

WEAR AND TEAR INJURIES IN ATHLETES – AN OVERVIEW

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Governments and Governmental organisations are currently encouraging people to take part in exercise, and particularly competitive exercise, without apparent regard to one inevitable consequence, an increasing incidence of injuries. By definition physical exercise involves stress which is being applied through sport to more and more people. Figures made available by the Central Council of Physical Recreation some time ago indicate the enormous growth in participation in sporting activities. Practically every sport in the U.K. nowadays, from judo through archery to squash, is claiming to be the major growth sport. More and more people, as they do less and less physical work to earn their livings, are doing more and more physical work to earn a feeling of fitness, to sleep well and so on, and they are doing it through sport. Sport, by applying stress to the body will produce an intended training effect, that is to say improve the capacity of the body to cope with that stress. Man is a homeostatic creature in that he likes to keep his internal environment constant. When he takes exercise he disturbs the basic resting internal environment, and all the physiological changes which take place as a result of exercise are designed to restore the "milieu interieur" to its resting state. The borderline between the training load that induces the right level of stress to produce a training effect and the training load that is too stressful and produces injury is very ill-defined.

Injury may occur to the body as a whole, as a result of stress to the body as a whole, or to a part or parts of the body. Not only may the stress effect the body, it may also affect the mind; mental "wear and tear" can occur equally in sport as in anything else.

As more and more people take part in sport and train harder and harder, the stresses imposed on the body are increasing progressively so that in future it will become not a matter of who is the strongest or the fastest or the most skillful who will win gold medals, but those whose bodies can take the stresses imposed without breakdown! At a recent symposium in Oswestry on "Injury in Sport", David Jenkins the former European 400m champion made the point very clear, describing how a particular group of athletes preparing for the Olympic Games in Montreal were overstressed in their training and nearly all broke down. Virtually none of them made it either to Montreal or when they got there.

Thus it is a matter of present concern that more and more people are taking more and more exercise and in consequence are injuring themselves more and more. Not

all of course, sustain the serious, immediate injuries – impact injuries, fractures and dislocations – which are very important logistically but form part of normal casualty practice. Today attention must be focussed on another group of injuries known collectively as "overuse injuries". These are the consequence of excessive training loads applied for too long a period of time. What happens essentially is that the changes in the tissues resulting from exercise do not recover before the next bout of exercise occurs. There is then a summation of loading and breakdown inevitably follows. The purpose of the training effect is of course to increase the ability of the body to recover rapidly after exercise, as also to sustain exercise. But adequate time must be allowed if adaptation is to take place. This applies to individual active tissues as well as to the body as a whole.

The terms overuse and "wear and tear" when applied clinically usually suggest osteoarthritis or degenerative joint disease. Frank osteoarthritis is not uncommon in the sixty year old in the population generally but similar clinical and radiological findings are too often demonstrated by active sportsmen two or more decades younger! It seems indeed as if sport is bringing forward the age at which joints degenerate. From a practical and preventative point of view it is important to determine whether it is stress that produces such degeneration or whether it is a failure to deal with the effects of stress. Is osteoarthritis a direct response to overuse, or a result of untreated earlier injuries, overuse or otherwise?

Physical recreation and sport is becoming more common in extreme youth, and sadly more competitive as well. This may be a necessary or at least inevitable consequence of the increase in intensity of adult competition, but is it really acceptable? Not only are children taking part in sporting activity earlier in life, usually as part of the school curriculum, but they are doing so to higher and higher standards. It is particularly worrying that certain types of very stressful sport such as Olympic gymnastics are very popular with young children at stages of rapid growth and development. Too many clinical problems such as osteochondritis are met in association with overtraining of young girls in gymnastics.

Traction epiphysitis is remarkably common as a result of overuse in sport. It is always horrifying to see some unfortunate twelve year old brought into the clinic by his parents or coach and plonked down on the seat to the accompaniment of a story such as "his knee hurts

and he's a keen footballer, and we've got a talent scout from Tottenham Hotspur coming down to see him next week". A twelve year old! The wretched child is under tremendous pressure to produce the glories which eluded his parents when they were young! Overuse injury in sport in childhood is thus a big problem and those who are dealing with the clinical problems of injury in sport have to be very much aware of this oversteering, both physical and psychological. One of the reasons why top class young swimmers very seldom continue to compete later in life is the discouragement of forced over-training when very young. In the 1976 Montreal Olympics, in swimming most of the gold medallists were mature swimmers, which demonstrates a trend away from the situation of some years ago when they were all teenagers, and young teenagers at that.

Other examples of overuse injury in children include epiphysitis of the olecranon as seen in a youngster who was being pushed and pressured into playing tennis. He was kept doing forced extension of the elbow playing tennis shots and ended up with a fragmented olecranon. This condition may also be observed among gymnasts, as may damage to the episeal end plates in the dorsal spine as a result of excessive suppling. One of the horrid things that happens to young gymnasts is that they are submitted to vigorous passive movements to increase the range of their joints to enable them to participate in their activity. The tragedy of this is, of course, that as Munrow (1963) intimates — "Flexibility is the one quality of fitness of which you can have an excess" and the situation is even worse for children with hypermobile joint disease. In 1971, Murray and Duncan published a paper in the *Journal of Bone and Joint Surgery* on hip dysplasias in young boys and showed that in boys who were in schools with a heavy physical education programme, (particularly involving a lot of cross-country running) there was an increased proportion with deformities of the hip joint typical of an upper femoral epiphysiolysis or at least damage to the upper femoral epiphysis. It is arguable as to whether this is true slipped epiphysis, but it is too commonly seen in children with a significant sporting history while at school. More recently it has been noted in traumatic osteitis pubis (in footballers especially) that the incidence of hip deformity appears to be very much higher than the incidence of hip deformity in the population as a whole and further, that the incidence of traumatic osteitis pubis in patients with such hips is higher than in the population as a whole. It seems therefore that this is an example of how the effect of earlier damage (to the hip) by excessive activity in puberty gives rise to later damage (to the symphysis pubis) by excessive physical activity during maturity: Williams 1978.

Running, whether as training for other sports or for running itself, can cause excessive wear and tear,

particularly when very long distances are involved, and there are obvious reasons for this. One of the reasons why so many cases of back problems (overuse or "wear and tear" injuries) are seen in running is poor technique associated with excessive mileage. Very often it is found that patients run with a positive velocity heel strike in which the forward moving leg is held rigid so that shock waves from landing go straight up the leg, through the hip and into the lumbo-sacral joint. If there is a slight give in the knee on running, the body's centre of gravity tends to follow a more smooth oscillatory trajectory and there is a cushion effect, rather like the oleo legs on the under-carriage of an aircraft. Because the shock waves are transmitted directly to the spine there is an increased incidence of spondylolysis and spondylolisthesis in runners (as well as weight-trainers). This is why back problems, including disc lesions, are so commonly found in runners where normally most of the injuries would be expected to occur in the lower limbs.

The other common cause for back injuries is excessive, uncontrolled weight-training.

Yet another example of the sort of problem associated with excessive use is the growth of spikes of bone at the joint margin, suggestive of osteoarthritis or degenerative joint disease. However radiological examination of joints of this type shows that the "joint gaps" are within normal limits. There is no evidence of erosion of articular cartilage and many of the spikes of bone are in fact extra-capsular. These are "impingement exostoses" due to the banging of the joint margins of the bones against each other. They may be found at the elbow in a squash player or fencer.

In some instances accessory ossicles may behave like impingement exostoses, as in the case of the os trigonum, an accessory ossicle which lies behind the talus. This is present in 7% of the population and causes very little trouble, except in sport, when excessive movements of the ankle joint in plantar flexion cause nipping of this small bone. Damage is done to the bone and its surrounding structures and occasionally, as Helal (1978) has suggested, chondromalacia of the joint surface of the os trigonum may be noted. Furthermore repeated injury to the joint structures can lead to the progressive development of joint instability, as with disruption of the lateral collateral ligament the ankle joint in chronic repeated sprains progressing to instability and talar tilt with osteoarthritis. There is therefore a definite risk that patients with relatively minor ligament injuries who are not given proper treatment and rehabilitation will develop injuries which become progressive. This is seen in the ankle, the knee and the elbow (in gymnasts for example enormous loads are applied to the elbow in tumbling and bar work).

Another example of overuse degenerative change is

found in the acromioclavicular joints of rugby players. The joint appears in reasonable shape both clinically and radiologically but there is a peculiar "fluffy" appearance of the outer ends of the clavicles on x-ray. The condition is known as traumatic osteolysis and is associated with repeated minor injury to the acromioclavicular joint. In rugby football the joint is injured not so much by tackles, but by bad falls on the point of the shoulder.

Chondromalacia of the patellae is extremely common in sport. The pathology involves softening of the articular cartilage on the underside of knee-cap. It is not certain whether in fact it is a genuine overuse injury or "wear and tear". It certainly appears to be due to muscle imbalance of the quadriceps, sometimes associated with other problems such as hypermobile joint disease, patella alta, patellar bipartita and so on. It is one of the biggest clinical problems in sportsmen, and almost one in ten of patients attending the Oxford R.H.A. Regional Centre for Sports Injuries has chondromalacia of the patellae. e.

One of the best known types of overuse injury of bone is the stress fracture. Examples include the metatarsal stress fracture (usually in the shaft of II and III) otherwise known as the "March fracture", and the fibular and tibial fracture of runners and gymnasts. It is essential to clarify the diagnosis even though radiological changes may become apparent only some weeks after onset of symptoms, in order to exclude more sinister bone pathology, such as sarcoma or even osteomyelitis.

Overuse and wear and tear does not occur only in bones and joints. In the skin the normal response to use is callus formation, as exemplified in the feet of long-distance runners and the hands of gymnasts. Unaccustomed or excessive use leads to blister formation or cracking; an example of the latter is spinner's finger in cricket. In the subcutaneous tissues overuse may result in the development of adventitious bursae and these may become inflamed or infected.

Overuse injury is relatively uncommon in muscle, if only because muscular tissue has as a rule such an excellent blood supply. However, in excessive use even trained muscle can "seize up" with acute oedema, although absorption of fluid is usually rapid on cessation of exercise. In unaccustomed activity the typical overuse injury of muscle is simple muscle stiffness which in the untrained muscle takes longer to subside.

The main site of overuse injury in the soft-tissue is in and around tendons, largely because of the relatively small blood supply associated with these structures, associated with the lower metabolic rate of tendon required for the maintenance of high levels of tissue tension without ischaemic necrosis.

Inflammation may take place around the tendon in

the soft paratenon giving rise to an acute or chronic peritendonitis or tenosynovitis or may affect the tendon sheath. The acute inflammatory response to overuse is usually cleared readily with appropriate anti-inflammatory medication, either systemic or locally applied together with a diminution in activity. Chronic overuse injuries of the paratenon or tendon sheaths invariably result in a fibrotic reaction, scarring and stenosis. Symptoms may be kept at bay temporarily with anti-inflammatory medication, particularly local steroid injection but tend to be relentlessly progressive and the patient frequently requires formal surgical decompression and excision of the scar tissue before full function is restored.

Various overuse injuries have been described in the tendon itself: In tendonitis the whole thickness of the tendon is affected, there is a diffuse oedema and clinically the patient complains of pain and swelling. In the early stages resolution may be achieved by a reduction in activity together with appropriate supportive treatment (including ultrasound) but in the established case the most rapid recovery of function is achieved by a formal tenolysis or splitting of the tendon to decompress it. More focal lesions in the tendon (either focal degeneration of partial rupture) present similarly although the swelling is often not as marked. The classic site for these lesions is the Achilles tendon but they may also be found in the patellar tendon ("jumper's knee"). Treatment of the resistant case is by surgical decompression. In the case of partial rupture there is always a history of a sudden incident of pain. These latter lesions, although in many ways similar to focal degeneration, should not be regarded as specific overuse injuries.

Overuse injury to a muscle attachment other than a tendon is known as an enthesitis and a classic example is tennis elbow. Here the aponeurotic attachment is pulled away from the bone; very often there is a triggering initial acute injury but failure to heal rapidly (associated with poor local blood supply) predisposes to a series of recurrent lesions and eventually the patient ends up with a mass of healing tissue, old and new, with extravasated blood and a structureless scar. In chronic cases this mass of scar tissue may have to be excised, although local and systemic anti-inflammatory medication can help in the less chronic case. In all instances of severe overuse soft-tissue injury it is likely that there has been a breakdown in the pattern of activity in addition to the overuse and it therefore becomes necessary to make certain that the sporting technique is satisfactory for each individual patient.

This brief review of some of the overuse injuries encountered in sport indicates the less attractive side of sport and physical recreation from a health point of view. However, injuries are the exception rather than the

rule and it is remarkable how many individuals can participate in sport throughout the whole of their active lives with very little trouble. The risks of these relatively minor, although sometimes troublesome, injuries are well worth taking having regard to the immense ad-

vantages, both physical and psychological, that sport can offer. These risks can be further reduced very significantly by a proper scientific study of the injuries and their mechanisms and the development of the appropriate means of treating them.

REFERENCES

Helal, B. 1978. Personal Communication.

Munrow, A. D. 1963. *Pure and Applied Gymnastics*. Arnold, London.

Murray, R. O. and Duncan, C. 1975. "Athletic activity in adolescence as an etiological factor in Degenerative hip disease", *J.Bone Joint Surg.*, 5313, 406.

Williams, J. G. P. 1978. "Limitation of hip joint movement as a factor in traumatic osteitis pubis", *Brit.J.Sports Med.* 12, 129.
