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Osteochondritis dissecans

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Abstract

Osteochondritis dissecans is a condition characterised by acquired pathological subchondral bone lesions and its incidence is unknown. It has a multifactorial aetiology, with a combination of genetic and acquired risk factors. It commonly presents in adolescents and young adults. Patients have variable presentations, including trauma, insidious onset and pain exacerbated by exercise. The joints primarily affected are the knee, ankle and elbow joint. Early identification is key to treatment and to prevent future osteoarthritis of the joint. This article gives an overview of the presentation, assessment and management of the juvenile form of osteochondritis dissecans.

Key words: Orthopaedics; Osteochondritis dissecans; Paediatric knee pain

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Introduction

Osteochondritis dissecans is an acquired, idiopathic lesion of subchondral bone which is potentially reversible, but can involve articular cartilage and lead to chondral instability. It can be divided into juvenile onset and adult onset; earlier onset is associated with a better prognosis (Cahill, 1995). The juvenile form occurs at 10–15 years of age, with an incidence of 11.2 per 100 000. Males are four times more likely to be affected (Kessler et al, 2014). The knee joint is the most common location, but it also seen in the ankle (talus) and the radiocapitellar joint of the elbow. It typically presents with activity-related joint pain, but may later present with mechanical symptoms of locking and reduced range of motion. It is investigated with X-rays and magnetic resonance imaging, and can be managed conservatively or operatively, depending on the severity of disease.

Anatomy

Synovial joints are lined with articular cartilage, made of hyaline and contained within a fibrous capsule. There are three main components: capsule, cartilage and synovial fluid. The cartilage forms a cavity containing synovial fluid, which allows movement of the bones without destruction of the underlying bones and acts as a shock absorber. It contains two layers, the outer relatively avascular fibrous layer, and the inner synovial layer. The synovium aids in the lubrication of the joint.

Osteochondritis dissecans is a condition affecting synovial joints, in which a lesion develops in the subchondral bone and articular cartilage. This leads to softening of the bone and may result in early articular cartilage separation. This is partial detachment of the cartilage, which can eventually detach from the larger bed of bone and lie within the synovial joint itself. The final stage of the condition is osteochondral separation, forming loose bodies.

Aetiology

The aetiology is unknown but the condition is likely to be multifactorial, including genetic, traumatic and vascular factors (Flynn et al, 2004). Patients who carry out repetitive exercise or axial loading with valgus or varus stress on the joint, or shearing forces, may result in disruption of blood flow to the cartilage.

Familial osteochondritis is linked to inherited mutations of the ACAN gene, which is responsible for producing aggrecans to aid with cartilage formation (Dateki, 2017). These patients also present with short stature.

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Stage	Description
I	Small change of signal without clear margins of fragment
II	Osteochondritis dissecans fragment with clear margins but without fluid between fragment and underlying bone
III	Fluid is visible partially between fragment and underlying bone
IV	Fluid is completely surrounding the fragment, but the fragment is still in situ
V	Fragment is completely detached and displaced (loose body)

Table 1. The Hefti classification of lesions in osteochondritis dissecans

From Hefti et al (1999)

Classification

There are several classification systems used for osteochondritis dissecans, based on plain X-ray, magnetic resonance imaging or arthroscopic findings. The Hefti classification, based on magnetic resonance imaging findings, is most commonly used (Table 1) (Hefti et al, 1999). Stage I and II are stable and stages III to V are unstable. An unstable lesion can be defined as a breach in the cartilage and the presence of synovial fluid between the fragment and underlying bone. On magnetic resonance imaging the synovial fluid will appear as a white line behind the osteochondritis dissecans.

Clinical presentation

There is a bimodal distribution depending on the form, with the juvenile form occurring at 10–15 years of age while the physis is still open (ie the child is still growing) and usually in parallel with times of growth spurts. This is compared to the adult form when the patient has reached skeletal maturity.

In earlier stages of the condition, patients will typically present with poorly localised, activity-related pain. They may have intermittent stiffness and recurrent effusions related to physical exercise. As the disease progresses, with the development of a looser or larger fragment within the synovium, mechanical symptoms such as locking or catching of the joint can occur. Symptoms do not always correlate with disease severity.

Patients tend to present to either the GP or emergency department, depending on symptom severity and circumstances.

When taking the history, it is important to ask about repetitive loading activities of the extremities. This includes weight-bearing exercises of the upper limb such as gymnastics, weightlifting and racket sports. There is a history of trauma in up to 40% of patients with osteochondritis dissecans of the knee and up to 90% of cases involving the talus (Tol et al, 2000).

On examination of the affected joint, there will be generalised tenderness, swelling and stiffness. Anteromedial knee pain may indicate osteochondritis dissecans of the lateral aspect of the medial femoral condyle of the knee, which is the most common area affected by this condition. Typically, patients retain a full range of motion.

Differential diagnoses include osteonecrosis, stress fracture, osteochondral fracture, septic arthritis, bone contusion and soft tissue contusion.

Imaging

First, an X-ray of the affected joint should be obtained. This may show subtle changes to the cortical surface. As the disease progresses, more obvious changes may be seen, including contour abnormalities, fragmentation, lucency and sclerosis (Figure 1). If the fragment is unstable and displaced, this may also be seen within the joint.

In the knee, weight-bearing anteroposterior and lateral views should be obtained, including a tunnel view with the knee flexed between 30 and 50°. A skyline view of the patella is also useful to look at the superior inferior projection of the patella and identify any loose bodies.

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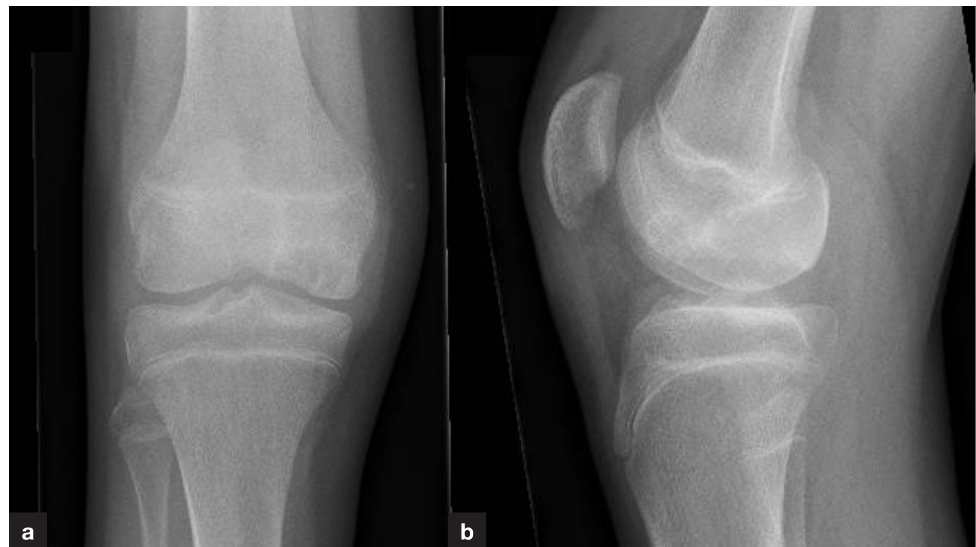

Figure 1. An (a) anterior-posterior and (b) lateral X-ray of the knee demonstrating a medial femoral condyle osteochondral defect.

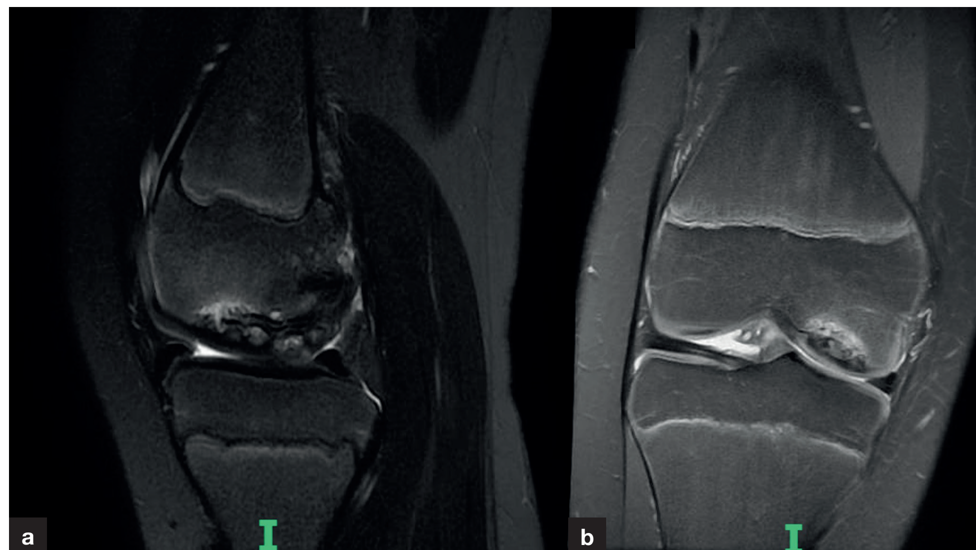

Figure 2. A (a) sagittal and (b) coronal slice T2-weighted magnetic resonance image of the knee demonstrating a medial femoral condyle osteochondral defect.

After an X-ray has been taken, a magnetic resonance imaging scan should be obtained if osteochondritis dissecans is suspected (Figure 2). This can be useful in evaluating the size and stability of the lesion (Table 2), the separation of the bone fragment, the quality of the subchondral bone and cartilage, and the presence of loose bodies.

A computed tomography scan can be useful in identifying loose bodies, but is rarely needed. Magnetic resonance imaging is the preferred investigation as it gives ample information regarding the chondral surface and its stability, especially in children, without exposure to radiation.

Table 2. Signs of instability on magnetic resonance imaging
High signal intensity rim at the interface between the fragment and adjacent bone
Fluid-filled cysts beneath the lesion
High signal intensity line extending through the articular cartilage overlying the lesion
Focal ostechondral defect filled with joint fluid, indicating complete detachment

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Management

The management options are non-operative or surgical (Figure 3). The goals are to promote subchondral bone healing, preserve the articular cartilage, and prevent fissure or fracture, which subsequently prevents joint arthritis.

Non-operative management can be considered if there is no instability of the fragment. Typically, patients are advised to rest, with protective weight bearing (or non-weight bearing) and reduction in exercise intensity for approximately 3 months. Spontaneous healing without fragmentation is seen in approximately 50–75% of patients (Wall et al, 2008; Krause et al, 2013). Open distal femoral physes are the best predictor of successful non-operative management (Accadbled et al, 2018).

Surgical management is advised for an unstable or displaced fragment because of the risk of detachment and secondary osteoarthritis. Therapeutic arthroscopy of the joint involved, with a view to fixation, should be carried out for patients with clinical signs of instability, impending physeal closure, expanding lesions on plain films, or those for whom non-operative management has not worked (if the patient remains symptomatic after a prolonged period of protective weight bearing and reduction in exercise intensity).

Different surgical techniques can be used, including subchondral drilling and/or fixation. If a lesion is felt to be stable on arthroscopy, subchondral drilling can be carried out to stimulate formation of fibrocartilaginous tissue and cartilage healing. If the lesion is large (more than 2 cm) and/or felt to be unstable during arthroscopy, then it can be fixed. Fixation methods include bio-compression screws and bio-absorbable chondral darts (Figure 4). After microfracture and/or fixation, there is usually a period of non-weight bearing (6 weeks). Patients can expect to return to full sport at approximately 4–6 months postoperatively.

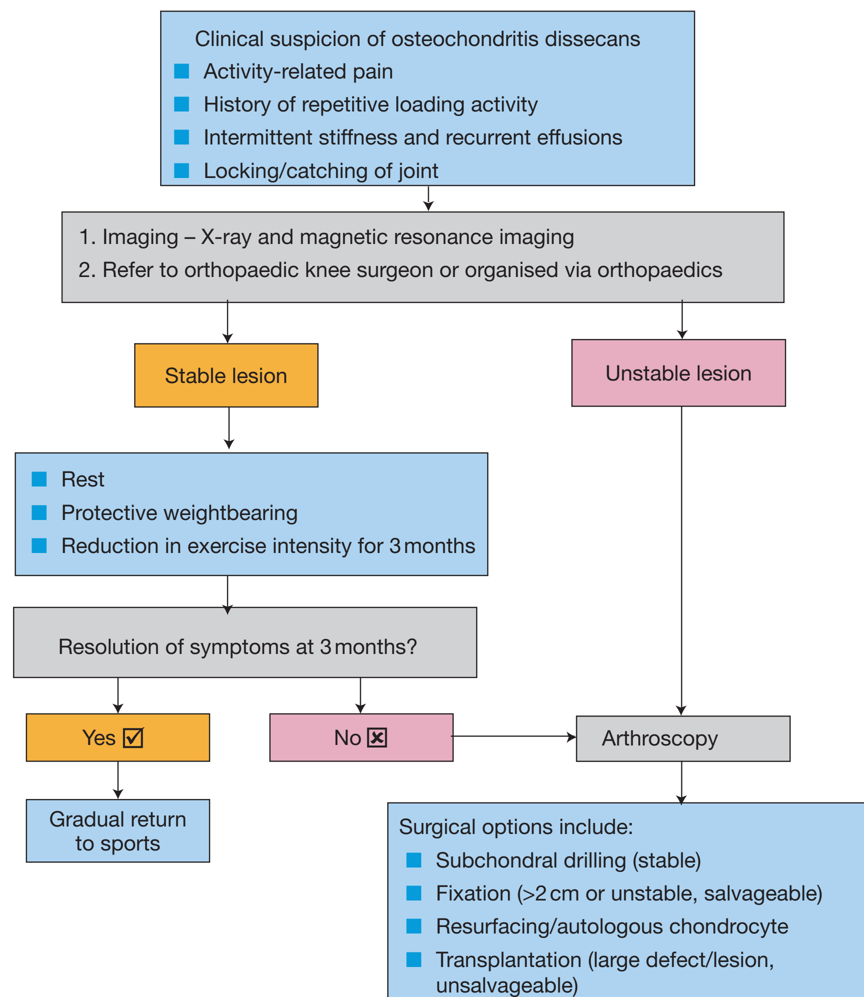

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Figure 3. Management of osteochondritis dissecans.

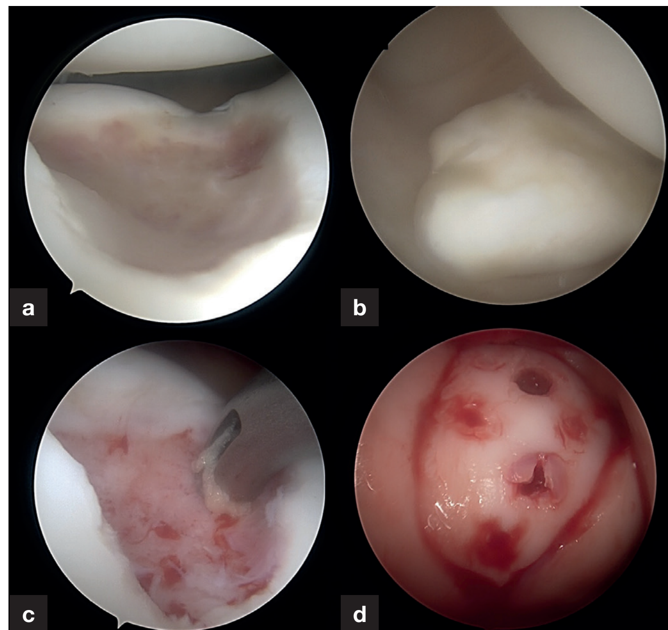

Figure 4. Intraoperative images taken during knee arthroscopy demonstrating (a) defect in the trochlea, (b) unstable loose osteochondritis dissecans fragment, (c) preparation of the fracture bed with curettage and (d) fragment fixation of osteochondritis dissecans with bio-compression screws (Arthrex).

If the defect or lesion is large, chondral resurfacing may be considered, using a cartilage graft. This involves taking healthy cartilage from a non-weight bearing joint and using it to cover the defect. More novel surgical techniques include autologous chondrocyte transplantation, which combines articular cartilage with extracellular matrix.

When to refer to the orthopaedic knee surgeon

If osteochondritis dissecans is suspected, then early referral to an orthopaedic knee surgeon is warranted. Baseline investigations such as an X-ray should be obtained in the community. If available in primary care or there is diagnostic uncertainty, a magnetic resonance imaging scan should also be organised. The patient should be advised to rest or use protective weight bearing while awaiting orthopaedic review.

Prognosis

The prognosis depends on the form (juvenile vs adult). Good prognostic factors include younger age and open femoral physis, which indicate an ability for the cartilage to remodel (Figure 5) (Accadbled et al, 2018). There is a poorer prognosis associated with lateral femoral condylar and patellar osteochondritis dissecans (Jones and Williams, 2016). The adult form has a worse prognosis and if symptomatic can lead to degenerative joint disease if left untreated.

Conclusions

Osteochondritis dissecans is a multifactorial disease characterised by subchondral and articular cartilage lesions which can eventually displace into the synovial cavity. It can be investigated with X-ray and magnetic resonance imaging and can be managed conservatively or surgically. Early identification is key to treatment and to prevent future osteoarthritis of the joint.

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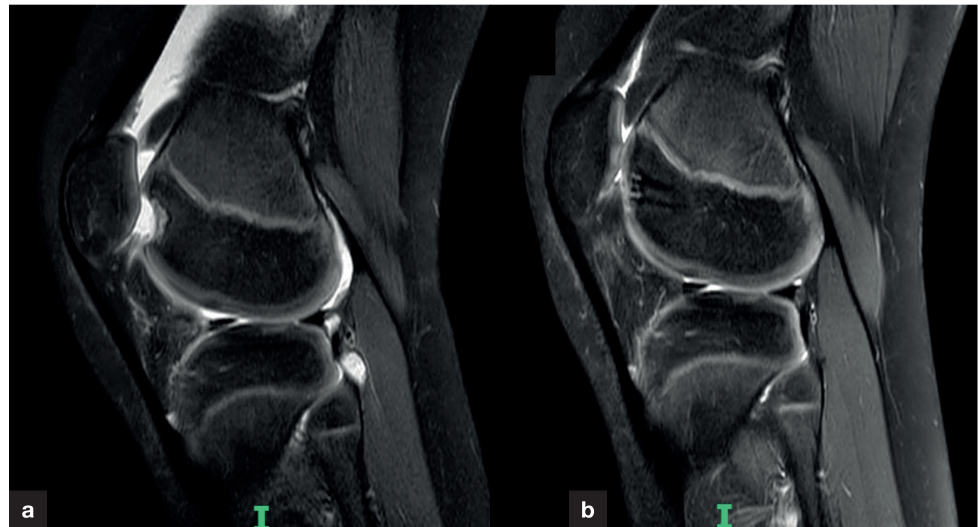

Figure 5. A sagittal T2-weighted magnetic resonance image slice of the knee demonstrating (a) trochlea osteochondritis dissecans that went on to heal and remodel following surgery as shown in (b) the 3-month postoperative interval scan.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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Key points

- Osteochondritis dissecans is a relatively uncommon but important differential diagnosis of patients with activity-associated joint pain.
- It is characterised by subchondral and articular cartilage lesions which can eventually displace into the synovial cavity.
- Conservative management can be considered for those with small undisplaced lesions, with open physes. Surgical management can be considered if conservative management fails, there are large or displaced legions, or impending physeal closure.
- Good prognosis is associated with younger age at onset with open physis.
- If not identified and treated, complications include early onset degenerative joint disease.

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Curriculum checklist

This article addresses the following requirements from the trauma and orthopaedics training curriculum.

- Manages an outpatient clinic
- Manages the unselected emergency take
- Manages an operating list.

Tol JL, Struijs PA, Bossuyt PM et al. Treatment strategies in osteochondral defects of the talar dome: a systematic review. Foot Ank Int. 2000;21(2):119–126. https://doi.org/10.1177/107110070002100205

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