Orthopedic Evaluation of the Ankle and Foot

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Clinical Orthopedic Rehabilitation Education

Southwestern Medical Center
Subjective history questions

- Patient's Chief Complaint and Rehab Goal(s)
- Mechanism of Injury
- Date of Injury-Surgery
- Length and type of immobilization
- Weight bearing status and progression
- Previous Treatment
- Present Status
  - better – worse – same
- Orthotics/braces/sleeves, etc
- Symptom Behavior
- Past Medical - Injury History
Remember S.I.N.S.?
Considerable Influence on Intervention Strategy

- **Severity**
  - How significantly this impairment affects the patient

- **Irritability**
  - The reactivity or stability of the condition
    - What does the patient have to do to set off the condition?
    - Once set off, how long and severe are the symptoms?
    - What does the patient have to do to calm the symptoms?

- **Nature**
  - Numbness/tingling, Weakness, Popping, Locking, Giving way, Clicking, Grinding, Skin changes

- **Stage**
  - Has the condition stabilized (better), become stagnant (same), or deteriorated (worse)?
Foot-Ankle Specific Questions

- Does spinal motion or posture effect your leg-ankle foot symptoms?
- Have you altered the IDF of your daily, occupational, or recreational activities?
- Do you have stiffness first thing in the morning that resolves in an hour or so?
- Does your heel hurt first thing in the morning or after prolonged sitting?
- Shoe preferences
Interclass Correlation Coefficients
Reliability Interpretation

<table>
<thead>
<tr>
<th>Degree</th>
<th>ICC</th>
</tr>
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<tbody>
<tr>
<td>High</td>
<td>.90 - .99</td>
</tr>
<tr>
<td>Good</td>
<td>.80 - .89</td>
</tr>
<tr>
<td>Fair</td>
<td>.70 - .79</td>
</tr>
<tr>
<td>Poor</td>
<td>&lt; .69</td>
</tr>
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</table>
Kappa Agreement Interpretation

<table>
<thead>
<tr>
<th>Kappa Value</th>
<th>Level of Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0</td>
<td>Less than chance agreement</td>
</tr>
<tr>
<td>0.01–0.20</td>
<td>Slight agreement</td>
</tr>
<tr>
<td>0.21–0.40</td>
<td>Fair agreement</td>
</tr>
<tr>
<td>0.41–0.60</td>
<td>Moderate agreement</td>
</tr>
<tr>
<td>0.61–0.80</td>
<td>Substantial agreement</td>
</tr>
<tr>
<td>0.81–0.99</td>
<td>Almost perfect agreement</td>
</tr>
</tbody>
</table>
Sensitivity-Specificity-Likelihood Ratios

- **SN**: % of true positive (SNOUT = rule out)
- **SP**: % of true negative (SPIN = rule in)
- **LR**: + or – (predicts post-test probability based on prevalence)

\[ LR = \frac{\text{sens}}{1 - \text{spec}} \]

\[ -LR = \frac{1 - \text{sens}}{\text{spec}} \]
observation and general appearance

- Posture
- Weight Bearing Status
- Symmetrical Appearance
- Soft Tissue swelling, effusion, atrophy, etc.
- Plantar Lesions
  - check for callous patterns
- Shoe Wear and Type
Anthropometric Measurements

- Circumferential girth measurements may be recorded bilaterally at mid-calf, mid foot, met heads, and Figure 8 or Heel Lock tape measurement
  - High intra/intertester reliability (ICC = .99) with MDC of 10 mm
- Volumetric displacement techniques may also be used to objectively quantify swelling
  - High interrater reliability (ICC = .98)

Vascular Pulses

Dorsal Pedal Pulse

Posterior Tibial Pulse

to rule out cardiovascular pathology
sagittal plane abnormalities

- **Feiss Line** (medial longitudinal arch)
  - assessment of navicular tuberosity position relative to bisection of medial malleolus apex and 1st metatarsal head

- **Longitudinal Arch Angle**
  - angle formed between line from medial malleolus to navicular tuberosity and 1st medial met head to navicular tuberosity
  - good interrater reliability, prognostic of dynamic foot posture during ambulation, and may have some value in predicting the risk of lower extremity injuries

Navicular Drop Test

- Difference in navicular height from STJN position (with most of weight on contralateral extremity) to relaxed stance position
- Intrarater ICC = .78 with S.E.M = 1.68 mm

Navicular Height and Drop

- The difference between navicular height in STJ neutral vs. STJ relaxed (or NWB vs. WBing)
- 6-9 mm drop is normal
- > 10-15 mm is indicative of compensatory pronation
Mulligan E, et al. Man Ther, 2013

\[ ICC^{2,1} = 0.88 \]
\[ \text{Ave. ND} = 12 \text{ mm} \]
Arch Index

- AI = surface area of B/(A+B+C)
- The lower the arch – the higher the index

High Arch = < .21
Normal = .21 - .26
Flat Arch = > .26

Test-Retest ICC = .99

Length of truncated foot (excluding toes) is divided into equal thirds
Arch Height Index

Arch Height @ ½ Foot Length
Truncated Foot Length

Normal = 0.316
High Arch = 0.356 (+1.5 SD)
Low Arch = 0.275 (-1.5 SD)


My Foot Example
8.7 cm ÷ 21.3 cm = .408 (high arch)
Frontal plane abnormalities

- Bony Landmark Symmetry
- Genu Varum/Valgus
- Tibial Varum
- STJ POSITION
  - Relaxed vs. Neutral
- Haglund's Deformities
- Met Length Classification
- Leg Length Discrepancies
- Hallux Valgus
Tibial Varum measured in unilateral stance with STJ in neutral

- extrinsic deformity in which the distal portion of the tibia is closer to the midline than the proximal portion
- intratester reliability of 2-3°

Lohman, 1987
STJ Position - relaxed vs. neutral

- Relaxed position indicates amount of compensation necessary in stance

- Interrater reliability of .75 in unilateral stance and .91 in bilateral stance

Smith-Orricchio, 1990
# STJ Neutral Reliability

<table>
<thead>
<tr>
<th>Position</th>
<th>Intratester ICC</th>
<th>Intertester ICC</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWB</td>
<td>.77</td>
<td>.60</td>
<td>Elveru, PT, 1988</td>
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<tr>
<td></td>
<td>.06-.27</td>
<td>.25</td>
<td>Smith-Orricchio, JOSPT, 1990</td>
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<tr>
<td></td>
<td></td>
<td>.06-.27</td>
<td>Picciano, JOSPT, 1995</td>
</tr>
<tr>
<td>WB</td>
<td>.14-.18</td>
<td>.15</td>
<td>Picciano, JOSPT, 1995</td>
</tr>
<tr>
<td></td>
<td>.75-.91</td>
<td>.72</td>
<td>Smith-Orricchio, JOSPT, 1990</td>
</tr>
<tr>
<td></td>
<td>.85</td>
<td>.79</td>
<td>Sell, JOSPT, 1994</td>
</tr>
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</table>
1st MTP Deformities
Hallux Valgus – “bunions”

metatarsophalangeal hallux valgus angle (HVA) representing the lateral deviation of the phalanx - should be less than 15°

intermetatarsal angle (IMA) should be less than 9°
<table>
<thead>
<tr>
<th>Foot Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squared Foot</td>
<td>9%</td>
</tr>
<tr>
<td>Greek Foot</td>
<td>22%</td>
</tr>
<tr>
<td>Morton’s Foot</td>
<td>69%</td>
</tr>
<tr>
<td>Egyptian Foot</td>
<td>1&gt;2&gt;3&gt;4&gt;5</td>
</tr>
<tr>
<td>Index Plus</td>
<td>1&lt;2&gt;3&gt;4&gt;5</td>
</tr>
<tr>
<td>Index Minus</td>
<td>1=2&gt;3&gt;4&gt;5</td>
</tr>
<tr>
<td>Index +/-</td>
<td></td>
</tr>
</tbody>
</table>
structural abnormalities of the toe

claw toe: typically deficient intrinsics

hammer toe: typically long extensor contracture at MTP

mallet toe: DIP flexion typically secondary to poor fitting shoes
Transverse plane abnormalities

- Tibial Torsion
  - 15° external tibial torsion
- Toe in/out
  - Femoral torsion
  - Hip ante/retroversion
  - Forefoot ab/adductus
Foot-Ankle Range of Motion

- Sagittal Plane TCJ DF-PF  20-0-50°
- Frontal Plane STJ Inv-Ever  20-0-10°
- MTJ Motions: not measurable
hallux dorsiflexion ROM

- 20-30° with 1\textsuperscript{st} ray stabilized
- 60-90° with 1\textsuperscript{st} ray plantarflexion
## ROM Reliability

<table>
<thead>
<tr>
<th>Motion</th>
<th>Intratester ICC</th>
<th>Intertester ICC</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCJ DF</td>
<td>.89</td>
<td>.28</td>
<td>Youdas, APMR, 1993</td>
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<tr>
<td></td>
<td>.90</td>
<td>.50</td>
<td>Elveru, PT, 1988</td>
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<tr>
<td></td>
<td>.86-.97</td>
<td>.26-.31</td>
<td>Van Gheluwe, JAPMA, 2002</td>
</tr>
<tr>
<td>TCJ PF</td>
<td>.91</td>
<td>.25</td>
<td>Youdas, APMR, 1993</td>
</tr>
<tr>
<td></td>
<td>.86</td>
<td>.72</td>
<td>Elveru, PT, 1988</td>
</tr>
<tr>
<td>STJ Inv</td>
<td>.62</td>
<td>.15</td>
<td>Everu, PT, 1988</td>
</tr>
<tr>
<td>STJ Ever</td>
<td>.59</td>
<td>.12</td>
<td>Elveru, PT, 1988</td>
</tr>
<tr>
<td>1st MTP DF</td>
<td>.90 -.98</td>
<td></td>
<td>Van Gheluwe, JAPMA, 2002</td>
</tr>
</tbody>
</table>

What do you assume is the S.E.M or what is your threshold for a MDC?
MMT for the Foot-Ankle

- Anterior Tib
- Extensor Hallucis Longus
- Extensor Digitorum
- Peroneals
- Gastroc
- Soleus
- Posterior Tib
## Palpation of the Foot-Ankle

**Medial**
- deltoid ligament
- tarsal tunnel
- navicular tuberosity
- bunions
- posterior tibial artery
- medial malleolus

**Lateral**
- ATF and CF ligaments
- sinus tarsi
- cuboid
- 5th metatarsal head
- fibula and lateral malleolus
- peroneal retinaculum

**Anterior**
- metatarsals/phalangeals
- cuneiforms
- dorsalis pedis artery
- anterior talar dome
- inferior tib fib ligaments

**Posterior**
- calcaneus
- Achilles tendon

**Plantar**
- metatarsal heads
- plantar fascia
- morton's neuroma
Ankle/Foot Functional Outcome Tools

- Functional Ankle Activity Measure – FAAM
- Functional Ankle Disability Index - FADI
- Foot Health Survey Questionnaire – FHSQ
- Foot Function Index - FFI
Special Tests

- Anterior Drawer – Talar Tilt
- Cuboid Provocation
- D.E.R.T./Kleiger Test
- Valgus Stress
- Thompson’s Test
- Peroneal Subluxation
- Neuroma Provocation
- Windlass Test
- Impingement Sign
- Ottawa Fracture Rules
- Homan Sign
Anterior Drawer Test (of the Ankle)

- Ankle relaxed in 10° of plantarflexion and slight adduction
- Stabilize the tibia and draws the talus forward in the ankle mortise
- Inside hand stabilizes the talus and the opposite hand grasps the posterior calcaneus to draw anteriorly
- Lack of integrity of the ATF will allow an anterior subluxation and internal rotation of the talus out from under the mortise.
- Can also reverse the stress – stabilize calcaneus and translate tibia/fibula posteriorly
Lateral Ankle Instability – ATFL Injury

Increased Talar Anterior/IR Translation

- Grading is reported as 1+, 2+, or 3+
- 86% SN; 74% SP; 94% + PV
  - if skin dimple appears
    (occurs in about 50% of injuries)

71% SN; 33% SP; +LR = 1.06; -LR = 0.88 at less than 48 hours post injury

improved diagnostic accuracy at 5 days post-injury if:

- presence of:
  1. hematoma
  2. pain on palpation of ATFL
  3. positive anterior drawer test

+ LR = 6; - LR = .05

Systematic Review
Diagnostic Accuracy of Ankle/Foot Physical Exam

<table>
<thead>
<tr>
<th></th>
<th>No Laxity Difference</th>
<th>Laxity Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uninjured subjects</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Injured subjects</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

Chi-square with continuity correction = 4.84, \( df = 1 \), \( P = 0.03 \).


SP = 100; SN = 58

### Anterior Drawer Test

- 66 subjects with lateral ankle sprain
- ADT with ≈ 30 lb. anterior translation
- Reference standard of 2 and 4 mm excessive translation

<table>
<thead>
<tr>
<th></th>
<th>Graded as 2+</th>
<th>Graded as 3+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 2.3 mm</td>
<td>&gt; 3.7 mm</td>
</tr>
<tr>
<td>SP</td>
<td>0.38</td>
<td>0.40</td>
</tr>
<tr>
<td>SN</td>
<td>0.74</td>
<td>0.83</td>
</tr>
<tr>
<td>+ LR</td>
<td>1.21</td>
<td>1.40</td>
</tr>
<tr>
<td>- LR</td>
<td>0.66</td>
<td>0.41</td>
</tr>
</tbody>
</table>

Talar Tilt Test

- Patient in sidelying or supine with the foot relaxed and the knee slightly flexed to relax the gastroc
- Foot held in neutral dorsiflexion to align the calcaneofibular ligament perpendicular to the long axis of the calcaneus and talus
- Varus (inversion) stress is produced through adduction and rotation of rearfoot
- Lack of integrity of the calcaneofibular and/or talofibular ligament will result in increased inversion, often with a clunk or bony end feel
- No research published on accuracy of clinical exam
Tilt and Drawer Tests

ATF/CF disruption
- 20-30° tilt or > 10° greater than uninjured side
intra-rater reliability of manual ankle instability tests

- 2 drawer tests (CKC and OKC) and 2 variations of the tilt test
- ICC = -0.12 – 0.33 for 4 raters on 60 subjects
- r = -0.12 – 0.42 when examining relationship to functional outcome tool (Cumberland Ankle Instability Tool)
- variability probably rooted in validity of tests, amount of force applied, and subjective judgment of translation

Midtarsal Supination
- Triplanar stress of cuboid

Midtarsal Adduction Test
- Transverse plane adduction stress

Keep TCJ in neutral so as to not confuse symptom reproduction with injuries to the ATFL
rotational mechanism for “high” ankle sprain
High Ankle Sprain MOI
Integrity of the tibiofibular ligaments can be assessed with passive abduction of foot on fixed leg (external rotation) with a dorsiflexed ankle.

Kappa Reliability = .75


Generally considered low sensitivity and high specificity.
Crossed Leg Test

- Figure 4 sitting with mid-fibula resting on thigh
- Gentle force to medial knee by the examiner
- Positive test if it reproduces pain in the area of the distal syndesmotic area
deltoid (medial collateral) ligament stress test

- MOI – hyperpronation (particularly in position of dorsiflexion)
- Test - valgus (eversion of the talus/calcaneus) stress

- May need to check for syndesmotic injuries or fractures if positive
  - Distal fibula
  - Avulsion of medial malleolus
  - Proximal fibula (Maisonneuve)
peroneal subluxation test

- Resist active eversion with ankle dorsiflexed
- Can be performed in sitting or prone with knee flexed to 90°
- + test is if peroneal tendon visibly subluxes over the lateral malleolus
Subluxing Fibularis Tendon Video
Thompson’s Test

- to detect Achilles tendon injury or integrity

SN = .96; SP = .93
+ LR = 14; - LR = 0.04

Achilles Tendon Rupture Diagnostic Triad

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thompson</td>
<td>96</td>
<td>93</td>
</tr>
<tr>
<td>Matles</td>
<td>88</td>
<td>85</td>
</tr>
<tr>
<td>Palpable Gap</td>
<td>73</td>
<td>89</td>
</tr>
</tbody>
</table>

Positive and/or negative findings in all three parameters will yield essentially perfect accuracy

Thompson Test Video

Calf (soleus muscle) being gently squeezed

If the Calf squeeze MOVES the foot, then the Achilles tendon is not fully ruptured between the soleus muscle and the heel bone.

If the Calf squeeze does NOT move the foot, then there is a full Achilles tendon rupture between the soleus muscle and the heel bone.

Calf squeeze test for Achilles tendon rupture
Posterior Tib Integrity

- **First metatarsal rise sign**
  - Passive ER in bilateral stance
  - If 1st metatarsal rises into extension it an indication of posterior tib insufficiency
    - In the normal foot, supination of the RF raises the height of the medial arch and the forefoot will remain plantigrade due to tensioning of the intact plantar ligaments.
    - With absent or lax plantar arch ligaments, inversion of the heel causes no arch raise and the forefoot simply inverts with the rearfoot as one unit.
Additional Tests

- **Dynamic Supination Test Arch Integrity**
  - also used to assess the integrity of the PTT and plantar fascia – passive extension of the 1st MTPJ should cause a slight elevation of the medial arch

- **Too-Many-Toes Sign**
  - 1 or 2 toes visible lateral to the heel is normal
  - 3 or more toes being visible is suggestive of hyperpronation or excessive forefoot abductus
Impingement Sign

- Digital pressure over anterolateral ankle with simultaneous dorsiflexion
  - SN = .95; SP = .88
  - +LR = .79; -LR = .06

- S/S Cluster

  1. Anterolateral ankle joint tenderness
  2. Anterolateral ankle joint swelling
  3. Pain with forced dorsiflexion and eversion
  4. Pain with single leg squat
  5. Pain with activities
  6. Ankle instability

If ≥ 5 present – SN = .94; SP = .75; + LR = 3.8; - LR = .0
Interdigital (Morton’s) neuroma provocation

A Mulder's click (painful reproduction of symptoms) may occur when the enlarged interdigital nerve subluxes between the met heads when they are compressed.

metatarsal head compression to reproduce chief complaint
Windlass Provocation Test for Plantar Fasciitis

- Forceful great-toe extension in a standing position causing pain at the medial calcaneal tubercle
- 100% specificity
- 31% sensitivity
  - just 13% sensitivity if performed in NWB

Rule Out Fractures
Ottawa Fracture Rules

Excellent screening tool because of high sensitivity and very low negative likelihood ratio

Rule
1. Inability to WB 4 steps
2. Localized tenderness in any of 4 spots
A series of ankle x-ray films is required only if there is any pain in malleolar zone and any of these findings:
- Bone tenderness at A
- Bone tenderness at B
- Inability to bear weight both immediately and in emergency department

A series of ankle x-ray films is required only if there is any pain in mid-foot zone and any of these findings:
- Bone tenderness at C
- Bone tenderness at D
- Inability to bear weight both immediately and in emergency department
R/O Deep Vein Thrombosis
Homan’s Sign

- Suspect diagnostic value
  - Unreliable
  - Poor specificity (.56) and suspect sensitivity (.39)

  + LR = 1.40
  - LR = 0.87

- Individual clinical findings are inadequate to detect DVT
- Wells CPR more useful in determining probability
New Gold Standard based on venography studies

Clinical Decision Rule
Wells, et al, 1997

9 medical history and physical exam findings that categorize a patient as low, moderate, or high risk

<table>
<thead>
<tr>
<th>Clinical Finding</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active cancer (within 6 months of diagnosis or palliative care)</td>
<td>1</td>
</tr>
<tr>
<td>Paralysis, paresis, or recent plaster immobilization of lower extremity</td>
<td>1</td>
</tr>
<tr>
<td>Recently bedridden &gt;3 days or major surgery within 4 weeks of application of clinical decision rule</td>
<td>1</td>
</tr>
<tr>
<td>Localized tenderness along distribution of the deep venous system&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1</td>
</tr>
<tr>
<td>Entire lower-extremity swelling</td>
<td>1</td>
</tr>
<tr>
<td>Calf swelling by &gt;3 cm compared with asymptomatic lower extremity&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1</td>
</tr>
<tr>
<td>Pitting edema (greater in the symptomatic lower extremity)</td>
<td>1</td>
</tr>
<tr>
<td>Collateral superficial veins (nonvaricose)</td>
<td>1</td>
</tr>
<tr>
<td>Alternative diagnosis as likely or greater than that of deep vein thrombosis&lt;sup&gt;d&lt;/sup&gt;</td>
<td>-2</td>
</tr>
</tbody>
</table>

<sup>a</sup> Score interpretation: \( \leq 0 = \) probability of proximal lower-extremity deep vein thrombosis (PDVT) of 3% (95% confidence interval [CI] = 1.7%–5.9%), 1 or 2 = probability of PDVT of 17% (95% CI = 12%–23%), \( \geq 3 = \) probability of PDVT of 75% (95% CI = 63%–84%).

<sup>b</sup> Tenderness along the deep venous system is assessed by firm palpation in the center of the posterior calf, the popliteal space, and along the area of the femoral vein in the anterior thigh and groin.

<sup>c</sup> Measured 10 cm below tibial tuberosity.

<sup>d</sup> Most common alternative diagnoses are cellulitis, calf strain, and postoperative swelling.
On-line calculator at http://www.mdcalc.com/wells-criteria-for-dvt/

Wells’ Criteria for DVT
Calculates Wells’ Score for risk of DVT.

- Active cancer +1 NO
- Bedridden recently >3 days or major surgery within four weeks +1 NO
- Calf swelling >3 cm compared to the other leg +1 NO
- Collateral (nonvaricose) superficial veins present +1 NO
- Entire leg swollen +1 NO
- Localized tenderness along the deep venous system +1 NO
- Pitting edema, greater in the symptomatic leg +1 NO
- Paralysis, paresis, or recent plaster immobilization of the lower extremity +1 NO
- Previously documented DVT +1 NO
- Alternative diagnosis to DVT as likely or more likely -2 NO
Negative LR for differentiating high vs. low probability = 0.17

TABLE 2: DIAGNOSTIC PROPERTIES OF WELLS CLINICAL PREDICTION RULE

<table>
<thead>
<tr>
<th>STUDY DATA</th>
<th>TAGELAGI ET AL&lt;sup&gt;8&lt;/sup&gt;</th>
<th>WELLS ET AL&lt;sup&gt;7&lt;/sup&gt;</th>
<th>CONSTANS ET AL&lt;sup&gt;9&lt;/sup&gt;</th>
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<tbody>
<tr>
<td>Gold Standard Comparison</td>
<td>Ultrasound</td>
<td>Ultrasound</td>
<td>Ultrasound</td>
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<tr>
<td>Wells Score</td>
<td>DVT</td>
<td>No DVT</td>
<td>DVT</td>
</tr>
<tr>
<td>DVT likely ≥ 2</td>
<td>32</td>
<td>226</td>
<td>85</td>
</tr>
<tr>
<td>DVT not likely ≤ 1</td>
<td>7</td>
<td>64</td>
<td>10</td>
</tr>
<tr>
<td>Sensitivity (%)</td>
<td>82.0</td>
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<td>89.0</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>23</td>
<td></td>
<td>64</td>
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<tr>
<td>Positive likelihood ratio</td>
<td>1.1</td>
<td></td>
<td>2.5</td>
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<tr>
<td>Negative likelihood ratio</td>
<td>.80</td>
<td></td>
<td>.17</td>
</tr>
</tbody>
</table>
Alternate Prediction Rule for DVT
similar diagnostic utility as Wells CDR

Variables Assessed
1. Male Gender
2. Paralysis or Immobilization of Lower Limb
3. Confinement to bed > 3 days
4. Lower Limb Enlargement
5. Unilateral Lower Limb Pain
6. Other diagnosis at least as plausible

Predictive Ability
• > 3  60-80% possibility
• 1-2  30% possibility
• ≤ 0  5% possibility

Observational Gait Analysis
Ankle/Foot Focus

• Adequate sagittal plane talocrural motion in swing and stance phase,
  • i.e., early heel off?, adequate toe clearance?
• Controlled eccentric plantarflexion from heel strike to foot flat
• Rigid lever push off at heel raise
• Adequate MTP/IP sagittal plane motion during heel and toe off
• Appropriate sequence, timing, and amount of subtalar joint pronation/supination
• Ability to accept weight on involved side
• Appropriate angle and base of gait
Don’t forget to check for LLD

“You, sir, have a leg length discrepancy!”
Functional Foot-Ankle Tests

- Walk/Jog
- Walk on Toes/Heels
- Deep Squat or Step Down
- Heel Raises (bi/unilateral)
- Hopping (bi/unilateral)
- Stork Stand
- Dynamic Reach (SEBT)