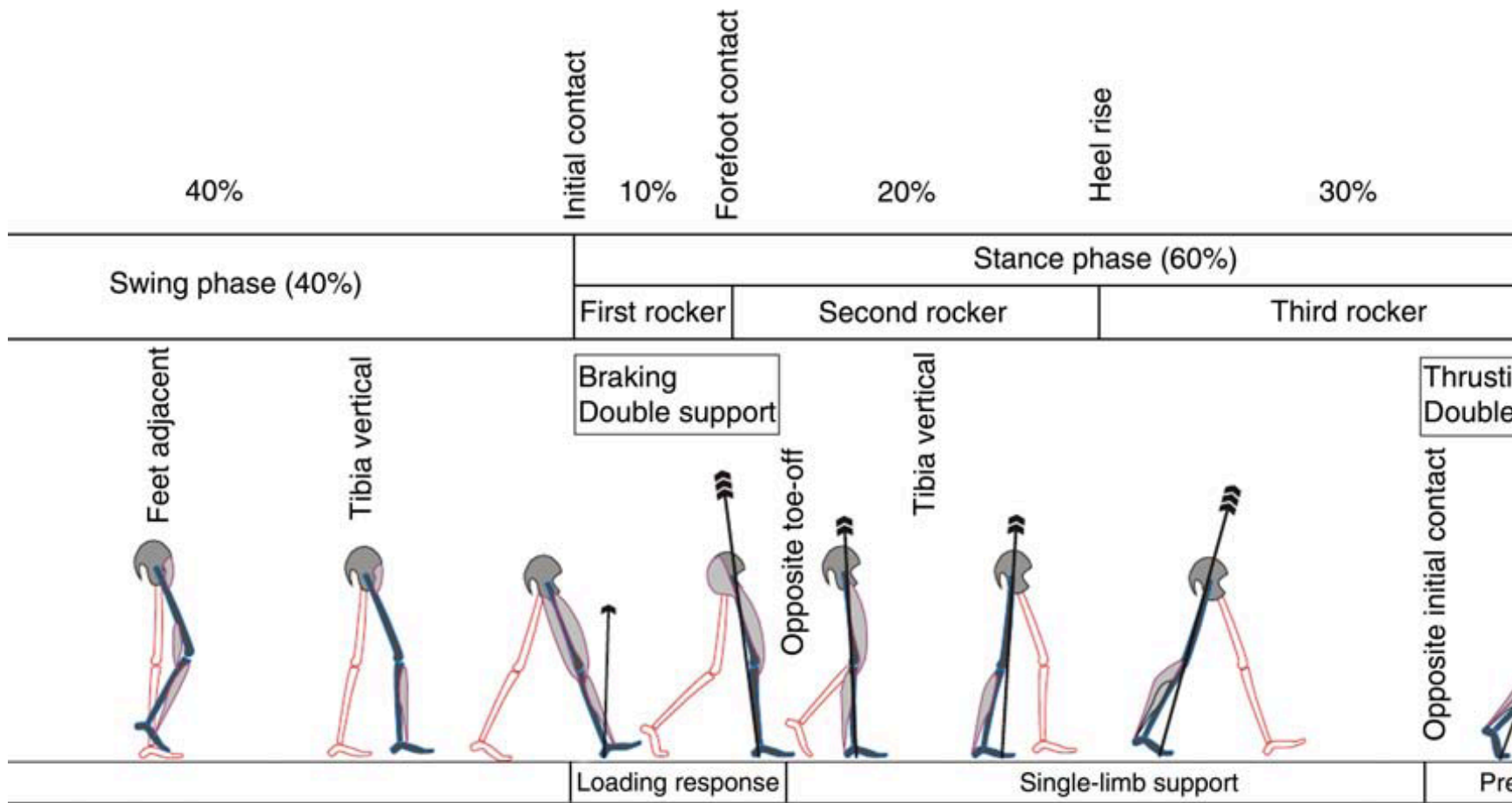


1. *J Am Acad Orthop Surg* 2010;18: 474-485

# Forefoot arthritis

- 1. it is frequently accompanied by deformity of the first and fifth rays as well as of the toes.
- 2. related to gait mechanics, foot anatomy, and foot and ankle deformity.

- 1. The swing phase accounts for 40% of the gait cycle, and the stance phase accounts for 60%.
- 2. During walking the foot functions as a three-rocker mechanism
- 3. The heel acts as the first rocker, beginning with initial heel strike during the first 10% of the gait cycle.
- 4. I rocker pain: presence of congenital deformity, cavus foot, or tight heel cord.
- 5. II Rocker [foot flat] 20%: Limited ankle motion or increased plantar flexion of the lesser MTs can overload the forefoot and produce second rocker metatarsalgia.
- 6. III rocker:[30%]: progressive deformity of the MTP joints (eg, subluxation) can produce third rocker metatarsalgia. Metatarsalgia occurs most frequently in this phase of the gait cycle.



# Primary Metatarsalgia

- **Abnormalities** that are related to the anatomy of the MT
- Discrepancy in MT length is one contributing factor. The most common pathology is the presence of a relatively long second MT.
- In contrast, increased pressure in the final stance phase caused by hyperextension of the MTP joint may result in dynamic plantar protrusion of the MT head.
- In the person with an incompetent first ray, such as in severe hallux valgus deformity with a wide intermetatarsal angle resulting in relative shortening of the first MT in relation to the lesser MTs, hypermobility of the first metatarsocuneiform joint or a short first MT leads to abnormal pressure transfers to the lesser MTs.
- Other causes of primary metatarsalgia include an abnormally enlarged MT head or condyle as a result of infection, neoplasia, congenital malformation, or other hereditary factors.

- **Secondary Metatarsalgia**
- Conditions that can lead to secondary metatarsalgia include trauma (eg, MT malalignment), hallux rigidus, inflammatory arthropathy, arthritides, degenerative diseases and instability of the MTP joints, interdigital neural tunnel syndrome, and Freiberg infraction.
- Trauma may shorten, elevate, or plantarflex an MT fracture, or it may cause injury to the soft tissues surrounding the MTP joint.
- Injury to the plantar plate resulting from trauma or chronic overuse causes the MTP joint to hyperextend, resulting in sagittal instability

- **Iatrogenic Metatarsalgia**
- This may arise from malunion after MT osteotomy or resection of the MT head.
- Nonunion or delayed union of MTs after reconstructive surgery or errors in positioning or fixation of an osteotomy may lead to MT overload under weight-bearing conditions.
- The most common error is iatrogenic shortening of the second MT as a result of nonunion, fracture, or incorrect choice of lesser MT osteotomy.
- Failed hallux valgus surgery can cause a shift of plantar pressure to the lesser MTs.

# Clinical Examination

- 1. A thorough patient history
- 2. The magnitude of deformity; Shoe wear
- 3. Localized or diffuse patterns of hyperkeratosis may be seen on the plantar skin.
- The most important feature of second rocker keratosis is the strictly plantar location under the MT head
- 4. Abnormal plantar flexion of the lesser MTs. An elevated first MT pushes the whole load of the second rocker onto the second MT, resulting in isolated keratosis underneath the second MT head.
- 5. Other causes of second rocker keratosis include gastrocnemius muscle contracture and pes cavus.



- 6. Propulsive, or third rocker, keratosis, in contrast, is found more distal from the affected heads.
- 7. Typically, each keratosis spans several heads
- 8. Keratoses associated with first ray insufficiency syndromes (ie, hallux valgus, short first MT) exhibit third rocker features.
- In case of concomitant MTP joint luxation, a second rocker lesion appears as well within the previous contour of the third rocker keratosis. Toe and ankle motion and stability are examined

- 9. Plantar flexion and dorsiflexion of the ankle joint are evaluated to identify contracture of the extensor or flexor tendons.
- 10. Hypermobility of the first ray and limited dorsiflexion at the hallux–first MTP
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- 11. Evaluate eversion and inversion
- 12. Medial column stability.
- 13. Each MTP joint is palpated to assess position, synovitis, and contracture.
- 14. Each intermetatarsal web space is palpated to assess for tenderness of
- the interdigital nerves.

- Stability of the MTP joints in the sagittal and transverse
- The examiner stabilizes the MT neck in one hand and attempts to displace the
- base of the proximal phalanx with the other hand while holding the joint in the neutral position (ie, mini Lachman test).
- Palpation of the MT heads and the plantar condyle is often possible; this is easier in advanced stages of metatarsalgia in the presence of atrophy of the plantar fat
- pad.
- The Silfverskiöld method