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Abstract

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Discussion on ski injuries therefore should emphasise prevention rather than treatment. Statistics suggest certain common factors in the clinical history of ski injuries which indicates the need for a safety code which might reduce the incidence of injury and thereby increase the pleasure derived from this sport.

In this article common ski injuries will be mentioned, prevention will be discussed and a safety code for skiers will be suggested.

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SKI-ING INJURIES

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Injuries sustained while ski-ing do not differ significantly from injuries due to other sports. Tears of the medial meniscus however are rare in ski injuries compared with football. The increasing frequency of the unstable boot top fracture due to the modern high rigid boot resembles the type of fracture sustained in a sliding tackle on the football field.

Discussion on ski injuries therefore should emphasise prevention rather than treatment. Statistics suggest certain common factors in the clinical history of ski injuries which indicates the need for a safety code which might reduce the incidence of injury and thereby increase the pleasure derived from this sport.

In this article common ski injuries will be mentioned, prevention will be discussed and a safety code for skiers will be suggested.

I. COMMON SKI-ING INJURIES

Ski injuries can be divided into (A) soft tissue injuries and (B) fractures.

(A) SOFT TISSUE INJURIES

1. *The knee joint.*

The most common soft tissue injury is the abduction rotation strain to the knee which causes a partial or complete rupture of the medial collateral ligament of the knee with associated capsular tear in the severe cases. The injury is usually a partial rupture of the medial collateral ligament and the medial meniscus is seldom involved. Waldie (1969) reported 125 cases of knee injury in which there were 102 cases of injury to the medial collateral ligament. There were 11 cases diagnosed as medial meniscus injuries in which 6 cases healed without operation and probably were not true meniscus injuries — there was only 1 bucket handle tear proved at operation. The relative infrequency of medial meniscus injuries from ski-ing as opposed to football is probably due to the fact that in the ski injury the unweighted tibia is abducted and rotated on the femur while in football the femur is rotated and abducted on the weighted tibia.

Statistically the infrequency of injury to the medial meniscus is of special interest to the orthopaedic surgeon. The problem is complicated by the skier who returns from a continental holiday with the history of an abduction rotation knee injury, sustained perhaps a week ago, which has been treated by a compression bandage to allow the patient to continue with the social if not the sporting activities of the holiday.

Clinical examination reveals a flexion deformity of the knee suspiciously like the "locked knee" of a meniscus injury. There is tenderness over the femoral origin of the medial collateral ligament but there is also tenderness over the medial meniscus. A definite effusion might suggest a meniscus lesion but many cases have only a slight or no effusion. This knee should not be subjected to immediate operation. The knee should be examined and fully extended under general anaesthesia and should then be immobilised in a plaster cylinder with full weight bearing for approximately 3-4 weeks. At the end of this period the incomplete tear of the medial collateral ligament will have healed sufficiently to allow normal rehabilitation. If the meniscus injury is present then the knee will again produce symptoms on mobilisation and arthrotomy will be indicated. Immobilisation in a plaster cylinder is initially the best treatment for a partial rupture of the medial collateral ligament which might otherwise give rise to symptoms for a considerable period.

Complete tears of the medial collateral ligament should always be treated by surgical repair because this allows accurate reposition of the torn ligament, repair of the associated capsular tear and accurate inspection of the joint to ascertain any injury to the medial meniscus.

2. *Injury to the Gastrocnemius and Tendon Achilles.*

Partial rupture of the Gastrocnemius muscle or complete rupture of the tendon achilles is

a relatively frequent ski-ing injury. The modern high rigid boot will reduce such injuries at the expense of "boot top" fractures of the tibia.

Complete rupture of the tendon achilles can be successfully treated by immobilisation of the ankle joint in full equinus but the majority of ski-ing surgeons would prefer a formal surgical repair.

Rupture at the Gastrocnemius tendon junction can be a very painful injury and in major tears the ankle joint should be immobilised in plaster. A below knee plaster does not abolish all symptoms but the patient is more mobile and rehabilitation is more rapid. Immobilisation in an above knee plaster abolishes all pain but greatly restricts mobility.

3. Dislocation of the Shoulder.

Dislocation not associated with other injury is usually found only in the shoulder in the skier and is a relatively common injury. The importance of this injury is that shoulder dislocation can be reduced by first aid measures either on the ski slope or in the local hotel thus avoiding the need of transportation of the patient to hospital and anaesthetic facilities.

The technique of reduction of shoulder dislocation without anaesthesia was described by McNair (1957) and the author has found the method to be successful in all cases treated either on the ski slopes or in the nearest habitation. The principle implies the positioning of the patient in a comfortable prone position on a table with the injured arm hanging free over the edge of the table. The pain is usually immediately relieved and muscle spasm can be further reduced by simple analgesics such as whisky or brandy provided the patient is treated in his home base. Pain disappears the moment the arm is dependent. The doctor then sits on the floor and applies gentle longitudinal traction to the arm, at the same time reassuring the patient, to allow full relaxation of the muscles. Usually at a very early stage of traction the shoulder reduces because the muscles have relaxed. Traction should be prolonged and gentle in apprehensive patients. In the rare event of reduction not being achieved by gentle traction, one hand is gently placed in the axilla while the other hand maintains traction. The humerus can then be displaced laterally into the joint from the subglenoid position achieved by traction.

The author has reduced shoulder dislocations on the ski slope by the same technique with the patient lying prone on the back of a man kneeling in the snow. Ski clothing does

not have to be removed. The only difficulty is that the patient's elbow must be flexed to the right angle in order to apply adequate traction without the patient's hand touching the snow. Such immediate reduction allows the skier to return to his base without assistance. This method of reduction is safe because the hand in the axilla can easily detect the crepitus of an associated fracture.

4. Abduction injuries of the thumb.

Abduction strains and complete rupture of thumb ligaments can occur from the thumb being caught in the strap of the ski stick or from impingement of the thumb in the mesh of an artificial nylon ski slope. Sprains of the medial ligament respond to plaster immobilisation but complete tear should be treated by surgical repair of the medial ligament which is frequently entrapped in the joint.

5. Ligamentous injuries of the ankle joint.

These used to be common injuries with the soft boot. Recently with the rigid high boot these injuries have decreased while tibial fractures occur more frequently.

The most common injury is a tear of the anterior talo-fibular ligament. Lateral rotation of the ankle may cause a tear of the inferior tibio-fibular ligament resulting in instability but this injury is often accompanied by a fracture of the fibula.

Rupture of the lateral ligaments should be treated by immobilisation in plaster.

Spademan (1968) reported that in lower limb injuries 15% occurred in the lateral ligament of the ankle joint and 12% occurred in the deltoid ligament.

(B) FRACTURES

Fractures occur most commonly in the tibia or in the ankle joint where they may be associated with rupture of the ankle ligaments. In the past ankle injuries were more common than fractures of the tibia. Recently however the number of fractures of the tibia has increased while ankle fractures have reduced. This is considered due to the modern high rigid boot which protects the ankle at the expense of the tibia. The fracture of the tibia in the lower third of the leg known as the "boot top fracture" is now a relatively common injury in the modern ski slopes.

The principle of treatment of fracture of the tibia and fracture dislocation of the ankle joints does not differ from standard practice of similar injuries from other causes and so will not be discussed.

II. PREVENTION OF SKI-ING INJURIES

Skiing injuries could be reduced by attention to (A) equipment (B) Adherence to the skiers safety code.

(A) Equipment.

In recent years there has been an increase in the types and complexity of so called "safety binding". There is really no such thing as a "safety binding" — there are only release bindings. The implication is that a release binding is only a safety binding when the release mechanism is adjusted to the technique, experience and strength of the skier.

Reliable adjustment of a release binding can only be made by the skier himself provided he fully understands the mechanism of his own binding. The adjustment applied by ski hire shops is unreliable and even modern ski binding testing mechanism can only give an approximate assessment. The accurate assessment depends much more on the technical ability of the skier than on the weight and height of the skier. The skier who can adjust his own bindings has a greatly reduced chance of injury compared with the skier who hires skis and relies on the ski shop for the adjustment. Commercially it is not possible for the ski hire shop to spend the time necessary for the accurate adjustment of bindings to the strength, ability and boots of the customer.

Release bindings are only safe when the skier fully understands their release mechanism and is prepared to spend time testing and adjusting these bindings at slow speed and varying snow conditions. A binding set to safety for the moderate skier would release prematurely during a turn at speed by a highly competent skier of the same body weight. Ski hire is therefore less safe than one's own skis, which have been set from experience to one's own ability.

Space does not permit detailed discussion on the merits of relative bindings but some common errors can be mentioned. The curved sole of the old boot which does not have the rigidity of the modern plastic sole, the matching of different types of forward and heel release, the worn or kinked cable release and the bent cable clamp or inaccurately sited posterior heel cable release, the lack of antifreeze lubricant in certain bindings at high altitudes, &c. The conclusion is that there is no such thing as a safety binding and bindings can only be

safe when personally adjusted to release before injury threshold.

The modern high rigid boot is responsible for an increase in "boot top fractures" of the tibia which did not occur with the old lacing boot. A strong, fit and experienced skier will benefit from the more rigid support which is not necessary or advisable for the beginner or moderate skier who is not fit. The danger of the modern high rigid boot can be avoided by adjustment of the boot to grip the heel but to allow some forward flexion of the ankle. In the conventional boot with 5 clips this will mean firm adjustment of the second top clip with a less firm adjustment of the upper or ankle clip.

(B) Skier's safety code.

Surgeons dealing with ski injuries find a constantly recurring theme in the history. This suggests that efforts to make the skier aware of the danger might reduce accidents. It is well known that the skier is most prone to injury in the first year, which in this country probably means the first two weeks of skiing. The accident rate graph gradually drops until after 8 years skiing there is only a small chance of injury. Waldie (1968) reported interesting statistics from the Scottish ski slopes which are approximately similar to reports from other countries. These statistics commend study:

- 58% of injuries occurred in beginners
- 36% in competent skiers
- 6% in expert skiers
- 54% of injuries occurred in the first year of skiing
- 14% of which occurred on the first day
- 33% of which occurred in the first week.

The influence of fatigue was noted by the fact that the majority of ski injuries occur at 12 mid-day and between 3 and 4 p.m., i.e. after approximately 2 hours skiing. McIntyre (1963) also found that most accidents occur at noon or late in the afternoon. Factors causing accidents are fatigue, inexperience, poor technique, speed and poor snow and over confidence in release bindings.

Relation of injuries to snow conditions in Scotland showed 45% in soft snow, 24% on piste and 27% on ice — other 4%.

Effect of release bindings: 80% of the injured wore apparently adequate release bindings which failed to release in 74% and opened in 26% (causing mainly upper limb injuries), 13% wore fixed bindings.

Spademan (1968) reported that safety bindings functioned in 60% of injured males but in only 27% of females.

The American ski patrol report of 1960 showed that 6 out of 10 injured skiers wore release bindings which did not release.

- (1) You are particularly vulnerable to injury during your first year of ski-ing and particularly so during the first week. Injuries in Ski Schools are rare — you should ski only in Ski School during your first ski-ing holiday. The expense of Ski School is less than injury and you will reach proficiency earlier. In early years at least part of every holiday should be spent in Ski School.
- (2) Study the side slip, which is the most important manoeuvre to negotiate awkward inclines and is the basis for the more advanced ski-ing techniques. The snow plough is only reliable at low speeds and is a dangerous technique to adopt at increasing speeds.
- (3) Learn to fall correctly and do not hesitate to fall if in trouble. Fall whenever you feel out of control. Fall into the hill curled up like a ball with your skis together and elevated off the snow.
- (4) Do not ski unless you are fit. Ideally you should attend dry ski school classes before your first holiday. Keep fit by jog trot runs. The one best ski exercise is to sit up against a wall with knees bent to a right angle until you can last 2 minutes in this posture. This will strengthen the quadriceps muscle and give confidence.
- (5) Never have one last run of the day after you have left the ski school however well you think you have been ski-ing.
- (6) Beware of the last run of the day when the sun sets in the spring and the piste becomes icy in a matter of minutes.
- (7) Beware of the last run of the holiday which may be more memorable than you had intended.
- (8) Do not run into deep snow if you are in trouble, it may turn out to be heavy or crusted and may well fracture your tibia.
- (9) Beware of drift snow which can be very heavy and difficult.
- (10) Beware of ruts in spring snow in the late afternoon. They will probably be frozen and dangerous.

- (11) You are very vulnerable when fatigued. Always stop ski-ing when you feel you would like one more run. The majority of accidents occur after 2 hours ski-ing at mid-day or in the late afternoon.
- (12) Do not ski by yourself, always have company.
- (13) When you hit ice — if you cannot hold the edges then slide and keep the skis together, relax and let yourself go. Look out for patch of snow and be balanced so that you can stop or turn when you reach the snow.
- (14) Release bindings — the only reliable release bindings are your own which you have learned to adjust. If you hire skis, try to understand the adjustment mechanism and do not hesitate to return to the ski shop at a quiet time of the day when the fitter will be free to answer your questions and carry out any further adjustments to suit your particular ski-ing ability.
- (15) If you purchase a modern rigid boot adjust the clips to provide firm support over the heel but leave some freedom for forward movement at the ankle in the event of a fall. In the five clip boot this will mean firm support from the second top clip but more freedom from the upper or ankle support.

These rules are suggested not to curtail your enjoyment but to prevent injury and prolong your holiday. The more experienced you become and the more proficient your technique the less will be the chance of injury. Most honest experienced skiers will admit that most potentially dangerous falls could have been avoided with some forethought.

Ski-ing will always be dangerous to some extent and that perhaps may be one of the many attractions. Attention to the safety code, equipment and ski-ing technique will greatly reduce the possibilities of a serious injury and add to your enjoyment.

REFERENCES

- McIntyre, J. M., 1963. *Canad. M.A.J.*, 88: 602-605.
McNair, T., 1957. *Journal of R.C.S.Ed.*, 3: 47-53.
Spademan, R., 1968. *J.A.M.A.*, 203: 445-450.
Waldie, F., 1969. Meeting of the British Orthopaedic Ski Group, Zurs.