Overuse injury

"Overuse"—an overused term?

P L Gregory

Use of the term overuse injury should be avoided until there is definite proof of the cause of the injury

Injuries are often categorised as being due to trauma or overuse. When no moment of trauma is recalled, then an assumption is made that an injury is the result of overuse. In this article, I will argue that there is insufficient evidence to support this extensive use of the term "overuse" and that there are problems associated with using it. Thus, we should avoid the term, which implies the cause of the injury, until we have proof of the cause.

WHAT IS MEANT BY OVERUSE

Overuse injury is now categorised in medical subject headings as "cumulative trauma disorder (CTD)". This is a subcategory of sprains and strains. CTD is defined as a "Harmful and painful condition caused by overuse or overexertion of some part of the musculoskeletal system, often resulting from work-related physical activities. It is characterized by inflammation, pain, or dysfunction of the involved joints, bones, ligaments, and nerves." The term includes overuse injury, overuse syndrome, repetition strain injury, repetitive strain injury, and repetitive motion disorders. As CTD is defined as being caused by overuse, this definition fails to clarify the meaning of overuse injury. Overuse probably implies there is an amount of use that is excessive, and if use reaches or exceeds that amount then injuries arise.

Consider now this term as used in sports medicine. Traumas, such as a fractured tibia caused by a tackle in soccer, are likely to be most common among players who play or train most. Yet, overuse is not said to be the cause of this injury. Injuries arising from obvious trauma are excluded from the category of overuse injuries. Such a trauma may be witnessed or may be felt as an acute moment of injury. An example of the latter is the sudden pain from a hamstring muscle strain when attempting to sprint. The cause of such an injury is sometimes called "macrotrauma". There is speculation that there may be other damage to the body's tissues that does not manifest as immediate pain, loss of function, deformity, swelling, bruising, or bleeding. The cause of such damage is sometimes referred to as "microtrauma". The accumulation of damage from microtrauma may eventually result in overt damage—that is, when someone feels pain, loses normal function, or notices swelling, deformity, etc. If it is the repeated physical activity of an athlete that has predisposed him or her to sufficient microtrauma to bring about such an injury, then it is reasonable to call it an overuse injury.

LOOKING FOR THE EVIDENCE

A Medline search (1966–2000) for overuse injury brought up 88 references. None of this research was designed to prove that injuries were due to overuse.

WHY IS THE TERM ACCEPTED READILY?

It is easy to accept that overuse causes injuries. We are all likely to be familiar with the negative sensations associated with a bout of unaccustomed exercises that leaves our muscles and tendons sore and tight. Those sensations are somewhat similar to some of those experienced after injuries caused by (macro) trauma. Fortunately the negative sensations wear off after a day or two. This phenomenon is called delayed onset muscle soreness and is not generally thought of as an injury. Now, when somebody starts to suffer similar sensations when there has been no obvious macrotrauma and no recent unaccustomed exercise, yet they are involved in some regular physical activity, it is understandable that they and their doctors blame their negative sensations on that physical activity.

In the clinic, sports physicians find that patients who have conditions that have been categorised as overuse injuries tend to be training or competing a lot. Thus, their experience seems to confirm that overuse causes these problems. However, there are factors that distort their experience. Sports physicians see a large proportion of physically active people in their clinics. They may therefore assume that the conditions seen are due to the activity. Non-active people may also suffer the same conditions, but would not present to sports physicians. Non-active people may be less inconvenienced by such conditions as their less active lifestyle puts fewer demands on their bodies. Hence, they may not present to doctors at all.

DOES IT MATTER?

The language used—overuse injury—may lead to responses that may not have a firm evidence base. One such response would be to tell any athlete with an overuse injury to rest. Rest can be absolute or may be more acceptable if activity modification is recommended. Telling the athlete to rest is an intervention. To be justified, we should know that it prevents further damage, works (brings about recovery), and that it is safe (no adverse affects). Another response is to impose limits on the physical activities of athletes to prevent overuse injuries—for example, fast bowlers in cricket. There should be evidence for effectiveness before a restriction becomes a regulation of the sport. A better approach would be to offer advice or guidelines where evidence is lacking.

IMPLICATION FOR STUDY DESIGN

If we are to accept that the term overuse is valid for certain injuries, then we need proof that these injuries arise when a certain level of use is exceeded. To provide evidence that overuse causes a particular injury, a study design will need to include several groups exercising at different levels of activity. These groups need to be matched, so we will need to know the contribution of all confounding factors. Ideally, the groups and investigators need to be blinded to the activity level, but this may be impossible. Compliance with the exercise regimen would need to be confirmed. There may be ethical problems in asking a group to be inactive when there is evidence to suggest this is harmful to health.

Observational studies may be required, bearing in mind the difficulties outlined for prospective trials. Yet, evidence for causality is less convincing from such cohorts. The design would have to allow for the change in activity level that a serious injury may bring, otherwise the injury rate in the less active groups would be distorted. In this respect, a retrospective study that measured activity level leading up to injury may provide more useful data, but would such a study have reliable activity data?

INTERPRETING RESEARCH DATA

Let us consider a type of injury that is caused by macrotrauma and obviously not overuse. Road runners may be hit by cars. Let us make the reasonable assumption that the risk of injury from such a road traffic accident when road running is proportional to the distance run in training. Figure 1 presents these hypothetical data.

This would be the appearance of the chart for any type of injury that was related to use and not overuse. The

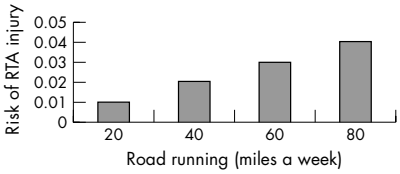

Figure 1 Risk of injury from a road traffic accident (RTA) when running.

example given above of tibial fractures in football may look similar.

If we are to accept the notion of an injury being caused by overuse, we must see that the relation of injury to activity is not one of proportionality. At some point on the curve that relates injury risk to activity level, the risk must exceed the risk predicted if it continued to rise proportionally with activity.

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Figure 2 provides further hypothetical data. In this, the risk of plantar fasciitis rises proportionally to activity, and this is compatible with a traumatic causation. Achilles tendinitis, however, only occurs above a threshold activity level and so is compatible with the notion of overuse as cause. The examples are clearly simplified relative to data that may realistically be collected. The influence of contributory factors would distort the relation in real charts.

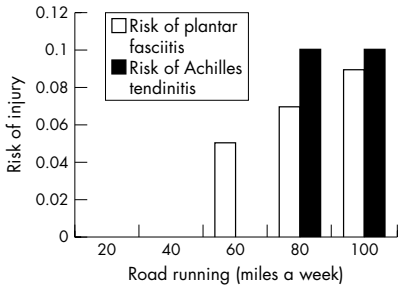

Figure 2 Risk of injury in runners.

HOW MIGHT SPORTS PHYSICIANS MISINTERPRET THEIR EXPERIENCE IN CLINIC?

If a type of injury was due to overt trauma and that trauma was equally likely for each unit of activity, the relation between number of injuries and level of activity would mirror the example of road traffic accidents in runners given above. If all runners presented to a sports physician, he/she would see four runners with this type of injury from the highest mileage group to every one from the lowest mileage group. If the moment of injury is not obvious, yet the pattern of occurrence the same, then the sports physician will blame the one thing that appears to have brought most athletes to the consulting room with this problem: the amount of running. There appears to be no other explanation, and so the injury is blamed on running too much and categorised as overuse. This experience could be repeated time and time again for various types of problems and each experience compounds the sports physician's opinion that overuse causes many injuries that he/she is called upon to treat. Only carefully conducted and interpreted research could show whether he/she is right.

ALTERNATIVE THEORY

If overuse is not the cause of some or all of the injuries thus categorised, what is? We need to consider the possibility that there may be an acute injury that was not apparent by obvious trauma with pain and or loss of function occurring at the time. It is reasonable to speculate that the pain may not start at the moment that the pathological process starts. Such an injury, like all sports injuries, would relate to use not overuse. There may be another explanation for these injuries.

CONCLUSION

This all highlights the challenge for those researching the cause of sports injuries to prove whether the concept of overuse as a causal factor is correct. I propose that, until this proof is available, we stop using the term overuse injuries. We will then be less inclined to fall into the trap of assuming that rest will be therapeutic and that restriction of activity is a justified preventive measure.

My apologies to Slocum and James[1] who coined the phrase overuse injury.

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Author's affiliations
P L Gregory, Centre for Sports Medicine, Department of Orthopaedic and Accident Surgery, Queen's Medical Centre, University Hospital, Nottingham NG7 2UH, UK

Correspondence to: Dr Gregory; Peter.Gregory@nottingham.ac.uk

Sprained ankle management

Management of the sprained ankle

C N van Dijk

Non-operative treatment with early functional rehabilitation is the treatment of choice

Inversion injuries of the ankle ligament are among the most common injuries, accounting for about 25% of all injuries to the musculoskeletal system. The most commonly injured part of the lateral ligament complex is the anterior talofibular ligament (ATFL). Although ruptures of the ankle ligaments are very common, treatment selection remains controversial. In a recent systematic review of the available literature, it was found that treatment of an acute lateral ligament rupture that was too short in duration or that did not include sufficient support of the ankle joint tended to result in more residual symptoms. It was concluded that a "no treatment" strategy for acute ruptures of the lateral ankle ligament leads to more residual symptoms.[1] After a supination trauma, it is therefore important to distinguish a simple distortion from an acute grade II or III ankle ligament rupture, because adequate treatment is associated with a better prognosis.

Although ruptures of the ankle ligament are very common, treatment selection remains controversial.

Because of the suspected poor reliability of physical diagnosis of ligament ruptures after inversion trauma of the ankle, stress radiography, arthrography, magnetic resonance imaging, and sonography are often performed simultaneously.[2] However, these methods are expensive, and their reliability is debatable. The reliability of physical examination can be enhanced when the investigation is repeated a few days after the trauma. The accuracy of physical

examination has been determined in a series of 160 patients, comparing physical examination performed within 48 hours of the injury and five days after injury. All patients had arthrography, but the outcome was not disclosed to the patient or the investigator until after the second delayed physical examination. The specificity and sensitivity of the delayed physical examination for the presence of absence of a lateral ankle ligament rupture were 84% and 96% respectively. It is therefore concluded that a precise clinical diagnosis is possible.[3 4]

The most important features of physical examination are swelling, haematoma discoloration, pain on palpation, and the anterior drawer test. Physical examination is unreliable in the acute situation because of the pain: the anterior drawer test cannot be adequately performed. Moreover there is diffuse pain on palpation and it is often difficult to judge whether the cause of the swelling is oedema or haematoma. A few days after the trauma, the swelling and pain have diminished and it becomes obvious whether the cause of the swelling was oedema or haematoma. The pain on palpation has become more localised and the anterior drawer test can be performed.

The site of pain on palpation is important. If there is no pain on palpation on the ATFL, there is no acute lateral ligament rupture.[4] Pain on palpation on the ATFL cannot in itself distinguish between a rupture or a distortion. If there is pain on palpation on the ATFL and haematoma discoloration, however, there is a 90% chance that there is an acute lateral ligament rupture.[4]

A positive anterior drawer test has a sensitivity of 73% and a specificity of 97%.[5–9] It is sometimes possible to detect the occurrence of a skin dimple when performing the anterior drawer test. If a skin dimple does occur during the anterior drawer test, there is a high correlation with a rupture of the lateral ligaments (predictive value 94%). A skin dimple will occur, however, in only 50% of patients with a lateral ankle ligament rupture.[6] A positive anterior drawer test in combination with pain on palpation on the ATFL and haematoma discoloration has a sensitivity of 100% and specificity of 77%. It has been shown that the interobserver variation for the delayed physical examination is good with an average κ of 0.7.[5]

When a diagnosis has been made, it is generally agreed that non-operative treatment with early functional rehabilitation is the treatment of choice.[2] A recent meta-analysis showed operative treatment to be superior to functional treatment.[1] There are reasons to question the selection of operative treatment as a treatment of choice. Operative treatment is associated with increased risk of complications and is also associated with higher costs. Because of the high prevalence of ankle injuries, operative treatment may be performed by surgeons in training, which may affect the outcome. Finally when conservative treatment fails, secondary operative reconstruction of the elongated ligaments can be performed with similar good results, even years after the initial injury.[10] Functional treatment therefore remains the treatment of choice.

Delayed physical examination provides a diagnostic modality of high sensitivity and specificity

Application of an inelastic tape bandage is only effective when it is applied at the moment that the swelling has diminished. This kind of treatment is cheap and not a burden to the patient. The same is true for delayed physical examination. Before the decision is made to apply the inelastic bandage or a lace up support, a delayed physical examination must be performed to obtain a diagnosis and to decide whether this treatment is really necessary. Does performing an anterior drawer test four to five days after injury disturb wound healing? Cell lysis, granulation, and phagocyte activity take up to six days to occur after injury, and fibroblasts start to grow into the wound at five days. Subsequently, collagen grows along a fibrin mesh. After 10 days, the defect is filled with vascular inflammatory tissue.[11 12] Performing an anterior drawer test four to five days after the trauma will therefore not disturb wound healing. Delayed physical examination provides a diagnostic modality of high sensitivity and specificity. This has been proposed to be the strategy of choice in an editorial of the *British Journal of Bone and Joint Surgery*.[13]

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Author's affiliations
C N van Dijk, Academic Medical Centre, Amsterdam, The Netherlands

Correspondence to: Dr van Dijk, Orthopaedic Research Centre, Academic Medical Centre, University of Amsterdam, 1100 DD Amsterdam, The Netherlands; M.Lammerts@amc.uva.nl

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