Cartilage injuries and management

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It is important for footballers, like other professional athletes, to have a life after their playing careers that is not marred by injury. Thankfully, health professionals can help protect these players' musculoskeletal health so that they can enjoy an injury-free retirement as well as a satisfying playing career. Retired players also need to pay more attention to diseases such as cardiac problems, diabetes, obesity and degenerative joint pathologies. The general health of retired players should therefore be routinely evaluated, and issues related to the musculoskeletal system should be assessed separately from other diseases. A simple approach can be adopted for retired footballers, for whom a general health plan can be integrated into a personalised fitness programme.

Footballers tend to finish their playing careers with overloaded joints even if they have sustained no major injuries. Microtraumatic cartilage injuries, for example, can lead to early degenerative arthritis, causing pain and disability in daily life. The main function of cartilage tissue is to provide a pain-free range of low-energy movement by decreasing friction. Healthy cartilage lays the foundations for a problem-free playing career in which footballers expect their bodies to continue to perform optimally under extreme loads and with extreme ranges of movement. However, accidents do occur and unexpected trauma, in particular, can cause shear forces or impact resulting in cartilage injury. The knee, the biggest joint in the body, is most the frequently affected, and footballers are among the most exposed to knee damage. The prevalence of knee osteoarthritis in athletes depends on the frequency, intensity and level of their sporting activity. The estimated rate of knee osteoarthritis among footballers is 19-29%, compared with 14-20% in long-distance runners and 31% in weightlifters. In a study by Kujala et al, the risk of knee osteoarthritis was found to increase five-fold in top-level male athletes with prior knee injuries.

In addition, secondary osteoarthritis of the knee develops at an earlier age in footballers than in other sectors of the population, with its origins traceable to ligament and meniscus injuries.

Common injuries such as meniscus tears and anterior cruciate ligament ruptures are also found to be associated with a higher incidence of osteoarthritis, according to several studies. Professional athletes who have undergone surgery for ligament reconstruction or meniscal pathologies are at particular risk of early arthritis. This is seen at an earlier age than primary osteoarthritis, which is more common in elderly people, with an incidence of 25-30% in the 45-64 age group and 85% at 65+. Primary and secondary osteoarthritis are both cartilage-eroding and destructive pathologies.

All evidence indicates that footballers require a strong muscle structure to avoid injury. The muscular system acts

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Knee pain can be managed with cold-application

as a dynamic support for extreme joint loading. Weak muscles lead to major injuries and increase the after-effects of microtrauma to joint cartilage. The problem with cartilage injuries is the progressive nature of the pathology due to the unique properties of cartilage tissue, which contains no blood vessels, nerves or lymphatics and is 2-4mm thick. These properties lead to delayed or insufficient healing after injury.

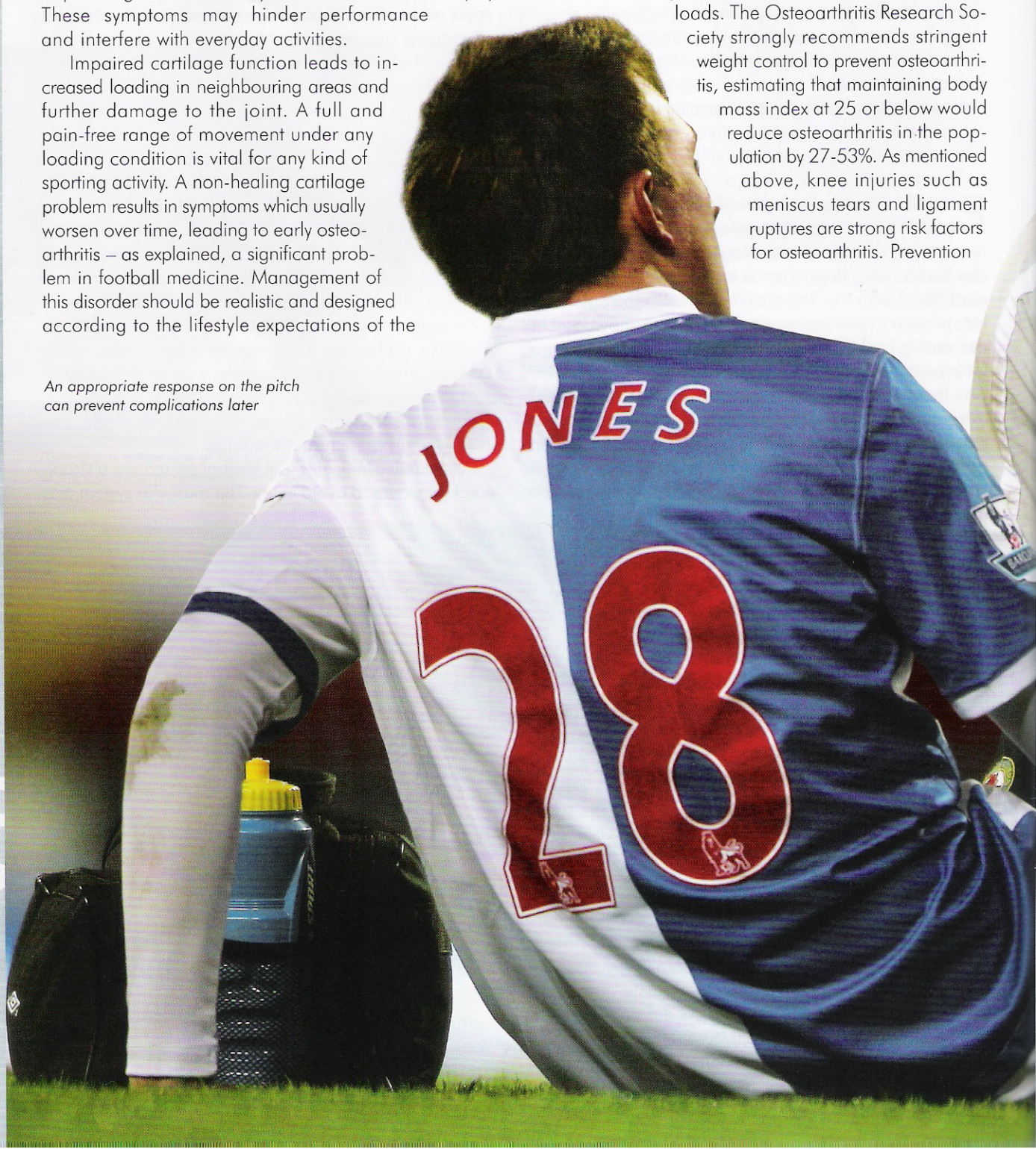
In addition to the lack of blood and the lack of healing response from progenitor cells in the blood, cartilage cells have a limited capacity to proliferate and regenerate. Cartilage injuries heal with a different tissue, known as fibrocartilage. This is biomechanically inferior to the original hyaline cartilage in terms of replicating the functions of hyaline cartilage, such as absorbing shock and minimising friction. Disturbed balance within the joint leads to pain during physical activity and can limit movement depending on the severity and location of the injury. These symptoms may hinder performance and interfere with everyday activities.

Impaired cartilage function leads to increased loading in neighbouring areas and further damage to the joint. A full and pain-free range of movement under any loading condition is vital for any kind of sporting activity. A non-healing cartilage problem results in symptoms which usually worsen over time, leading to early osteoarthritis – as explained, a significant problem in football medicine. Management of this disorder should be realistic and designed according to the lifestyle expectations of the patient. Non-surgical methods are sufficient to treat most everyday problems, and obese ex-players should be encouraged to lose weight to avoid excessive loading of the knees and ankles. This seemingly easy-to-achieve goal sometimes requires considerable effort and should be part of a comprehensive programme of daily activities designed to protect the individual's joints from extreme loading.

As the number of footballers with osteoarthritic pathologies is increasing, it becomes increasingly important to prevent cartilage injuries during active playing careers and transitions into retirement. There are three major risk factors that can be managed with preventive measures:

1. excessive musculoskeletal loading;
2. high body mass index; and
3. previous knee injuries.

According to Hochberg, the prevalence of knee osteoarthritis could be reduced by 15-30% by avoiding squatting, kneeling and the carrying of heavy loads. The Osteoarthritis Research Society strongly recommends stringent weight control to prevent osteoarthritis, estimating that maintaining body mass index at 25 or below would reduce osteoarthritis in the population by 27-53%. As mentioned above, knee injuries such as meniscus tears and ligament ruptures are strong risk factors for osteoarthritis. Prevention



An appropriate response on the pitch can prevent complications later

programmes for sports injuries, especially anterior cruciate ligament injuries, have recently shown promising results. According to Norwegian studies, it is possible to prevent anterior cruciate ligament injuries using neuromuscular training programmes. After retiring from professional sport, moderate or low-intensity exercise and weight control can be useful to prevent osteoarthritis.

The most important preventive measure is to recuperate muscle power. Dynamic muscle balance and force need to be regained with well-designed exercise programmes featuring isometric training, which is also good for general health. Simple exercises with moderate weights play a key role in these programmes. Even 30-minute sessions combining flexibility movements with short weight-lifting activities are helpful in ensuring a problem-free everyday life.

The sudden onset of knee and ankle pain can be managed with cryotherapy (cold-application), which can decrease inflammatory swelling. Cold-application may also be used as an analgesic agent. The most simple and widespread technique is to use ice or cloth soaked in iced water (direct ice-to-skin contact for long periods should be avoided to prevent cold burns). This technique is applied over four to six sessions usually of 15-20 minutes an hour. After the oedema and/or swelling has reduced, cold-application should be terminated. Physical therapy and drugs are the next step in the event of persistent complaints, and advice from a professional physician can be helpful to determine the ideal dose and combination.

Nowadays, there are various way to evaluate the extent of cartilage injury. Besides clinical examination, widely used techniques include X-rays, computerised tomography and, in particular, magnetic resonance imaging (MRI). After a definitive diagnosis through radiological imaging, age and level of physical activity are important factors when deciding on treatment. Arthroscopic debridement, high tibial osteotomy (HTO) and arthroplasty (unicompartmental or total) are the main methods of treatment for older patients, as explained in more detail below.

Technical, biological and scientific advances in recent decades have provided better treatment options for cartilage injuries, but a simple, effective and universally accepted method has yet to be discovered.

Traditional treatments are based on the principle that stem cells in peripheral blood may promote the healing process in the defective area. In cartilage injuries not extending below the subchondral bone, there is no bleeding due to the avascular nature

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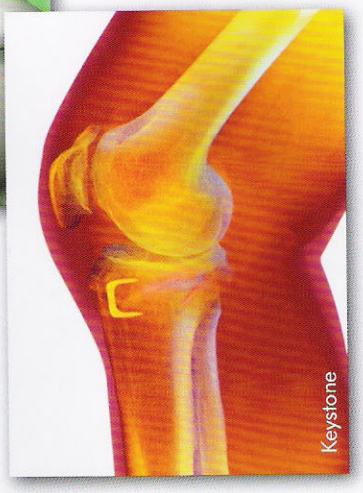
of articular cartilage. This is especially helpful in defects smaller than 2-3cm^2. The techniques used in such cases are almost always arthroscopic and minimally invasive.

In these kinds of minor cartilage injuries, pain and soreness are usually present in joints after normal everyday activities, but symptoms may be aggravated by meniscus ruptures. Meniscus ruptures among older patients are different from those sustained during an active sporting career. The elasticity and durability of meniscal tissue decreases with age, when small forces may damage this structure. Meniscal pathologies may be diagnosed by a sensitive joint line on palpation, clicking noises during flexion-extension movements and special physical examinations indicating a rupture.

In retired players, arthroscopic debridement can be useful for both meniscus removal and evaluation of cartilage, which is frequently damaged in patients with meniscus ruptures. Mechanical barriers to joint movement are cleaned with arthroscopic debridement and relief can usually be obtained as a result. This relief may also delay the need for joint arthroplasty in last-stage joint arthritis.

Subchondral drilling is based on making perforations in the subchondral bone with a wire and perforator, providing a passage from the injured area to bone marrow and blood. Microfracture surgery, meanwhile, is performed by making small fractures in the subchondral bone to promote healing. Both methods produce a limited healing response as they produce fibrocartilage, which (as explained early) is inferior and often cannot meet the expectations of a professional or amateur athlete, or even an active young adult.

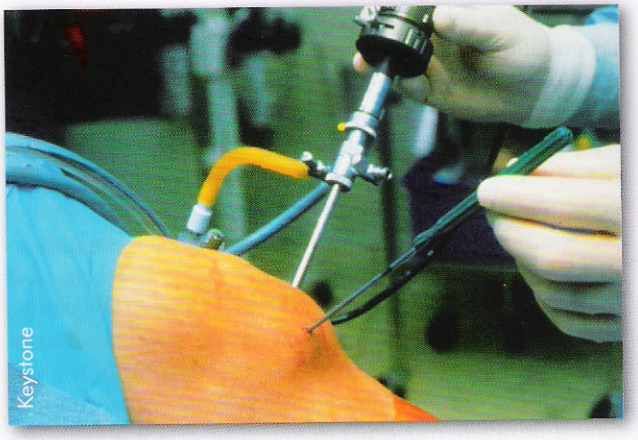
Osteoarthritis



Knee osteoarthritis x-ray

HTO, another treatment option for cartilage lesions, is generally preferred in middle-aged patients and is indicated in single-limb malalignment leading to unicompartmental degeneration. In selected patients this is probably the best method for correcting altered load transmission. By performing knee arthroscopy at the same time it is possible to address meniscal pathology and loose bodies, which is strongly indicated in this group of patients. In the case of large chondral lesions, mosaicplasty using autologous osteochondral grafts is widely applied and seems beneficial.

A recent innovation in cartilage injury management in orthopaedic surgery is the use of autologous chondrocyte



Arthroscopy of a knee joint

implantation and mesenchymal stem cell (MSC) transplantation. Autologous chondrocyte implantation involves harvesting cartilage through an arthroscopic procedure, proliferating the chondrocytes in cultures and, finally, implanting the chondrocytes by direct injection or by matrix scaffolds in a separate procedure. As for MSCs, these retain both a high proliferative potential and multipotentiality, including the potential for chondrogenic differentiation. A number studies have reported on the use of MSC transplantation on animals, but its application in cartilage repair is still at an early stage, with more clinical studies required. Both of the above procedures, however, will probably shape the future of cartilage injury management and provide hope for top players.

The other treatment option mentioned in this article is knee arthroplasty, which involves removing the arthritic parts of the knee joint and replacing them with prosthetic implants. A decision on which type of arthroplasty to use (total or unicompartmental) should be made before the operation. Factors affecting this decision include the patient's age (especially when 60+), pain levels that limit the majority of everyday activities, and a recorded increase in physical limitations. Age, however, is the predominant factor in indications of arthroplasty.

Patients should be informed that after total knee arthroplasty they should limit their activities to make their repaired joint last longer. For example, swimming breaststroke should be avoided because it applies high levels of torque to the knees; if a patient wants to play tennis, they should be advised to play doubles; and in golf, short steps are advised to prevent excessive loading of the knee. The key issue during any activity is to avoid excessive loading of the knee while nonetheless enjoying the activity. The challenge is to achieve the ideal balance between these two concerns.

To conclude, cartilage injuries in sport cause major problems and are common in football. When planning a treatment strategy for an ex-professional player, the patient's expectations should be taken into account and managed, with the ultimate aim of achieving complete freedom in everyday life. The patient should be encouraged to explore new interests and hobbies which avoid excessive loading of the knee. Preventive measures are key, but doctors also need to take into account the differences between a normal patient and one that has been a high-level athlete.