

Muscle Evaluation of the lower extremity

Lecture & Video

Outline

- revise functional anatomy of:
 - tibialis posterior and anterior
 - triceps surae
 - peroneals
 - digital musculature
- manual muscle testing
 - grading system
- Muscles: testing and Function video (program 5) by Florence Kendall
 - BUND AV Reserve 617.58075
 - Reappraisal of most important muscles to test

Outline

- Need to be able to clinically perform manual muscle testing of the aforementioned muscles
 - Assumed knowledge for 3rd year clinics
 - Clinic tutorial soon

Factors influencing muscle action

- position of tendinous insertion relative to joint axis
- lever arm
- variation in joint axis position (eg: medially deviated STJ axis)
- position of adjacent joint (ie: AJ DF or PF affects muscle action at STJ)

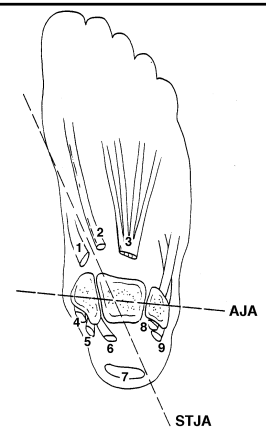
Factors influencing muscle action

Subtalar joint moment arms

Tibialis posterior	-19.2
Flexor hallucis longus	-7.8
Triceps surae	-5.3
Tibialis anterior	-3.8
Peroneus brevis	20.5
Peroneus longus	21.8

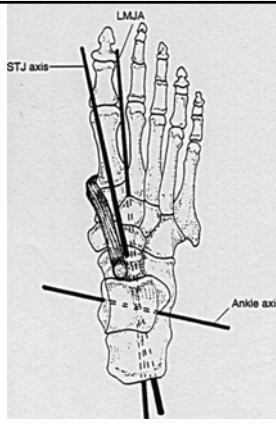
from Klein et al (1996) Clinical Biomechanics 29: 21-30.

Factors influencing muscle action



Tibialis anterior

- origin: proximal 2/3 of anteriolateral surface of tibia and interosseus membrane
- insertion: dorsal aspect of base of first ray
- actions:
 - dorsiflexes AJ
 - supinates long. axis MTJ
 - supinates STJ

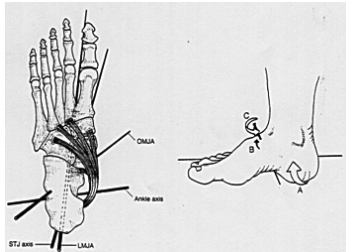


Tibialis anterior

- function
 - decelerates pronation and plantarflexion from HC
 - toe clearance during swing phase
- pathology
 - weak: foot drop, XS pronation
 - contracture: supinated foot

Tibialis posterior

- origin: posterior, proximal tibia
- insertion: pl. surf. of all tarsal bones except the talus
- actions:
 - stabilizes midfoot
 - major supinator / anti-pronator

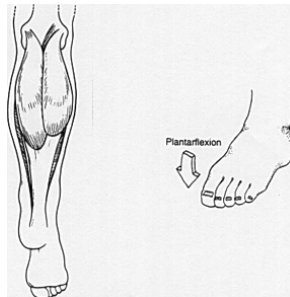


Tibialis posterior

- function
 - decelerates STJ pronation from HC
 - supinates STJ during propulsion
- pathology
 - weak: XS pronation > pes planus
 - contracture: supinated foot

Triceps surae

- consists of gastrocnemius and soleus
- origin: gastrocs: above femoral condyles, soleus: soleal line of tibia and fibula
- insertion: achilles tendon into posterior aspect of calcaneus



Triceps surae

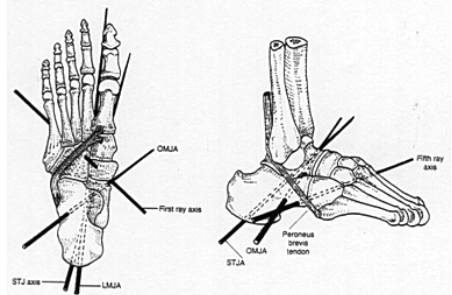
- actions:
 - plantarflexes AJ
 - supinates a supinated STJ, pronates a pronated STJ
- function
 - active from FFL to TO for propulsion
- pathology
 - contracture: muscular equinus



Peroneals

- origin: lateral aspect of fibula
- insertion: longus - base of first ray, brevis - styloid process of 5th met.
- actions:
 - PL: stabilises forefoot, plantarflexes first ray, pronates STJ
 - PB: pronates STJ and OA MTJ

Peroneals

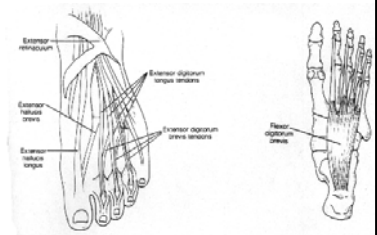


Peroneals

- function
 - stabilize forefoot prior to heel lift
- pathology
 - weak: overpowering of supinators > supination deformity
 - contracture: pes planus

Digital musculature

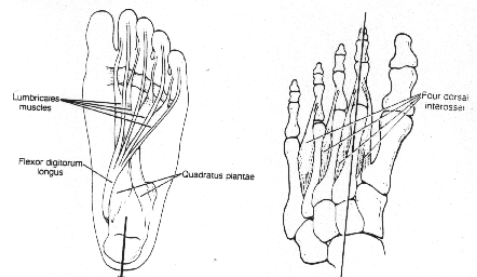
- long flexors / extensors insert into **distal** phalanx and produce motion at DIPJ
- short flexors / extensors insert into **intermediate** phalanx and produce motion at PIPJ



Digital Musculature

- interossei: dorsal and plantar layer, originate from met. shafts and insert into proximal phalanges
 - act to stabilise proximal phalanges in transverse and sagittal planes
- lumbricals: originate from medial side of FDL tendon slips, insert into base of proximal phalanx
 - plantarflex proximal phalanx and straighten pull of FDL

Digital Musculature



Manual muscle testing

- very useful, under-emphasised clinical technique within podiatry
- clinical applications:
 - to determine muscles affected by neuromuscular conditions such as CP, polio, CVA
 - congenital shortening of muscle groups

Clinical applications...

- post-surgical
 - shortening
 - Tendon tenotomy (eg: HAV)
- post-traumatic weakness
 - eg: peroneal weakness post inversion ankle sprain
- tibialis posterior dysfunction

◇ ◇ ◇ Basic principles ◇ ◇ ◇

- test position
 - one-joint muscles: end ROM position
 - two-joint muscles: half-way through ROM
- stabilise proximal structures
- apply resistance:
 - gradually, to let patient 'get set and hold', then uniformly apply resistance
 - directly opposite to line of action of the muscle
- always look for 'assistance' from other muscles

Grading system (as per Kendall)

Normal	++++
Good	+++
Fair	++
Poor	+
Zero	0

- Normal: can overcome > resistance than 'good'
- Good: against slight resistance & gravity
- Fair: can raise part against gravity, full ROM
- Poor: partial ROM against gravity
- Zero: no contraction felt

Summary

- Need to remember:
- origin and insertion of lower limb muscles
 - effect of contraction at AJ, STJ, MTJ, MPJs
 - effects of contracture and weakness
 - agonists and antagonists
 - grading system

Always revise anatomy

Video

- Lower Extremity Muscles
 - BUND AV Reserve Video
 - 617.585
 - BRN 810506

Questions?

Tibialis Anterior



- Pt: supine/sitting
- Fixn: examiner stabilises foot just above AJ
- Test: DF of AJ and inversion of the foot, without extension of hallux
- Pressure: against dorso-medial side of the foot, in the direction of **PF** of the AJ and **eversion** of the foot

Tibialis Posterior



- Pt: supine with extremity in lateral rotation
- Fixn: examiner stabilises leg above the AJ
- Test: inversion of the foot with PF of the AJ
- Pressure: against the medio-plantar surface of the foot, in the direction of DF of the AJ and eversion of the foot

Peroneals



- Pt: supine with extremity medially rotated
- Fixn: examiner stabilises foot above AJ
- Test: eversion of the foot with PF of the AJ
- Pressure: against the lateral border and sole of the foot in the direction inversion of the foot and DF of the AJ. To more specifically test PL, attempt to DF the 1st ray

30 second brief testing

QuickTime™ and a Video decompressor are needed to see this picture.