

The Need for Developing 3D imaging Tools for Evaluating Orthotics on Patients.

Can we improve the current practice?

CIRMS 25TH ANNUAL MEETING
COUNCIL ON IONIZING RADIATION MEASUREMENTS AND STANDARDS

MARCH 27-29, 2017
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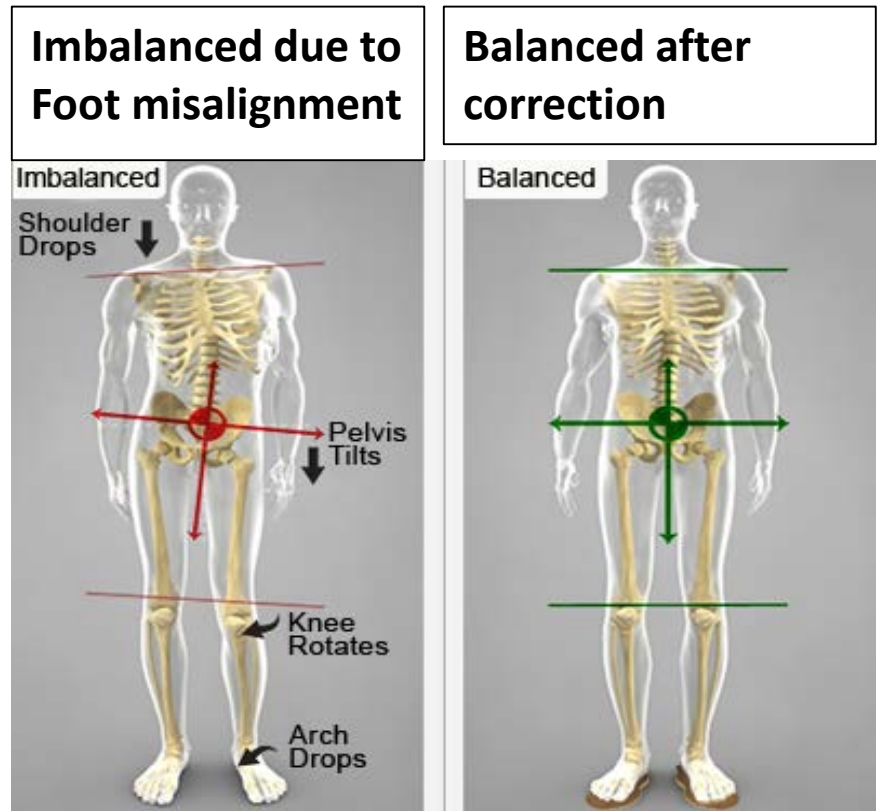


Chairs of the Medical Applications Working Group



Orthotics: What are they used for?

- Orthotics correct foot misalignments that can lead to body misalignment problems.



Design and Construction

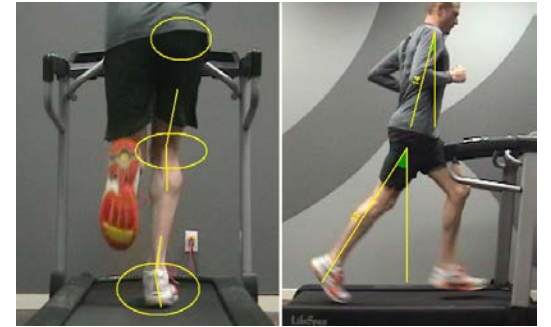
Last 10 years, surge of **design and construction** methods & orthotic **materials**

- Design: Plaster, Foam Box, glass beads, optical scanning, etc....
- Construction: mechanical methods, thermal molding, 3D printing



Evaluation: How are Orthotics currently evaluated on a patient?

- **Most common**: Put it on and stand up in your shoes. how does it “feel”?
- **More involved**: Walk down the hallway, how does it “feel”?
- **Most advanced (but rarely done)**: Video gait analysis



None of current methods assess effects of the orthotic on

- The patient's unique foot bone structure
- The patient's foot joints
- How the orthotic/ shoe combination affects the patients' unique 3D biomechanics,



3D image of foot anatomical structure inside shoe w. orthotics is needed



Current Evaluation/Treatment Protocol: **Trial & Error!**

Rarely an orthotic “FEELS” right on the patient upon testing it.



- General guideline: After initial evaluation, break in period of ~ 2-3 weeks.
- Patients return in 2- 3 weeks, tell provider where orthotic causes “**PAIN**”. Orthotic is adjusted based on the patient’s “**PAIN**” indication
- Patient returns after an additional 2-3 week break in period. If provider can not fix it it’s sent back to the manufacturer (3-4 weeks) for adjustment.
- Patient returns after 3-4 weeks and the whole process restarts.
- After a few iterations, and months of testing a few things may happen:
 - This long process finally succeeds.
 - A new orthotic is made and the whole process starts again.
 - Surgery may be recommended but,success rate is not that high!

Trial & Error



QUESTION FOR TODAY'S SESSION:

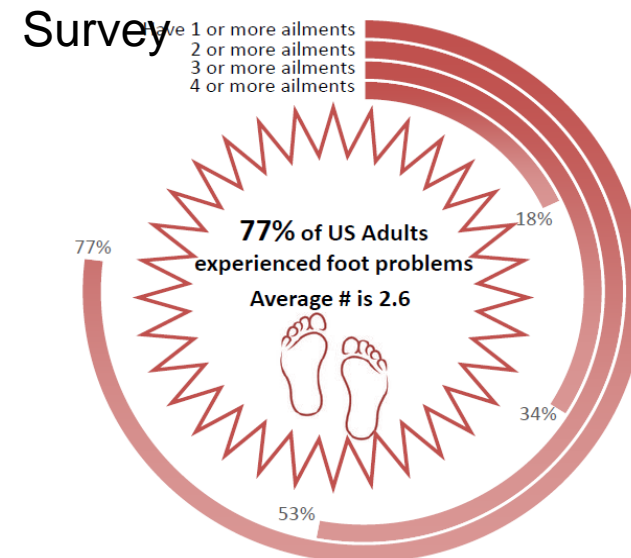
CAN WE IMPROOVE THE CURRENT PRACTICE?

- Can we reduce months of testing and reiteration of patients assessment and orthotic adjustments following the current methods?
- According to the APMA 77% of the US population suffers of feet problems (based on a 2014 Survey)



- The current method involves thousands of dollars per patient spent per year without guaranteeing success.

American Podiatric Medical Association, March 2014



How can we help to improve the practice?

3D imaging of the foot with the foot inside the shoe with orthotics is needed



Existing Technologies for Imaging in 3D the Foot in Weight Bearing Configuration

- **Weight bearing static CT** (Today's talk from Curvebeam)
- **Weight bearing dynamic Fluoroscopy** (Today's talk from Hologic)
- **Weight bearing static MRI** (example: units by ESAOTE)
- **Weight bearing dynamic MRI?** (not developed yet)
- **Other?**



***Needs That Need to be Discussed and Addressed in Today Session,
And, ... maybe later with a follow up focus group***

- **How current 3D imaging technologies could be incorporated in the current practice to better evaluate orthotics dispensed to patients in real time?**
- **Metrics need to be developed to evaluate orthotics using these new 3D weight bearing imaging technologies to evaluate the corrective effect on patient's feet misalignment conditions (such as flat feet and other ...)**
- **What are the doses involved in the X-Ray imaging technologies? Can we image in one setting a person with 2 different pair of orthotics?**



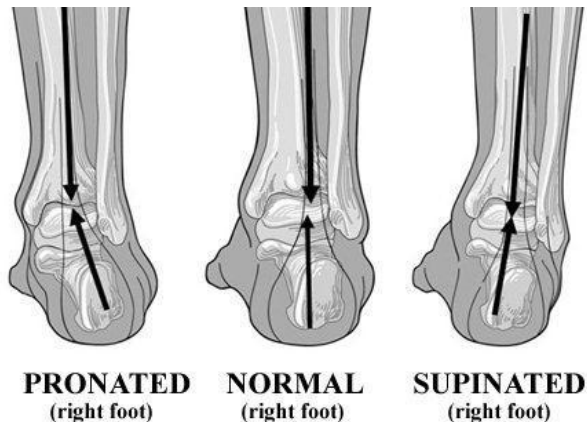
Improving the current Practice - A Multidisciplinary Effort

Professionals that provide Orthotics

- Podiatrists
- Orthopedic Doctors
- Physical Therapists
- Pedorthists
- Chiropractors
- Others

Others

- Instrument Manufacturers of both 3D X-ray and MRI imaging devices
- Radiation Physicists
- Radiologists
- Engineers



Thank you!

Questions?