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A 13-year analysis from Switzerland of non-fatal sledging (sledding or tobogganing) injuries

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ABSTRACT

Introduction: Winter sports have evolved from an upper class activity to a mass industry. Especially sledging regained popularity at the start of this century, with more and more winter sports resorts offering sledge runs. This study investigated the rates of sledging injuries over the last 13 years and analysed injury patterns specific for certain age groups, enabling us to make suggestions for preventive measures.

Methods: We present a retrospective analysis of prospectively collected data. From 1996/1997 to 2008/2009, all patients involved in sledging injuries were recorded upon admission to a Level III trauma centre. Injuries were classified into body regions according to the Abbreviated Injury Scale (AIS). The Injury Severity Score (ISS) was calculated. Patients were stratified into 7 age groups. Associations between age and injured body region were tested using the chi-squared test. The slope of the linear regression with 95% confidence intervals was calculated for the proportion of patients with different injured body regions and winter season.

Results: 4956 winter sports patients were recorded. 263 patients (5%) sustained sledging injuries. Sledging injury patients had a median age of 22 years (interquartile range [IQR] 14–38 years) and a median ISS of 4 (IQR 1–4). 136 (51.7%) were male. Injuries (AIS $\geq$ 2) were most frequent to the lower extremities (n = 91, 51.7% of all AIS $\geq$ 2 injuries), followed by the upper extremities (n = 48, 27.3%), the head (n = 17, 9.7%), the spine (n = 7, 4.0%). AIS $\geq$ 2 injuries to different body regions varied from season to season, with no significant trends ($p > 0.19$). However, the number of patients admitted with AIS $\geq$ 2 injuries increased significantly over the seasons analysed ($p = 0.031$), as did the number of patients with any kind of sledging injury ($p = 0.004$). Mild head injuries were most frequent in the youngest age group (1–10 years old). Injuries to the lower extremities were more often seen in the age groups from 21 to 60 years ($p < 0.001$).

Conclusion: Mild head trauma was mainly found in very young sledgers, and injuries to the lower extremities were more frequent in adults. In accordance with the current literature, we suggest that sledging should be performed in designated, obstacle-free areas that are specially prepared, and that children should always be supervised by adults. The effect of routine use of helmets and other protective devices needs further evaluation, but it seems evident that these should be obligatory on official runs.

Introduction

Winter sports, including sledging, have evolved from an upper class activity into a mass sport activity, with more and more winter sports resorts now offering sledge runs.[1]

Modern sledging began in Davos (Switzerland) during the early 1880s, when foreign visitors began to experiment with boys' delivery sledges for recreation. The world's first international sledge race was held in Davos in 1883.[2] Today, several types of sledge exist, the best known probably being classic wooden Davos sledge,[3] followed by the faster toboggan,[4] and, of course, many different types of plastic bobsleigh.

The number of sledging injuries reported in the literature varies widely between 2% and 25% of all snow sports injuries and probably depends on regional facilities and atmospheric conditions.[6–8] Although many publications deal with snow sports injuries, only a few have specifically addressed sledging injuries.

We therefore investigated the rates of sledging injuries over the last 13 years seen at a Swiss rural hospital, analysed injury patterns

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specific to different age groups, and make suggestions for preventive measures.

Material and methods

The study was conducted at a Level III trauma centre in the Bernese Oberland in central Switzerland. The trauma centre is surrounded by various famous winter sports resorts (e.g. Adelboden, Lenk, Kandersteg) and is the primary referral hospital in its catchment area. The study sample was therefore representative of the target population of winter sports injury patients with non-fatal or life-threatening injuries. The valley and its surroundings have about 18,000 inhabitants. This number increases to 35,000 persons in winter.

Trauma centres in Switzerland are not formally graded. We have therefore added a classification corresponding to Level III (American College of Surgeons classification of trauma centres) for better understanding for our international readers. A Level III trauma centre does not have the full range of specialists, but does have resources for emergency resuscitation, surgery, and intensive care of moderately injured trauma patients. It has transfer agreements with other trauma centres that provide back-up resources for the care of more severely injured patients.[9] Therefore, all minor and moderate injuries were admitted to this Level III trauma centre, whereas severe and life-threatening injuries, e.g. cerebral haemorrhage, and severe thoracic, abdominal and spinal injuries, were directly transferred to a nearby university hospital and are therefore not recorded in the regional hospital database.

All patients injured when sledging during the 1996/1997 to 2008/2009 winter seasons were recorded upon admission. A questionnaire including age, gender, snow sports activity, type of injury (self-inflicted or collision), diagnosis and treatment (conservative or surgical) was filled out by the physician on call. The questionnaire was available in German, English and French. To enhance reliability of the information, the details in the patient records and on the completed questionnaires were compared to the Emergency Department discharge letters by the senior consultant on call at the end of each day.

Total numbers of winter sports patients and characteristics of patients injured when sledging are reported as numbers and percentages, and as medians with the corresponding interquartile ranges (IQR), where applicable.

Injuries were classified into body regions (head, face, chest, pelvis, spine, upper and lower extremities and external injuries [e.g. hypothermia]) according to the Abbreviated Injury Scale (AIS).[10] The Injury Severity Score (ISS) was calculated.[10] The analysis focused on injuries with an AIS ≥ 2.

Patients were stratified into 7 different age groups ($\leq$10, 11–20, 21–30, 31–40, 41–50, 51–60 and >60 years). Associations between age group and injured body regions were tested using the Cochran–Armitage trend test. Patients were also stratified according to winter season (96/97, 97/98, 98/99, 99/00, 00/01, 01/02, 02/03, 03/04, 04/05, 05/06, 06/07, 07/08 and 08/09), and the slope of the linear regression with 95% confidence intervals was calculated for the proportion of patients with different injured body regions and season. The normality of the distribution of the data was graphically checked in a normal Q–Q plot. All p-values were two-tailed. A p-value <0.05 was considered significant.

Ethical considerations

Participation in the study was voluntary and anonymous; confidentiality was guaranteed. Data were collected, stored, analysed and shared according to the ethical standards of the hospital.

Results

Study population

A total of 4956 winter sports patients were recorded between 1996/1997 and 2008/2009, including 2932 male (59.2%) and 2024 female (40.8%) patients. Of these, 263 patients (5.3%) were injured when sledging. These patients had a median age of 22 years (IQR 14–38 years) and a median ISS of 4 (IQR 1–4). 136 (51.7%) were male. The number of patients with sledging injuries overall and patients with AIS ≥ 2 injuries by season are shown in Fig. 1.

Injury pattern

A total of 271 injuries were diagnosed in 263 patients. 51 sledging accidents (19.4% of all accidents) were due to collisions, and 212 (80.6%) were self-inflicted.

Injuries with AIS ≥ 2 ($n = 176$) diagnosed in 172 patients were most frequent to the lower extremities ($n = 91$, 51.7% of all AIS ≥ 2 injuries), followed by the upper extremities ($n = 48$, 27.3%), the head ($n = 17$, 9.7%) and the spine ($n = 7$, 4.0%). Injuries to other body regions were rare ($n \leq 5$) (Table 1).

As shown in Fig. 2 and Table 2, AIS ≥ 2 injuries to different body regions varied from season to season, with no significant trend ($p \geq 0.21$). However, the number of patients admitted with any AIS ≥ 2 injuries increased significantly over the seasons analysed ($p = 0.031$; slope 88.5%; 95%CI 9.77–167.15) (Fig. 1, Table 2), as did the number of patients with any kind of sledging injury ($p = 0.004$; slope 163.7%; 95%CI 64.1–263.4).

Fig. 3 shows AIS ≥ 2 injuries stratified by age group. Whereas mild head injuries ($p < 0.001$) and injuries to the upper extremities ($p = 0.011$) were significantly more frequent in the youngest age groups, injuries to the lower extremities were more often seen in the middle aged patients ($p < 0.001$). No significant associations with age were found for other body regions ($p > 0.25$).

Discussion

Summary of results

Over the past 13 years, sledging injuries accounted for 5% of all winter sports injuries seen at a Swiss Level III trauma centre. The number of sledging injuries to different body regions varied from season to season, with no significant trend. However, the number of patients with sledging injuries of a severity of AIS ≥ 2 increased during the period of observation, as did the number of patients admitted with sledging injuries. Mild head trauma and upper extremity injury were most frequent in the youngest age group, whereas injuries to the lower extremities were more often seen in middle-aged patients.

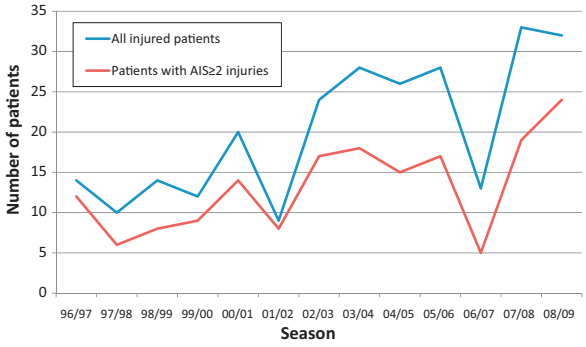

Fig. 1. Number of patients with sledging injuries overall and with AIS ≥ 2 injuries per winter season.