

SKI-ING INJURIES

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THE rapid increase in ski-ing injuries in recent years has given rise to much concern, and a pilot investigation was carried out among British troops in Austria during the 1954 season, with a view to a more complete investigation in 1955. Unfortunately, in 1955 extremely bad snow conditions prevailed, and facilities for ski-ing were much restricted, so the two seasons were not comparable; however, certain tentative conclusions may be drawn from this investigation, although the data are not as valuable as had been hoped.

Seventy-eight injuries occurred during the 1955 season, but accurate figures of the numbers at risk were not available.

Types of Injury

Sprain of ankle with strain of medial collateral ligament of the knee	21 (27%)
Strain of medial collateral ligament alone	18 (23%)
Sprain of ankle	11 (14%)
Fracture of lateral malleolus of ankle	11 (14%)
Complete rupture of medial collateral ligament	2 (3%)
Sprain of forefoot and/or fractured metatarsals	5 (7%)
Fracture of tibia and fibula	1 (1%)
Fractured metacarpals	3 (4%)
Fractured elbow	1 (1%)
Dislocated shoulder	1 (1%)
Fractured skull	1 (1%)
Soft tissue injuries	3 (3%)

Excluding the last five types (9 cases) the violence causing injury is a forced medial rotation of the leg, or a forced abduction of the knee or a combination of these two forces. The commonest occurs in a fall forwards and laterally, the ski catching with the tip or outer edge and forcibly rotating the leg inwards. The second occurs in traversing or turning when the upper (or inner ski in a turn) ski is weighted, the legs diverge and the inner edge of the ski catches in the snow.

No cases of torn meniscus were diagnosed, but five of seventy similar injuries of the knee, all presenting as strain of the medial collateral ligament when first seen, in the 1954 season subsequently presented signs of meniscus damage and were operated upon, four of them ski-ing uneventfully during the present season. It is considered likely that a number of the above cases of strain of the medial ligament have also sustained damage to the meniscus but none presented with unequivocal signs.

Contributory factors which in the 1954 series were suggested, were investigated.

1. *Experience*

Less than one hour on ski	...	...	...	...	5 (8%)
Less than one day on ski	...	...	...	...	8 (11%)
Less than two days on ski	...	...	...	...	7 (9%)
Less than one week on ski	...	...	...	...	19 (26%)
Less than one month on ski	...	...	...	...	17 (23%)
One season of ski-ing	...	...	...	...	8 (11%)
Two seasons of ski-ing	...	...	...	...	6 (8%)
Three or more seasons	...	...	...	...	3 (4%)

2. *Instruction*

37 injuries (46%) occurred whilst the patient was under instruction.

3. *Weather*

Sunny	...	...	...	...	...	39 (50%)
Cloudy	...	...	...	...	...	37 (47%)
Snowing	...	...	...	...	...	2 (3%)

4. *Type of Snow*

Powder	...	...	...	...	...	30 (38%)
Icy	...	...	...	...	...	32 (40%)
Breakable crust	...	...	...	...	...	2 (3%)
Wet Snow	...	...	...	...	...	14 (19%)

5. *Types of Bindings*

Kandahar	...	...	...	...	...	66 (96%)
"French" or Langfrieman	...	...	...	...	...	1 (1%)
Greenland or B.S.C.	...	...	...	...	...	8 (10%)
Suwe Marker	...	...	...	...	...	2 (2%)
Tyrolea	...	...	...	...	...	1 (1%)
Skifree	...	...	...	...	...	0 (0%)

Unfortunately efforts to obtain controls for the above figures were unsuccessful for a variety of reasons, but the following observations are considered pertinent. There is a high proportion of injuries in the first week (54 per cent.) but, surprisingly, the proportion occurring among those not under instruction was not as high as the pilot experiment had led us to expect. However, the absence of snow on the lowlands, where the bulk of unorganized ski-ing usually takes place, may explain this, as the effect would be to increase the relative amount of ski-ing done in organized classes. Much more ski-ing was done in fine spells so the fact that half the injuries occurred during bad weather possibly supports the contention that bad visibility, by preventing the skier from seeing irregularities and bumps, increases the risk of accident. Breakable crust failed to live up to its reputation as a bone-breaker, and no conclusions are drawn as to the relative safety of different types of snow.

The pilot investigation incriminated the Kandahar binding as the probable

factor, and this year safety bindings were made available to all skiers. Safety bindings were manufactured for all skis issued to troops and their use was encouraged, but, unfortunately, efforts to discover the proportion using them were unsuccessful.

It should be explained for the benefit of non-skiers that the Kandahar binding consists of a wire cable passing round the heel of the boot to two hooks on the side of the ski, level with the instep, and thence to a cable tensioner in front of the toe or by clips on to the sole of the boot. In this binding the heel can be raised about one inch, and both heel and toe are affixed to the ski.

The Langfrieman has similar toe irons, but the heel is firmly attached to the ski by a long leather thong wound round the ankle and passing through D rings on the side of the ski. This binding is only used by experts, and injury is certain in a bad fall unless the ski breaks first.

The Greenland (named after H. Greenland, Esq., the inventor) or British Ski Club safety device is used in conjunction with a normal Kandahar and consists of a leather strap around the heel cable behind the heel, and the strap passes through a D ring on the upper surface of the ski about four inches behind the heel. The strap is adjusted so that it is completely taut in the "Vorlage" (forward lean) position, so that if a forward fall occurs the strap will pull the heel cable off and release the binding. The device needs careful adjustment, as if it is too tight the ski will come off in normal running (this led many to discard the device without giving it a fair trial), whilst if it is too loose it fails to release the foot. This is what occurred in all eight cases of accidents with this binding and their ski failed to come off.

This binding was issued to all holders of Army skis as it is cheap to produce and is used with the normal binding.

The other types of safety bindings in use operated on a different principle; although differing in detail, their mode of action was similar.

They replace the toe clips of a normal binding, the cable and tensioner being unaltered. They consist of a portion fixed to the ski in front of the boot, on which is mounted a rotating portion, which is retained in the normal fore and aft position by a spring-loaded ball engaging in a slot on the fixed portion.

In the Suwe Marker (German) the upper portion engages the toe of the boot above the welt, in the Tyrolea (Austrian) two L-shaped pieces are pivoted on the moving portion with the long arms facing backwards, and the toe is introduced between the long arms with the toe pressing on the short arms and thus clamping the boot; in the Skifree (Swiss) a rigid metal plate is attached to the boot and the ridge engages in a groove on the rotating portion of the binding; at the top of the groove is a small wheel, so this type has the added advantage of releasing in a backward fall. Whenever a rotational strain sufficient to overcome the ball spring tension is applied, the upper portion of the binding rotates on the lower part and the toe is released. Again the device must be correctly tensioned, and if too loose it will release in a turn (this accounted for one of the Suwe cases), whilst if too tight injury occurs without it releasing, as happened in the remaining two cases. The Tyrolea bindings were fitted to twenty pairs

of Welfare skis and no accident occurred in users of these, and observations at the B.T.A. sports meeting indicated that approximately 50 per cent. of those with their own skis were using one or other of these devices, which cost approximately 25s.

CONCLUSION

The figures tend to support the opinion that the commonest type of injury in ski-ing is caused by a forcible rotation of the leg which is attached to the ski. The only factor among those investigated that can clearly be incriminated is the rigid binding, and it is noteworthy that before the war, when the Alpina or Arlberg binding, which allowed the skier to lift his heel clear of the ski, was in vogue, many less injuries were seen. The correct use of safety bindings will remove this hazard, but none of the devices is foolproof and all require careful adjustment. Further development of these devices should remove these faults and lead to an appreciable reduction of ski-ing accidents.

SUMMARY

A series of seventy-eight ski-ing accidents is analysed, showing the types of injury and recording various possible contributory factors. It is believed that this paper represents the first attempt to study the effect of safety bindings in the prevention of accidents.

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