Equinus – A Review of McGlamry (Ch 43)

Anatomy: Gastrocnemius, plantaris, soleous (n. Tibial, a. PT)
**Achilles

Biomechanics
How posterior compartment acts across joints: Knee and Ankle perpendicular to muscles/STJ parallel but becomes perpendicular as pronates.
What this means in gait: Gastroc/plantar: Flex knee and PF ankle; Soleous: PF ankle.
**Before heel lift (end stance phase) w/ STJ neutral, max DF is required: at least 10 degrees require

Measure Ankle DF NWB: Pt supine, knee extended, STJ neutral, look at angle rear foot to bisection of leg (forefoot may have deformity to change measurement)

Etiology/classification:
Muscular forms: 1. Spastic: NM dx (cerebral palsy)-No DF ankle in swing, toe walking
   2. Non-spastic: a. Congenital: toe-toe walking may be normal for 3-6mo after starting to walk. By age 7 child should be heel-toe walking. If not may have congenital shortness of posterior compartment muscles.
   b. Acquired: Davis law: soft tss elongates/contacts to altered position. i.e. high heels
   **differentiate Spastic vs. non spastic with Tibial nerve block

Which muscle? Gastroc vs. Gastrocsoleous
-Silfverskiold Test: Strait leg and dorsiflex at ankle, knee bent at 90 degrees (gastroc and soleous at disadvantage) and dorsiflex at ankle. Result: DF ankle at 90 Knee: Gastroc tight.
   Not DF more at 90 knee: contracture soleus/deep post crural muscles/ankle joint capsule/ligament/osseous equinus

Osseous Forms: 1. Talotibial exostoses: Anteriorly
   2. Pseudequimus: Anterior cavus (metatarsal equinus/forefoot equinus) cause foot to DF at ankle to get heel on ground. No more DF available for gait.

Combination forms: Combinations of factors.

Subjective and Objective Associated Pathologic Findings
Proximal Associated Pathologic Changes
- Pts COG is shifted posterior vs normal
- Proximal compensatory changes
  o Lumbar lordosis= SADDLE BACK (associated w severe ankle equinus & is usually associated w hip and knee flexion)
  o Genu recurvatum
    ▪ Associated w/( All of these deformities can occur in combination, in pairs or alone)
      • Lower back, hip, knee pain
      • Calf cramping
Distal Associated Pathologic Changes
- DF at the oblique axis of the MTJ=> pronation along that axis, DF of the FF on the RF compensates for the limited ankle DF
- Sgarlato- divided this distal compensation in 3 groups
  o Uncompensated or absence of distal compensation
  o Partially compensated
    ▪ Minimal distal compensation in which the STJ remains supinated and min /no ST or Midtarsal jt pronation
  o Fully compensated – MTJ pronation => hypermobile 1st ray - Metatarsus primus adductus and HAV

Conservative Treatment
- Team approach for pts with neuromuscular disease
- Exercise routine (passive or active)
  o - aimed at weakening the posterior group and strengthening the anterior group
  o Used for mild equinus & moderate equinus pt who aren’t surgical candidates (limited benefits for moderate equinus cases)
- Orthoses, Padding (heel lift), Molded shoe gear (Charcot deformity)
  o To prevent the progression of associated compensatory pathologic changes and to accommodate or support an ankle equinus
- Serial casting and bracing (younger pts)
  o MILD – MOD Non spastic neuromuscular deformity- often corrected
    ▪ Stretching posterior group, strengthening anterior group, brace/ night splint- maintain correction until full skeletal maturity
  o Spastic muscular or more severe non spastic neuromuscular deformity- consider casting
  o In older children and adults casting inappropriate. Instead use combo of exercises, stretching routine, night splints
  o Conservative tx for MOD-SEVERE equinus too slow, allows for compensation prox and distal
- Local intramuscular injections (alcohol, phenol or botulinum A toxin)
  o Alcohol and phenol injections- associated with 1)skin slough, 2) muscle fibrosis, 3) scarring, 4)permanent nerve damage, and 5)increase pain
- Botox
  o Effective and practical neuromuscular blocking agent (prevents Ach at the NMJ)
  o Injected in the spastic components of the triceps surae => weakness of spastic muscles
  o Min adverse effects of IM Botox injections for equinus, however long term studies have not been conducted.

Surgical Treatment
- Preoperative considerations
  o Clinical evaluation, patient’s intelligence and motivation, age, severity of ankle equinus
  o Increased physical activity, better prognosis
- Gastrocnemius Equinus
  o 1924, Silverskiold test to distinguish gastroc from other types of equinus
  o Neurectomy: Stoffel then Baumann
    ▪ Useful in cases of gastroc contracture with clonus but denervated muscle untrainable
Proximal Recession
- Silfverskiöld: release of gastroc heads from femoral condyles above knee
  - Knee effusions, lack of protection to knee, genu recurvatum
- Distal Recession
  - Vulpius and Stoffel (1913) transverse lengthening modified with V cut
  - Strayer: transverse lengthening and suturing retracted portion to soleus
  - Baker (1956): tongue in groove modification, freed distally and centrally to prevent reoccurrence
  - Fulp and McGlamry: inverted cuts for easy technique and cut, narrow aponeurosis
  - High rate of reoccurrence but good procedure choice for non-spastic equinus
- Endoscopic Gastroc Recession
  - Trevino and Panchbhavi noted EGR can increase ankle DF to 15 degrees
  - Best indicated for diabetics with peripheral neuropathy (loss of sural nerve)
  - Ankle DF assessed for 10 degrees past neutral.

Gastroc-Soleus Equinus
- Neurectomy
  - Used in conjunction with lengthening procedure
- Advancement of Achilles
  - Achilles reattached to calcaneus in Bunell fashion plantarly
  - Downey and McGlamery: medial and lateral advancement and attachment posteriorly
  - Weakens gastroc/soleus complex and MPJ joint fulcrum
- Tenotomy
  - Procedure of Choice for non-spastic gastroc equinus
  - Open Z-pasty, Grabe and Thompson, Sagittal Plane
  - Open frontal plane Z-plasty

Osseous Equinus
- Surgical correction aimed at resection of talotibial exostoses
- Open arthrotomy
- Arthroscopic ankle

Postoperative Care
- BKC 4-6 weeks
- Degree of spasticity, patient's physical condition, and age
- Continue isometric exercises 25 days s/passive and active exercises

Complications
- Infections, hemotoma, postoperative adhesions between Achilles, nerve entrapment
- Transient weakness of triceps surae with calcaneal gait