NATURE, PREVENTION, AND MANAGEMENT OF INJURY IN SPORT

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Nature of injury

Intrinsic factors in the causation of injuries

- Age, sex, body weight and composition, and muscle power (for example, imbalance of agonist versus antagonist)
- Muscle stiffness or weakness
- Congenital joint hyperlaxity or conversely poor flexibility
- Malalignment—for example, forefoot varus, hyperpronation, pes cavus, tibia vara, patella baja/alta, genu varum/valgum, femoral anteversion leg length discrepancy, etc

Valgus heel and flat foot of overpronation.

Extrinsic factors in the causation of injuries

- Training methods and competition (high volume and increase in intensity of training, sudden changes in training method, poorly designed training techniques, ineffective rules of the sport, violent play, or ill-timed contact)
- Surfaces (change from running on grass to synthetic track, increased incidence of anterior cruciate ligament injuries on synthetic grass)
- Equipment (poor footwear, old or unsuitable training shoes, poorly adjusted bindings on ski-boots, heavy wet footballs, poor landing surfaces for jumpers)
- Environment (cold weather with inadequate warm up leads to reduced elasticity and stiffness, hot and humid weather can cause heat stroke, competing or training in poor light can cause injury)

Unfortunately, injury is inevitable for some of those who participate in sporting activity. Injuries may occur as a result of an acute episode of trauma, such as a fractured tibia in a footballer. Overuse injuries are caused by repeated episodes of microtrauma that individually are insufficient to give rise to macroscopic injury. When healing mechanisms are overcome, however, the end result can be as serious as a fractured neck of femur from a completed stress fracture. The nature of the injury depends on many interrelated elements, but they can be divided into those caused by intrinsic and those caused by extrinsic factors.

Intrinsic factors are concerned with the makeup of the individual person. Preparation and training can alter some of these constituents, which should always be considered in the management of individual people.

Extrinsic factors in injury are those derived from external forces. These range from a clumsy tackle inflicting a sudden violent force on a limb to footwear and the surface being used.

Sport specificity of injury

The injuries suffered by athletes do not differ greatly from those occurring in any other group of people. However, every sport has its own group of injuries that are, to a greater or lesser extent, specific to that sport itself. This has important ramifications when managing an injury, but also in preventing the injury in the first instance. Doctors caring for athletes must have a knowledge of the type and techniques of training involved for a sport and the physiological basis of the type of exercise as well as being familiar with the aspects of competition. Only then can they gain the confidence of their athletes and become closely involved in their return to sport.

Shoes badly deformed from overuse.

Sole of shoe worn away (50% of shock absorbercy lost after 500 miles, about a month's training for a marathon runner).

Prevention of injury

Simple measures in injury prevention: removing from poorly designed shoes heel tabs that impinge on the Achilles tendon, aggravating Achilles tendonitis.

Preventing sports injuries

Intrinsic factors

- Adequate warm up before participation
- Correct stretching techniques
- Strengthening exercises to achieve a balance of muscle power
- Fitness for sport, particularly aerobic—that is, cardiovascular and respiratory fitness, muscle power, and sport specific fitness
- Good nutritional status

Extrinsic factors

- Correct use of equipment, especially footwear
- Avoiding abrupt changes in training methods, effort, and intensity
- Paying due attention to the environment
- Awareness of the second injury syndrome
- Playing within the rules of the sport

Preparation

Preparation is the key word when considering prevention of sporting injury. There are very few circumstances in which inadequate preparation cannot be blamed for injury. Training errors cause injury. A footballer with a broken tibia may have been suffering from fatigue because of poor aerobic fitness or may have become a victim of the second injury syndrome—in this case a previous minor knock may have lead to clumsy timing or poor commitment in a tackle.

Victims of overuse injuries have failed to manage correctly their training schedules or have paid inadequate attention to correct use of equipment. A typical example is a runner who uses the same pair of shoes for over a year. After this amount of time the shock absorbency of the shoe is severely reduced and the shoe is deformed, which exaggerates any biomechanical abnormality of the runner and leads to an overuse injury.

Safety equipment

Many sports use safety equipment routinely. Perhaps the most striking example of this is American football, where the more obvious padding covers many yards of taping, strapping, and bracing for added protection. Correct use of such equipment is essential in avoiding injury. The design of helmets has altered and improved to prevent serious neck and face injuries in sports such as ice hockey and American football. The simple addition of a harness to prevent falls while jumping has reduced head and neck injury rates in horse riders. When equipment is used it must be maintained and adjusted properly. Unless correctly tuned, ski-boot bindings will prevent the ski from detaching in a fall and lead to knee ligament injury.

Rules of sport

One of the impacts of sports medicine has been in changing the rules of some sports. This rarely occurs by presidential decree, as it did in American football, but in rugby the alteration of scrummaging rules has been brought about to prevent injury. There is now an important medicolegal aspect in terms of adhering to the rules. When considering the intrinsic and extrinsic causes of injury listed earlier, preparation for sport includes several considerations.

Management of injury

Stages of managing a sporting injury

- (1) First aid measures
- (2) RICE—Rest the injured part, not the rest of the athlete
 - Ice, pain relief, and prevention of bleeding
 - Compression to reduce swelling
 - Elevation of injured part
- (3) Early management—make a diagnosis with appropriate investigation and formulate a treatment plan
- (4) Maintain cardiovascular and respiratory fitness, while resting the injured part
- (5) Strengthening and stretching exercises
- (6) Sport specific fitness
- (7) Attention to technique, equipment, etc
- (8) Competition—staged return by setting targets to achieve simulation of potential areas of risk

Managing a sporting injury is not simply a matter of treating the injured part. A runner who returns to pounding the roads in the same pair of old, worn shoes after his Achilles tendonitis has settled with treatment will relapse without fail. The same principle applies to tennis players with lateral epicondylitis who have not given themselves time to adjust to their new rackets. (It is also necessary to remember that the aim of treatment is a return to sport.)

History

It is imperative that the sporting cause of the injury is discovered. This occasionally requires an intimate knowledge of the sport itself so that a full sporting history can be obtained. However, patients are often able to provide the reasons for their injuries. Liaison with the coach may be invaluable.

Diagnosis

As with the rest of medicine, it is essential to make a diagnosis when managing a sporting injury. Appropriate investigations should be made. Ultrasound scans are particularly useful in this specialty, although the high resolution probes for visualising subcutaneous structures are expensive.

Demonstration of stretching technique.

Ruptured Achilles tendon.

Rehabilitation

Many injuries are caused by premature return to competition before the athlete is ready. The rehabilitation of athletes through all the stages of their return to competition is an integral part of managing the injury.

Athletes often complain that they are simply told to rest and given no more advice. Doctors may complain that athletes seek multiple opinions in order to receive the answers that they want to hear, and not what is best for them. This breakdown in communication can be avoided by the doctor explaining the nature of the injury and emphasising what the athlete should be doing to retain power and fitness. A positive attitude towards rehabilitation should be adopted on both sides. The injury should not be thought of as time lost, but an opportunity to correct some of the deficiencies of those intrinsic factors listed earlier. In addition, athletes may need to be seen by appropriate specialists to investigate chronic fatigue from overtraining, amenorrhoea resulting in stress fractures, or the management of eating disorders.

Drugs

Non-steroidal anti-inflammatory agents can be used for analgesia and helping during recovery, but should not be used to mask chronic injury. The non-steroidal anti-inflammatory gels have their uses in sports medicine. In addition to their therapeutic effects they are useful for self massage. Local anaesthetic injections, alone or with corticosteroid, have both diagnostic and therapeutic uses. Although the published evidence is equivocal, injection of corticosteroid around the Achilles tendon should be avoided because of the risk of rupture.

Surgery

Surgery has an important role in the management of sports trauma, but the surgeon should ensure that conservative measures, using the principles outlined in this article, have been thoroughly applied.

Physiotherapy

Medical advice is often combined with physiotherapy. Although stretching techniques can be demonstrated in the surgery, supervision by a physiotherapist is recommended. There are many ways athletes will delude themselves that they are stretching adequately.

Physiotherapists will also use massage, friction, faradism, strapping, stretching, and strengthening techniques with manipulation and mobilisations. They may also aid in making a diagnosis with their own techniques, and close working relationships between doctors and physiotherapists are helpful.

Physiotherapy includes the use of electrical treatments such as ultrasound; interferential, short wave diathermy; and laser therapy. Although some basic research work has shown why ultrasound and laser may be effective, they are no substitutes for active "hands on" work.

Insoles

The use of insoles to modify running gait, after video analysis of running on a treadmill, is becoming increasingly common in the commercial world of sports injury medicine. The results can be dramatic in the treatment of a surprisingly wide variety of conditions. Perhaps the most notable results are in the treatment of medial periostitis of the tibia in runners. Unfortunately, the use of insoles has become excessive and uncontrolled.

Doctors and physiotherapists perfecting strapping techniques on a British Association of Sport and Medicine course.

Conclusion

Important factors in managing sporting injury

Prevention (general fitness, training regimen, equipment use)

Management

- History to establish cause(s) of injury and thus make correct diagnosis and prevent recurrence
- Examination (of athlete and equipment)
- Investigation
- Diagnosis—for correct treatment
- Treatment appropriate to injury (rest, drugs, physiotherapy, surgery)
- Maintenance of general fitness (of uninjured parts)
- Correction of poor training programmes
- Rehabilitation—gradual, structured regimen
- Emphasis of importance of warm up before, stretch after, exercise
- Prevention of too early return to sport—to avoid recurrence or second injury

Management of a sporting injury requires an assessment of why the injury occurred, treating the injury itself while maintaining fitness, and a gradual structured rehabilitation programme through to competition. Breakdown can occur at any stage along the path of return to sport. Doctors should liaise with the athlete's coach to alter bad training regimens and check the sporting history for other factors contributing to the risk of injury.

Athletes are enthusiastic and rewarding patients to treat. The British Association of Sport and Medicine runs an educational programme covering all aspects of sports medicine. Anyone interested should contact the author.

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Current Issues in Cancer

Palliative care

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This is the 10th and concluding article in the series examining developments in cancer and updating what we know about the disease

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Though many of the treatment strategies used in palliative care have never been subjected to clinical trial, it has been argued that advances in palliative care have outstripped those in many other specialties. This article is not a comprehensive review of therapeutic options, nor even of recent advances in this topic, but concentrates on the latest developments and controversies in the pharmacological treatment of four frequent and important symptoms: neuropathic pain, anorexia and cachexia, intestinal obstruction, and breathlessness. It is difficult to perform blinded, randomised trials in patients with advanced disease and poor performance status, yet it is these patients who may gain most from the adoption of new well evaluated treatment strategies.

"Palliative treatment is no longer regarded as a negative lack-of-treatment, or as a ragbag of therapies which are vaguely thought of as supportive."

Palliative care has been defined in many ways, but perhaps the most apposite is that recently adopted by the World Health Organisation—"the active, total care of a person whose condition is not responsive to curative treatment."² This definition highlights the fact that such care should not be restricted to patients with malignant disease and that terminal care is but one aspect of palliative care, if a very important one. The concept of palliative care embraces optimal symptom control and quality of life as well as appropriate rehabilitation.³ The patient is regarded as part of a unit which also includes his or her family, friends, and carers.

Issues in pain management

Pain is one of the most common and probably most feared symptoms of advanced cancer. A recent highly

publicised court case centred on the symptomatic management of a patient with severe rheumatoid arthritis⁴ served to illustrate that pain is not always responsive to conventional analgesics.

The semantics of pain are complicated and to some extent controversial. Total pain, as first described by Cicely Saunders, is recognised as pain comprising physical, psychological, emotional, and spiritual elements and underlines the importance of a multi-disciplinary approach to its control. Paradoxical pain is described as pain that gets worse not better with increasing doses of opioids,^{5,6} but there is controversy over the precise definition and, indeed, over whether this phenomenon actually exists.⁷⁻¹¹ Neuropathic pain is nearly always secondary to nerve damage, whether due to compression, infiltration, or destruction, whereas nociceptive pain is caused by ongoing activation of primary afferent neurones in response to noxious stimuli and can arise from either somatic or visceral lesions.

A full discussion of recent advances in pain control is beyond the scope of this article, but some current issues are reviewed.

Morphine-6-glucuronide

Recent advances in our understanding of morphine metabolism have led to the recognition of the importance of the active morphine metabolite morphine-6-glucuronide.^{12,13} This substance has been isolated and synthesised.¹⁴ Preliminary single dose studies have shown morphine-6-glucuronide to be less toxic than equipotent doses of morphine.^{15,16} These findings are exciting but must be considered in the light of the fact that morphine, when properly employed, is an excellent strong analgesic which does not usually cause major, unmanageable toxicity. Until the results of