Metatarsalgia

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Definition

- Pain and inflammation in the forefoot region, involving the metatarsals (MT) or associated joints [1]
- A symptom rather than a discrete condition:
  - Metatarsalgia (i.e., central metatarsalgia): pathology of second through fourth MT
  - Transfer metatarsalgia: pathology of the great toe transfers abnormal forces over to lesser toes:
    - Hallux rigidus: degenerative disease of the first metatarsal-phalangeal (MTP) joint
    - Hallux valgus (i.e., bunion deformity): MT varus with valgus of the phalanx:
      - Can also physically deform second toe
    - Iatrogenic: following reconstructive procedures to correct hallux valgus [2]

Pathophysiology

- Repetitive loading of the forefoot during gait, especially during the midstance phase (from heel rise to toe off) [1]
- Frequently an overuse injury associated with increased or abnormal stresses on forefoot

Causes [1, 3]

Primary: Related to the Anatomic Configuration of the MT

- Insufficiency of first ray (i.e., transfer metatarsalgia): excessive force is transferred to lesser toes (Fig. 78.1).
- Disproportionately long second MT: exposed to higher pressures during gait
- Excessively plantar-flexed MT
- Cavus foot: forefoot deformity with increased declination of MT
- Soft tissue imbalances:
  - Hammertoe deformity—flexion deformity at PIP, with DIP extension and neutral or extended MTP joint:

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Fig. 78.1 The images show the anteroposterior and oblique view radiographs of a patient with metatarsalgia and hammertoe deformities affecting the second, third, and fourth toes. Note the relative shortness of the first metatarsal compared to the lesser metatarsals:

    - Results from an imbalance between intrinsic and extrinsic musculature
    - Associated with constricting shoe wear, hallux valgus, neuromuscular disorders, and inflammatory arthritis
  - Claw toe deformity—flexion of both PIP and DIP, hyperextension of MTP:
    - Results from an imbalance between intrinsic and extrinsic musculature
    - Associated with neuromuscular disorders
  - Crossover toe
- Equinus deformity—persistent plantarflexed foot generates increased stress on MT heads:
  - Gastrocnemius-soleus complex tightness
- Others: arthritis, tumor, infection, stress fracture of the metatarsal head/neck, and fracture malunion

Secondary: Indirectly Leads to Greater Loads on Forefoot

- Trauma, metabolic disorders, gout, and rheumatoid arthritis (rheumatoid forefoot)
- Morton's neuroma—irritation of the plantar interdigital nerves:
  - May be associated with narrow space between MT heads, tight footwear, and trauma
  - Most commonly affects the third interdigital nerve
- Freiberg's infarction: avascular necrosis (AVN) of the metatarsal head

Fig. 78.2 The images show the anteroposterior and oblique view radiographs of a patient with iatrogenic second metatarsalgia and hammertoe deformity. The previous bunionectomy procedure resulted in shortening of the first metatarsal causing overload of the second metatarsal head, rupture of the plantar plate, and ultimately hammertoe deformity

Iatrogenic

- Nonunion or malunion after MT reconstructive surgery
- Excessive shortening of MT (Fig. 78.2)
- Partial MT head resection

Presentation

Symptoms

- Pain in forefoot region, exacerbated by walking, activity, or footwear

Signs [2, 3]

- Hyperkeratosis (thickened skin) on plantar aspect of foot
- Swelling or bruising
- Equinus contracture (common associated finding)

Evaluation

History

- Previous foot trauma or surgery
- Prior diagnosis of diabetes, peripheral neuropathy
- Equinus or cavus foot deformity and leg length discrepancy

Clinical Examination

- Inspect for hyperkeratosis on plantar aspect of foot:
  - May be diffuse or localized under affected MT heads

- Observe deformities including long second MT, hammertoes, and claw toes.
- Passive and active range of motion at MTP, PIP, and DIP joints.
- Palpation of MTP joints and intermetatarsal web spaces for tenderness.
- Range of motion of ankle: Silfverskiold's test to distinguish gastrocnemius versus Achilles tendon tightness.
- Check perfusion and sensitivity of distal toes.
- Weight-bearing foot posture:
  - Compare bilaterally.
  - Gait analysis, as necessary, to determine overload sites.

Radiology

- Obtain weight-bearing AP, lateral, and oblique views of the foot
- Evaluate:
  - Relative length of each MT.
  - MT cascade: second ray should be equal or shorter than the first.
  - Inclination of MT on lateral view.
  - Rule out subluxed or dislocated MTP joints and MT stress fractures.
  - Hallux deformities.

Treatment [1, 4]

Nonoperative

- Initial treatment for all patients.
- PT focused on stretching for heel cord tightness.
- Shoe modifications—for primary causes of metatarsalgia:
  - Wider toe box, appropriate length, softer sole, padding, lower heel, and metatarsal bars built into orthotics.
  - Rocker bottom sole reduces pressure at MT heads.
  - Nondisplaced ligamentous injury with or without avulsion fracture.
  - Nondisplaced fractures through bases of first, second, or third MT.
- Corticosteroid injection (for Morton's neuroma, bursitis, and synovitis):
  - Frequency limited due to complications of subcutaneous fat atrophy and tendon rupture
- Alcohol injection (for Morton's neuroma) [5]:
  - Ultrasound guided, up to four injections
  - Pain relief with minimal side effects
- Shaving callus can reduce pain from chronic hyperkeratosis.

Operative

- Indicated after failure to respond to conservative management
- Distal oblique MT (Weil) osteotomy (for MTP joint instability and excessive MT length):
  - MT is shortened by intraarticular osteotomy; proximal translation of MT head relieves pressure during gait.
  - Three-step/triple Weil osteotomy (modified technique) limits relative plantarflexion of head (and shift in center of rotation) with coaxial shortening of shaft.
  - Contraindications: osteoporosis, hallux valgus causing second MT deformity.
- Midshaft segmental MT osteotomy: equalize lengths of lesser MT:
  - Shortening accomplished by segmental resection with plating
- Proximal MT osteotomy (correction of excessive MT declination/forefoot cavus):
  - Elevation of MT accomplished by dorsal wedge resection of proximal MT
- First TMT fusion: reduces instability of first TMT and associated overloading of 2–5 MT
- Tendon transfer for joint stabilization or lesser toe deformities:
  - EDB transfer or flexor-to-extensor transfer for treatment of crossover toes
- Achilles tendon lengthening or gastrocnemius recession for equinus contracture

Postoperative Rehabilitation

- After metatarsal shortening osteotomy, foot protected in neutral using stiff-soled shoe for 4–6 weeks, then progress range of motion

Complications [1, 3]

- Stiffness of MTP joint
- Dislocation at the MTP joint
- Floating toe deformity—toe fails to contact ground—associated with Weil osteotomy but minimized with three-step technique
- Nonunion or hardware failure
- Osteonecrosis of MT head
- Infection
- Neurovascular injury

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