture clinic attendances. This drain on local healthcare resources may be partially minimised by the education of all skaters on how to effectively break their falls to minimise risk of injury, and the wearing of wrist protectors should be encouraged in future years.

The authors declare that they have no conflicts of interest.

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