Int. j. adv. multidisc. res. stud. 2024; 4(4):628-630

Received: 11-06-2024
Accepted: 21-07-2024

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Morton's Neuroma: A Comprehensive Review of Current Findings

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DOI: https://doi.org/10.62225/2583049X.2024.4.4.3083
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Abstract

Morton's neuroma is a problem affecting the forefoot of human. It is fibrosis of the nerve but is not a true neuroma. Secondary to repetitive irritation or pressure leads to thickening of the digital nerve, located in the third or second intermetatarsal space. Various treatment options like rest, orthotics, steroid injections and surgical excision usually performed. Proper clinical assessment, evaluation, patient selection, pre-operative counselling and surgical technique are required for the successful management of this condition.

Keywords: Morton's Neuroma, Forefoot Pain, Digital Nerve, Intermetatarsal Space

Introduction

Morton's neuroma is indeed a common condition affecting the interdigital nerves in the foot, particularly in the third web space. It can cause pain, tingling or numbness in the ball of the foot or between the toes [1]. Morton's Neuroma was anatomically described by Civinini in 1835 and clinically was described by Thomas Morton in 1876 later. That is why this condition is known as Civinini -Morton syndrome and also known as Compressive neuropathy of the common digital plantar nerve (CDPN) [5]. Morton's Neuroma is often caused by compression and irritation of plantar surface of transverse intermetatarsal ligament, typically between 3rd and 4th metatarsal head. This can result in pain and a sensation of having a pebble in the shoes [2]. Morton's Neuroma is not common in women, but it can occur in both men and women, typically between the ages of 40 and 60 years. It is often –associate with wearing tight or high heeled shoes [2]. It occurs when a nerve in the foot becomes irritated and swollen. It is a condition where excessive fibrous tissues lead to compression of nerves within a sheath. This compression can hinder blood flow and exacerbate the fibrosis causing further damage [3].

Pes planus and pes cavus can both contribute to increased pressure on the forefoot, which can lead to repetitive trauma and condition like Morton's neuroma, affecting the plantar intermetatarsal nerve [3].

It is characterized by inflammation of the plantar fascia, which can cause pain in the heel and along the bottom of foot. Avoiding loading on the forefoot is a common behaviour to alleviate discomfort [2].

Chronic pain can indeed have complex effects on sensory processing and pain modulation mechanism in the brain. Prolonged tissues injury can lead to changes in neural pathways, resulting in heightened pain sensitivity and decreased pain inhibition. This can contribute to the development and persistence chronic pain condition.

Etiology

Tibial nerve bifurcates into two plantar branches i.e., lateral, and medial plantar branch. The medial branch contributes to first, second, third web spaces with the medial side of hallux. The lateral branch supplies to the fourth web spaces with the lateral aspect of little toe.

The common digital nerve forms an anastomotic branch from the nerve of fourth web space to the nerve of third web space. In 62.2% of cases, it has been reported to be present. As the thickening of the common digital nerve of third web are more prone to trauma and compression which is lies under the deep transverse metatarsal ligament. Morton's Neuroma also caused by primary and secondary Metatarsalgia. Primary metatarsalgia reasons include stress fracture, any trauma, hallux valgus, hallux rigidity, plantar warts, structural foot Malalignment. Secondary metatarsalgia causes are chronic synovitis, atrophy of plantar

fat pad, which may develop rheumatoid arthritis, gout, psoriasis later.

Morton's Neuroma associated with tight Gastrocnemius and uses of pointed high heels and limited spaces also like inflammation of bursae or presence of ganglion which occupying lesions in the web space.

Women are affected more than males as they have narrow foot causing traction on the interdigital nerve and it is more common in runners' athletes and dancers due to frequent stress on metatarsals with overextension of the MTP joints [1, 3, 5].

Clinical Presentation

The pain in the web space on the plantar surface is a classic symptom associated with conditions like Morton's neuroma or metatarsalgia [1].

This condition involves a thickening of the tissue around one of the nerves, which is supplies to the toes, often causing sharp, burning, and stabbing pain in the intermetatarsal region, dorsum, and hind foot. It is also related with paraesthesia or dysaesthesia in the region of affected nerve. Which is aggravates by wearing tight shoes and walking. Symptoms provoking due to repetitive trauma, bursitis, nerve entrapment [4].

Clinical Examination

The patient should have the lower limb below the knee is crucial for a comprehensive examination, allowing for a thorough assessment of circulation, sensation, and musculoskeletal function. It is essential for diagnosing various conditions and injuries accurately. The examination technique is aimed at ruling out other possible causes of symptoms before focusing from the hind foot to progressively forefoot, possibly to ensure a more accurate diagnosis.

Examining hind foot alignment for valgus or varus, assessing the height of the medial longitudinal arch for high, planus or normal and observing the relationship between the forefoot and hind foot are crucial in evaluating foot health (abducted, adducted, pronated, supinated). Detecting abnormalities in toe alignment (hallux valgus, hammer toes, claw toe, gaps between the toes, and the presence of plantar callosities can also provide valuable diagnostic information.

Assessing swelling, scars, skin conditions, and observing the gait can provide valuable diagnostic insights. Additionally, difficulties with weight bearing on a plantigrade foot can underlying pathologies.

Precise palpation to identify tender areas is essential in diagnosing foot conditions like Morton's neuroma. Tenderness in the intermetatarsal space on the plantar surface is indeed characteristic of Morton's neuroma, whereas tenderness localized to the metatarsophalangeal joint or metatarsal head suggests other potential pathologies (plantar plate tear, hammer/claw toe, MTP joint arthritis, vascular necrosis (AVN) metatarsal head or an instability issue.

Thorough examination of joint motion, particularly focusing on the hind foot to the toes. Comparing both sides for symmetry and checking for hypermobility or stiffness at TMT articulation is essential for assessing weight distribution and potential pressure points.

Special Tests

The Mulder sign (Foot squeeze test), also known as the "clicking sign," is a diagnostic manoeuvre used to assess for Morton's neuroma, a painful condition involving a nerve in the foot. When pressure is applied over intermetatarsal space from plantar aspect by thumb of one hand while at the same time the other hand is used to squeezing the metatarsal together by grasping the forefoot from dorsum, if palpable or audible click may be felt or heard, indicating the presence of a neuroma. It is a helpful tool for diagnosing this condition [1, 6, 7].

Silverskold test significant for evaluating gastrocnemius tightness. If positive, it could potentially contribute to metatarsal gait issues [1].

Plantar percussion test

The plantar percussion test, also known as Tinel's sign or Tinel's test, can be performed over the affected web space to assess for nerve irritation or compression. If the test produces pain or paraesthesia (tingling or numbness), it can indicate a positive motor neuron response, suggesting potential nerve involvement or pathology [7].

Digital nerve stretch test

A diagnostic test for Morton's neuroma, a condition that affects the nerves in the foot. The examiner's extending the lesser toes while holding the ankles in dorsiflexion, and pain or discomfort in the affected web space indicates a positive result. This test helps in diagnosing Morton's neuroma by eliciting symptoms [7].

The divergence of adjacent toes, particularly at the symptomatic web space, can indeed be indicative of Morton's neuroma. This condition occurs due to a thickening of the tissue around a nerve leading to the toes. Neurovascular assessment is crucial to evaluate the function and circulation of the foot, aiding in diagnosis and treatment planning [1].

Investigations

Starting consultations with history and examination before moving on to investigations is a solid approach, ensuring a comprehensive understanding of the patient's condition before diving into tests.

Clinical diagnosis of a motor neuroma often involves assessing symptoms such as pain, which is typically more pronounced on the plantar side and may radiate to the toes. Physical examination, including palpation of the affected area, can also aid in confirming the diagnosis.

plain radiographs can be helpful in distinguishing between different causes of web space pain, such as osteoarthritis, Freiberg's disease, and stress fractures. However, ultrasonography, ultrasound scans (USSs), and MRI are also valuable tools, especially for detecting conditions like Morton's neuroma, providing more detailed information about soft tissues and nerve involvement [1, 5, 7].

Treatment

Non-operative Treatment

non-operative treatments for symptomatic lesions often focus on reducing pressure, inflammation, and nerve irritation. These can include medication, physical therapy, lifestyle changes, and other interventions tailored to the specific condition and symptoms. Footwear modifications can play a significant role in managing symptoms for various foot conditions. Appropriate footwear with pronation and supination offloading Orthosis have been used for reducing pain.

A medical procedure involving ultrasound-guided injection of a combination of steroid and local anaesthesia beneath the

deep transverse intermetatarsal ligament. If it has been shown to be effective in 30% of patients, that suggests it could be a viable treatment option for certain conditions.

The advantages of using local anaesthetic injections for immediate diagnostic purposes and chemical neurolysis with alcohol as a safe treatment strategy. Using a dorsal approach seems advisable to avoid potential complications like plantar atrophy.

Extracorporeal shockwave therapy (ECST) can be performed in an outpatient setting, and it is often utilized in randomized placebo-controlled trials to evaluate its effectiveness.

For some conditions, conservative treatments may be the first approach, but if they fail to produce significant improvement, surgery might be considered.

Operative Treatment

Different surgical techniques are used to treat Morton's Neuroma including neurotomy, microsurgical release of the perineural fibrosis (neurolysis), minimally invasive interdigital approach, endoscopic decompression sectioning the intermetatarsal ligament.

Neurotomy is a common approach, along with both plantar and dorsal approaches. The most popular approach is neurectomy and decompression through dorsal approach. A surgical procedure involving the removal of planter interphalangeal nerve branches near the metatarsal head using a dorsal approach. Minimizing the risk to the dorsal cutaneous nerve branches is crucial for successful outcomes.

Preserving the intermetatarsal ligament during procedures involving nerve endings can be beneficial, but it does indeed pose challenges due to its location in the plantar weight-bearing area. These challenges may include potential interference with weight distribution and healing processes [1, 5, 8-10].

Funding

No funding sources for this article.

Competing Interests

The authors declare that they have no financial or other conflicts of interest in relation to this research and its publication.

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