Diagnosing and managing Morton's neuroma

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A common problem in general practice, Morton's neuroma is relatively easy to diagnose. The goal of therapy is relief of pain while allowing continuation of daily activities. These two authours discuss their approach to this condition.

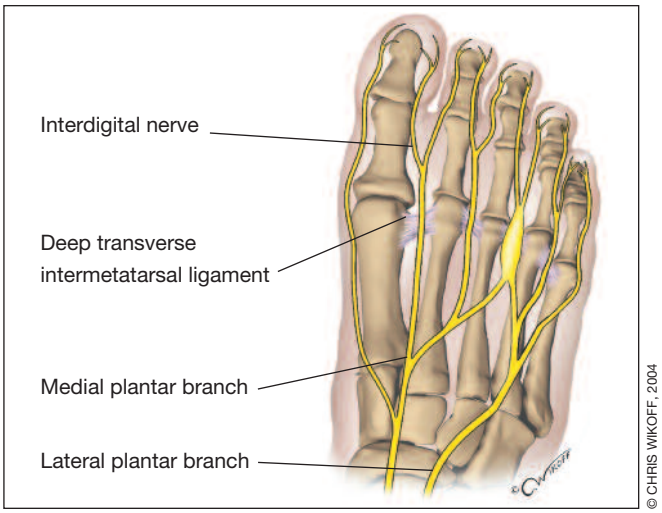

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Figure 1. Plantar view showing a Morton's neuroma in the third intermetatarsal space.

Morton's neuroma, or interdigital neuroma, is a common painful condition of the forefoot. The actual incidence and prevalence is uncertain but more women are affected than men. The condition was originally described by Durlacher in 1845, and is now commonly referred to as Morton's neuroma, after the description by T.G. Morton in 1876.

Despite its name, Morton's neuroma is not a true neuroma but a benign mass of perineural fibrosis affecting the plantar digital nerve at the level of the metatarsal heads. It most commonly involves the third interdigital nerve and, less commonly, the second interdigital nerve. The first and fourth interdigital nerves are rarely involved. Uncommonly, Morton's neuroma may be found bilaterally or in two interspaces of the same foot.

Other common causes of forefoot pain include foot deformities, trauma, entrapment neuropathy, Freiberg's disease and arthritis of the metatarsophalangeal joints.

Anatomy

The plantar digital nerves are terminal branches of the medial and lateral plantar nerves of the foot, and pass beneath the deep transverse intermetatarsal ligaments (DTIL) on the plantar aspect of the foot. The lumbrical tendons and the digital vascular structures also pass below the DTIL. The superficial transverse intermetatarsal ligament lies below the nerve and separates it from the underlying fat pad.[1]

Most neuromas occur in the third intermetatarsal space (Figure 1). The third interdigital nerve is larger than the other interdigital nerves and is tethered in the third web space, making it more vulnerable to repetitive microtrauma.

Aetiology

Morton's neuroma is thought to be due to a degenerative process. Many theories have been proposed as to the cause, most favouring nerve damage secondary to mechanical impingement. The various contributing factors include repetitive trauma from shoes (particularly pointed and high-heeled shoes), stretching and shearing stresses on the third digital nerve (due to the relatively fixed position of the third metatarsal coupled with the relatively more mobile nature of the fourth metatarsal), tight DTILs and biomechanical abnormalities.

Most neuromas occur in individuals with pronated feet. Pes cavus feet also have an increased incidence of neuromas. Some other foot types that may be associated with interdigital neuromas include partially compensated and compensated forefoot varus, forefoot supinatus and flexible forefoot valgus. People with diabetes also have a higher incidence of Morton's neuroma.

Pathology

Grossly, a Morton's neuroma has a shiny, glistening surface that is white to buff yellow in colour, a fusiform configuration and a relatively soft consistency. Histopathological findings include perineural, epineural and endoneural fibrosis, degenerative vascular changes, axonal demyelination, fibrinoid degeneration and arrested axonal nerve endings (Figure 2).[1,2]

Clinical presentation

Morton's neuroma typically affects women in their fourth to sixth decades, although men and younger women can

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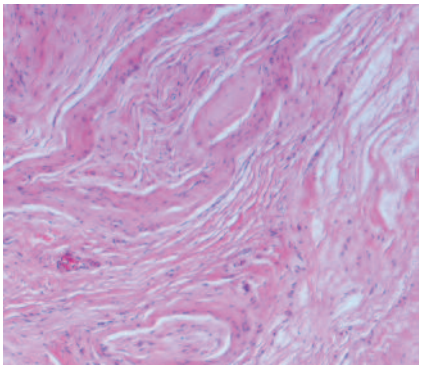

Figure 2. Low power view of a Morton's neuroma demonstrating perineural, epineural and endoneural fibrosis.

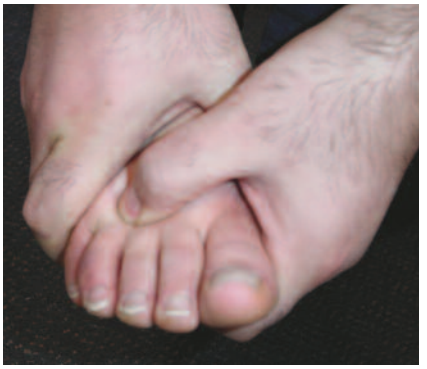

Figure 3. A web space compression test will reproduce the severe sharp pain of Morton's neuroma.

also be affected. It usually produces pain in the forefoot, which can radiate to the toes, and occasionally to the dorsal aspect of the foot or even the lower leg. The pain is typically described as sharp, burning or like an electric shock, and the onset may be acute or insidious. Patients may also describe parasthesia or the sensation of 'walking on a lump', or both. Wearing narrow shoes aggravates the pain, and removing the shoes and massaging the forefoot often relieves it. Left untreated, the symptoms often progress to become more frequent.

Clinically, there is pain with palpation in the involved metatarsal space. Occasionally, a palpable mass is identified. The most useful clinical test is a web space compression test, in which severe pain is reproduced by squeezing the metatarsal heads together with one hand while simultaneously compressing the involved web space with the thumb and index finger of the other hand (Figure 3). This compression test can also produce a painful and palpable click called Mulder's sign. The absence of this sign, however, cannot be used to rule out neuromas.

Physical examination should also take into account any underlying biomechanical foot abnormalities, and shoes should be checked for excessive forefoot wear.

Table. Differential diagnoses of Morton's neuroma

Tarsal tunnel syndrome
Metatarsal stress fracture
Painful plantar callosities
Freiberg's disease or avascular necrosis of the metatarsal head
Painful peripheral neuropathy
Intermetatarsal bursitis
Rheumatoid arthritis
Psoriatic arthritis (dactylitis)
Metatarsal tumours
Soft tissue tumours of the forefoot
Lumbar radiculopathy

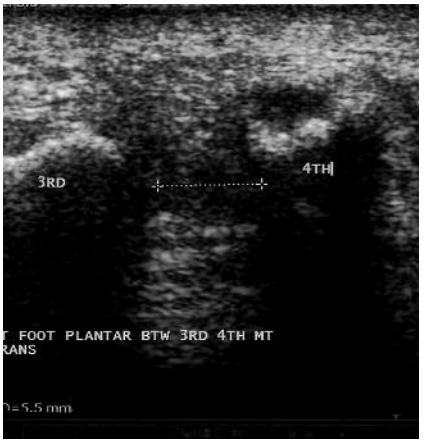

Figure 4. Ultrasound appearance of a Morton's neuroma – an ovoid mass parallel to the long axis of the metatarsals.

Diagnosis

A good history and clinical examination are often enough to diagnose Morton's neuroma. It is important, however, to exclude other causes of pedal neurogenic pain (Table).

Imaging options

Imaging can be helpful in patients with symptoms that are atypical or suggestive of more than one aetiology and, in those with typical neuroma symptoms and co-existing neurological conditions. Imaging options include radiography, ultrasonography, computed tomography (CT) and magnetic resonance imaging (MRI).

Standard radiography will not identify interdigital neuromas, and is not the imaging modality of choice. However, a large Morton's neuroma can produce lateral toe deviation, which will be obvious on x-rays. Radiographs can also be helpful in ruling out other causes of forefoot pain.

Ultrasound is useful in the detection of Morton's neuroma. The neuroma is seen as an ovoid or round hypoechoic mass with or without a small amount of hyperechoic material contained within. The mass is typically orientated parallel to the long axis of the metatarsals, and its position relative to the interdigital nerve can be established (Figure 4). Masses 5 mm or greater in diameter have been shown to produce symptoms.[3] The advantages of ultrasonograpy are that it is performed in real time, is more cost-effective than MRI and does not involve radiation exposure. In addition, local steroid injections can be given under ultrasound guidance. However, it is both operator and machine dependent. In good hands, ultrasonography has an accuracy of 95% for the detection of Morton's neuroma.

CT has been used in the diagnosis and localisation of Morton's neuromas but has been superseded by MRI because of MRI's enhanced soft tissue contrast and lack of associated radiation.

MRI will not only produce excellent soft tissue contrast but also assist in

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determining the size of the neuroma. On MRI, a Morton's neuroma has low signal intensity on T1- and T2-weighted images because of its fibrous content. This distinguishes it from a neoplasm such as a schwannoma, which appears hyperintense on T2-weighted images. MRI findings must always be correlated with the clinical picture as asymptomatic neuromas may be identified. In the series by Bencardino, 33% of neuromas identified on MRI were clinically silent.[4]

Management

Conservative management

Conservative measures should be tried first in all patients. However, studies have shown variable results with conservative measures, with success rates varying from 25 to 85%.[2] The principles of conservative management include correct footwear, orthotics, metatarsal pads, local injections, physical therapy and nonsteroidal anti-inflammatory medications (NSAIDs).

Shoe modifications such as wider toe boxes may decrease compression of the neuroma. However, these shoes are often not flattering and hence not particularly appealing. Orthotics can help to control abnormal pronation and other biomechanical abnormalities that may be contributing factors. Metatarsal pads, either built into an orthotic or directly applied to the foot (placed just proximal to the meta - tarsal heads), will spread the metatarsal heads and relieve pressure on the nerve.

An injection of a combination of local anaesthetic and corticosteroid into the involved web space may provide relief for some time, and may be curative in a few cases. A local injection may also be helpful as a diagnostic procedure. Repeated injections (more than two or three) are not advocated as a variety of local problems can occur, exacerbating the underlying problem. These include atrophy of the forefoot fat pad and rupture of the collateral ligaments, the plantar plate or both.

Physical therapies such as ultrasound, electrical stimulation and massage may be used in conjunction with the above. NSAIDs can also used in combination with other conservative measures but can have significant side effects.

Surgical management

Once the conservative measures are exhausted, surgery should be considered. The time course to surgery depends on the individual and his or her expectations. The options are nerve resection (neurectomy), nerve decompression and epineural neurolysis.

Surgical excision is an effective means of relieving painful neuromas and success rates are around 75 to 85% in most series.[2] Typically, a dorsal longitudinal incision is made, the DTIL is transected and the affected nerve is transected at the proximal root and at the four distal branches, removing the neuroma in total. It is important to resect the nerve proximal to the metatarsal heads to prevent recurrent pain and neuroma formation. The plantar approach provides better exposure but requires a longer postoperative non-weightbearing period. Postoperative sequelae include numbness to the affected web space and possible complications such as haematoma, infection, hammer toe development and stump neuromas.

Nerve decompression is an alternative to surgical resection. In this procedure, endoscopic techniques are used to release the DTIL in the affected web space, leaving the nerve intact. Nerve decompression involves smaller incisions than nerve resection, recovery is more rapid and there are fewer postoperative complications. In the series by Gauthier, 83% of patients had excellent or good results.[5]

When the nerve is scarred, an epineurolysis can be performed. In a five-year follow up of treatments of Morton's neuroma by neurolysis, 37 of 40 patients had an excellent result.[6]

Failure of surgery in correctly diagnosed patients is often due to neuroma entrapment from inadequate proximal transection of the involved nerve. Other factors include the skill of the surgeon and the postoperative care procedures followed by the patient.

Conclusion

Morton's neuroma is a common problem and the typical clinical symptoms and signs make the diagnosis relatively easy. Ultrasound and MRI are useful imaging modalities in difficult cases. The goal of therapy is to relieve the pain while allowing the patient to continue with his or her daily activities. Conservative measures should be tried before surgery. MT

Acknowledgements

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A list of further reading is available on request to the editorial office.

DECLARATION OF INTEREST: None.

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