Pathophysiology

- Perineural fibrotic swelling of interdigital plantar nerve (nerve to sole of the foot)
- Nerve to sole of foot begins behind medial malleolus
Nerve enters sole of the foot, posterior tibial nerve divides into medial and lateral plantar nerves
Interdigital branches then bifucate into proper digital nerves - supplies sensation to medial and lateral aspect of each toe
- Repetitive mechanical entrapment and ischemic tethering of the nerve
- Occurs at metatarsal heads just distal to intermetarsal ligament
- Dorsiflexion of toes - interdigital nerves compressed by metatarsal heads - ischemically tethered beneath intermetatarsal ligament

Demographics/Risk factors

- Occurs in 3rd web space - greater shearing forces and physically larger (Between 3rd and 4th toes) or second webspace
- Females more than males
- Middle aged population
- Wearing shoes with tight toe box/high heeled
- Repetitive toe dorsiflexion (dancing, walking, squatting, running -forefoot)
- Hypertonic gastrocs
- Hyperpronation

Presentation

- Sharp burning sensation in 3rd/4th web space
- Pain usually begins on sole of the foot at the level of metatarsal heads - radiates to the toes
- Feels as though they are walking on a marble
- Can radiate proximally
- Numbness, paresthesias, cramping in the toes adjacent to neuroma
- Sharp pain lasts 5-10 minutes then dull ache that lasts a few hours
- Aggravated by constrictive shoes/high heels/activity
- Relieved by taking off shoe and gently massaging area
- Tenderness within affected space
- Palpate adjacent metatarsals and MTP joints (MTP synovitis - pain and swelling occurs, stress f#, metatarsalgia - focal pain on plantar aspect of MT head)
- PROM/AROM of toe dorsiflexion painful
- +ve Lateral squeeze test (clicking and pain - dorsal subluxation of neuroma)
- Diminished sensation over interdigital skin **if motor/reflex changes, consider alt diagnosis**
- Assess for arches, hyperpronation, gastroc hypertonicity, foot/ankle joint hypomobility

Imaging

- Hx and physical exam more effective than imaging
- Rule out metatarsal stress f#, osteonecrosis, osteochondrosis, OA
- Can show a radiopaque lesion = morton's neuroma

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Not published yet.
Last updated 3rd February, 2021.

DDx

- MTP synovitis
- Stress f#
- Metatarsalgia
- Infection
- Neoplasm
- Freiberg's infarction (pain over dorsal second metatarsal head in young females)
- Ganglion cysts
- True neuroma
- Intermetatarsal bursitis
- Lumbar radiculopathy
- Peripheral neuropathy (tarsal tunnel syndrome)

Management

- Patient education
- Footwear modification
- Use of metatarsal pad (distributes pressure away from affected joint)
- Arch supports
- Nerve mobilisation/flossing
- Myofascial release/stretching of gastrocsoleus
- Strengthening of FHL
- EMT of foot joints (MTP and calcaneocuboid joints)
- Avoid high heeled, narrow, or unpadded shoes
- Forefoot strike to mid foot strike
- If conservative care fails, consider injection /surgery

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Last updated 3rd February, 2021.
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