Freiberg's Disease

Synonyms: Freiberg's infraction

This is a rare disease characterised by osteonecrosis of the second metatarsal head, most commonly seen in teenage girls.\(^1\) It was first described in 1914 by Alfred H. Freiberg.\(^2\)

Epidemiology

It is difficult to ascertain the true incidence of Freiberg's disease, as many cases may resolve spontaneously before treatment has been sought. Most series in the literature have small numbers.

It occurs during the growth spurt at puberty. Most commonly it is found in young females with a male:female ratio of 1:5.\(^3\) It is also more common in patients whose first metatarsal is shorter than the second metatarsal, which increases the weight on the second metatarsal head.

Pathogenesis

The initial injury, as described by Freiberg, was thought to be repetitive stress with microfractures at the junction of the metaphysis and the growth plate. The fractures deprive the epiphysis of adequate circulation, and there is avascular necrosis of the metatarsal head.

Although the second metatarsal is most often affected, the third metatarsal may also be involved; involvement of the fourth or fifth is rare.

However, despite much subsequent research, the true aetiology remains elusive - it's likely to be a combination of vascular compromise, genetic predisposition and altered biomechanics.\(^4\) It is thought to belong to a group of related diseases involving growth disturbances of the epiphysis or apophysis, collectively termed the osteochondroses.

Other osteochondroses include:

- Köhler's bone disease - tarsal navicular bone
- Panner's disease - capitulum\(^5\)
- Blount's disease - proximal tibia
- Sever's disease - calcaneus
- Sinding-Larsen and Johansson syndrome - patella

Clinical presentation

- Pain in the forefoot, usually localised to the head of the second metatarsal.
- Usually this is associated with physical activity.
- Wearing high-heeled shoes makes it worse.
- There may also be localised swelling and stiffness in the metatarsophalangeal joint.
- A limp may be visible.

A small effusion may be palpable and a callus may be seen underneath the affected metatarsal head.
Investigations

Plain X-ray appearance
On X-ray (see 'Classification', below), the second metatarsal head has a flattened appearance with areas of increased sclerosis and fragmentation.\(^1\)

Bone scans
Bone scanning may demonstrate a centre of reduced activity with a hyperactive collar.

Magnetic resonance imaging (MRI)
MRI may reveal hypo-intensity of the metatarsal head.\(^4\)

Differential diagnosis
- Synovitis
- Stress fracture
- Osteosarcoma
- Morton's neuroma

Classification\(^6\)
- Stage I - the earliest sign is fissuring of the epiphysis. X-ray changes at this stage may be so subtle that they are missed with routine pictures.
- Stage II - later, central depression of the articular surface becomes evident as subchondral cancellous bone is resorbed. The articular cartilage hinges on an intact plantar bridge.
- Stage III - the central depression is seen to be resulting in medial and lateral projections at the margins. The plantar hinge remains intact at its plantar isthmus.
- Stage IV - this stage demonstrates that the central portion has sunk below the surface and is free of the plantar hinge, thus becoming a loose body. Fractures of the medial and lateral projections are present, with folding of the projections over the central loose body.
- Stage V - the final stage shows marked flattening and deformity of the metatarsal head with secondary degenerative changes. The central loose body may have been resorbed at this stage. The shaft of the metatarsal becomes thickened and dense.

Management
Although originally described 100 years ago, Freiberg's disease remains controversial as to the most appropriate treatment. Most would advocate an initial period of conservative measures.\(^7\)

General measures
- Supportive footwear with a metatarsal bar or pad placed beneath the involved bone.\(^8\)
- Reduce weight-bearing activities for four to six weeks.
- If symptoms are severe, consider immobilising the foot in a short leg walking cast until the symptoms subside - usually within 3-4 weeks.

Surgical
This is rarely used, but the most usual indication is failure of conservative treatment. Options include:
- Debridement
- Bone grafting
- Osteotomy\(^9, 10\)
- Arthroplasty
- Osteochondral transplantation\(^7\)
Prognosis

Fortunately, the outcomes of both non-operative and operative management are good to excellent and most patients are able to return to previous activity.[4]

Further reading & references

5. Panner's Disease; Wheeless' Textbook of Orthopaedics
8. Freiberg's Disease; Wheeless' Textbook of Orthopaedics

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