OSTEOCHONDRITIS DISSECANS OF THE FIRST METATARSOPHALANGEAL JOINT

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INTRODUCTION

Osteochondritis dissecans is a form of traumatic arthritis which commonly affects the weight-bearing joints of the lower extremity. It is commonly observed in the knee and hip joints, however it may also present in the ankle or foot. In the ankle and foot, the talar dome and first metatarsal head are the most frequently involved articular surfaces, however it has also been described in other midfoot joints.

The etiology of osteochondritis dissecans has been widely debated, however the microscopic changes which occur are consistent in that there is damage to articular cartilage with necrosis of the underlying subchondral bone. The disease process represents a nonhealed osteochondral defect, which if left untreated, may progress to degenerative arthritis of the affected joint.

DISEASE PROCESS

When a significant amount of articular surface undergoes degeneration, that particular region is rendered non-functional. In an attempt to distribute the weight-bearing forces of ambulation, a joint will remodel at its periphery through the formation of reactive bone and fibrocartilage. This reactive bone formation, which is intended to increase surface area, secondarily limits motion. In a joint with already limited motion, such as hallux limitus, this vicious cycle continues until the joint autofuses (hallux rigidus). In addition, pain from inflammation causes guarding of the part and further limitation of motion. Subsequently, adjacent joints are employed in providing essential motion for ambulation, and these adjacent joints may also progress to degenerative arthritis.

The first metatarsophalangeal joint is particularly prone to articular damage due to the unique biomechanics of the propulsive phase of gait. Thus, hallux limitus, through a variety of causes, predisposes the joint to osteochondral damage, and is often the result of it. The most susceptible area in this location is the dorsal, central aspect of the first metatarsal head.

In propulsion, the proximal phalanx base rides up on the metatarsal head and causes impingement of the articular surface. (Figure 1) The repetitive motion of ambulation often causes a dorsally located defect in the articular cartilage. The underlying subchondral bone is then left to distribute the forces from the adjacent phalangeal base, and may undergo pressure necrosis.

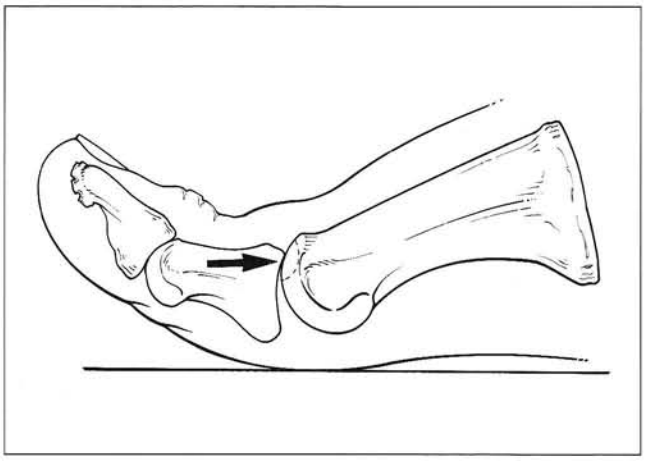

Figure 1. Hallux limitus predisposing to osteochondral dissecans. Note the joint impingement at the dorsal third of the metatarsal head.

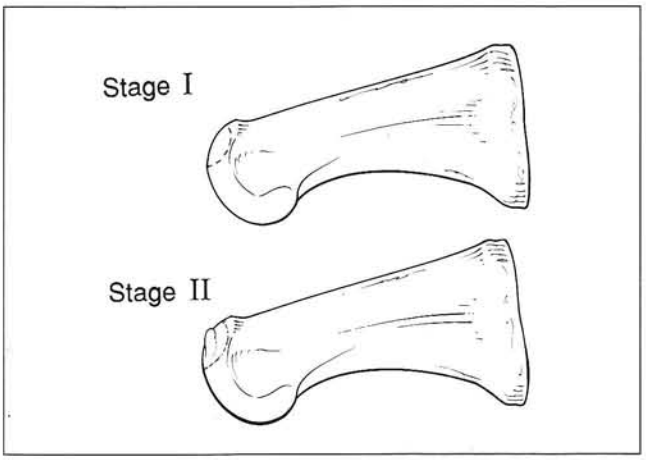

Figure 2A. Stage I and II of osteochondral lesions

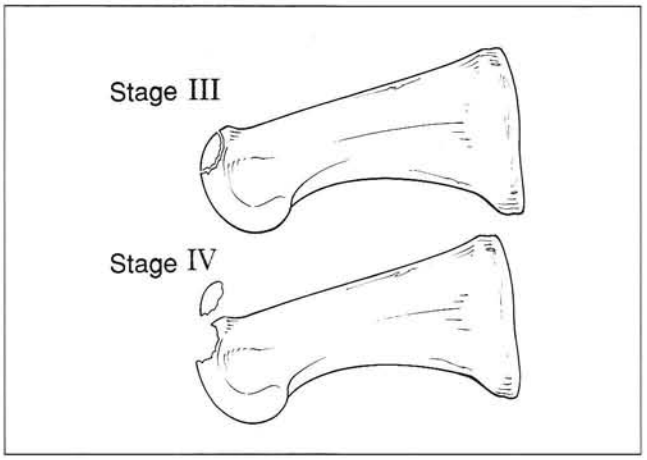

Figure 2B. Stage III and IV of osteochondral lesions

STAGING OF OSTEOCHONDRAL LESIONS

The staging of osteochondritis dissecans follows that described by Berndt and Harty for lesions of the talar dome. (Figure 2A, 2B) A Stage I lesion is a sub-clinical depression in the articular surface and underlying subchondral bone. Stage II presents with a linear tear in the articular surface extending into subchondral bone, and Stage III lesions demonstrate complete separation of an osteochondral defect which is non-displaced. Stage IV, the final stage of progression, is characterized by an intra-articular displaced loose osteochondral fragment.

DIAGNOSIS

A variety of diagnostic tests can be performed to aid in the early recognition of an osteochondral lesion. Conventional radiography is the most common technique performed, however a tomogram or CT may be used to further characterize the progression of the disease. MRI has also been used to obtain more detailed images of this condition. A bone scan is less likely to provide diagnostically useful information, since these lesions are avascular in nature, and the visual detail of small joints in the foot is obscure at best. The definitive means of diagnosing osteochondritis dissecans is through microscopic analysis of a biopsy specimen of cartilage and bone.

RADIOGRAPHIC FINDINGS

The radiographic appearance of osteochondritis dissecans of the first metatarsal head is characteristic of this condition. Early in the disease process, the only appreciable radiographic findings are joint space narrowing and sclerosis of the underlying subchondral bone. As the condition progresses with necrosis of subchondral bone, a lytic lesion is evident in the metatarsal head. Vacuolization around the centrally-located lesion represents the most characteristic stage of this progression, resembling a nondisplaced Berndt and Harty stage III lesion of the talar dome. (Figure 3)

Figure 3. X-Ray of Stage III osteochondral lesion. Note the lytic lesion located in the central aspect of the metatarsal head.

TREATMENT

Treatment of the early stages of osteochondritis dissecans centers around immobilization of the affected joint. The most common form of treatment in the first metatarsophalangeal joint employs the use of an orthosis with a Morton's extension to limit motion.

As radiographic signs of subchondral necrosis appear, surgical excision of the fragmented cartilaginous surface is the suggested treatment. This procedure has been performed through open surgical technique and arthroscopy. If the subchondral bone plate is intact, a decision to perform intramedullary drilling must be made. Often times, surgical exploration reveals an intact articular surface with a soft, boggy, central depression into the subchondral bone. These lesions are best treated with surgical excision of the defect. If the resulting crater-like defect is large enough, packing of the void with allogenic cancellous bone should be considered.

SUMMARY

Osteochondritis dissecans is a common cause of pain and limited motion in the first metatarsophalangeal joint. It is both a cause and effect of hallux limitus, and should be considered in patients presenting with an insidious onset of activity related pain in this area. Conventional radiography will aid in the diagnosis of osteochondritis dissecans, as early recognition and treatment is essential in preventing end stage arthrosis.

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