Musculoskeletal Exam Techniques:
Evidence-Based Treatment for Lower Extremity Injuries

Anthony Beutler, MD, FAAFP

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Anthony Beutler, MD, FAAFP

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In Dr. Beutler’s current positions at Intermountain Healthcare, his job is to reimagine sports medicine care, practice state-of-the-art sports medicine, and train the next generation of sports medicine physicians. A Hoosier by birth, he spent 21 years in the U.S. Air Force practicing family medicine and comprehensive primary care sports medicine for active-duty service members, retirees, and their families. He is an award-winning educator and teacher on the team that developed and implemented a new musculoskeletal curriculum for the Uniformed Services University of the Health Sciences’ medical school. The author of numerous articles and a sports medicine textbook, Dr. Beutler has lectured throughout the world. One of his favorite activities is helping family physicians make their musculoskeletal practices more rewarding and profitable.
Learning Objectives

1. Distinguish musculoskeletal conditions that result from overuse/repetitive motion injuries in the lower extremities, with particular attention to those that occur in pediatric patients.

2. Assess an injured patient’s range of motion, stability, bone alignment, soft tissue swelling, palpable warmth or mass(es), pain or tenderness and crepitation in the lower extremities.

3. Apply appropriate treatment strategies for patients with musculoskeletal injuries in the lower extremities that include pain management, application of the RICE strategy, casting, splinting, joint injection/aspiration, dislocation reduction and/or emergency stabilization.

4. Identify red flags from the physical examination of lower extremity injuries that warrant referral to a sub-specialist (e.g. surgery, physical therapy) or for diagnostic imaging.

Associated Sessions

• (PBL) Musculoskeletal Exam Techniques: Evidence-Based Treatment for Upper & Lower Extremity Injuries
Overview

- Facts and Philosophy
- 3 Common Conditions
  - Victims and Culprits
  - Myths, Legends & Mystical Truths
  - Evidence-Based Treatment
- Coding Minute
- Annoyng Editorial Comments

Better Diagnose, Treat, and Code for Musculoskeletal Medicine
Poll Question #1
Tell me about you... *Who are you?*
1. Family Medicine Resident
2. Family Medicine Staff or Family Med Trained
3. Peds
4. Other

Poll Question #2
Have You Previously Attended an MSK Session That I Have Taught?
1. Yes, at this AAFP conference.
2. Yes, at a previous AAFP or other conference.
3. No. And why is your nose so big?
Poll Question #3

How Comfortable Are You Diagnosing & Treating Common MSK Problems?

1. Not at all comfortable
2. Comfortable with the basics
3. Fairly comfortable with MSK
4. Confidently diagnose & treat MSK

Facts and Philosophy

Editorial Comment
How much Musculoskeletal Medicine (MSK) do you See?

- 22-34% of outpt visits (civilian) for MSK complaints
- How much Musculoskeletal Medicine will you Know?

- MSK = 2% of Med School Curriculum (US & Canada)
Two Areas of Difficulty

• Proper **History** and **Physical** leading to correct Diagnosis

• Proven-Effective **Treatments** for the Correct Diagnosis

3 Common Culprits & Victims

**Case #1**

• 32 yo male with R heel pain
• Recently “started running to get fit”
• Hurts to run, but he can run through pain

**Exam:**
- **Normal appearance**
- **TTP medial calcaneal tubercle**
- Hurts worst with 1st step in AM
Poll Question #4

What is most likely the correct diagnosis?

A. Plantar fasciitis
B. Calcaneal stress fracture
C. Achilles tendinopathy
D. Tarsal tunnel syndrome

Plantar Fasciitis

Pathoanatomy

• NOT an inflammatory condition (not an “–itis”)
• Microtears of the plantar fascia
• Subsequent collagen degeneration

& Pain!!
Plantar Fasciitis

Diagnosis

**Clues to Diagnosis**
- Pain worst with first steps
- Classic TTP medial tubercle of calcaneus
- Dull “toothache” daytime pain

**Differential Diagnosis**

Like Real Estate: Location, Location, Location….

- Achilles Tendinopathy
- Tarsal Tunnel
- Stress Fracture
- Insertional Achilles Pain

- Plantar Fasciitis
Take Your Right Shoe Off

- Identifying The VICTIM
  - That’s easy

- Identifying The CULPRIT
  - Most common error:
    Not Identifying/Treating the Culprit
Poll Question #5

What is the Best Initial Treatment for Plantar Fasciitis?

1. Extracorporeal Shockwave
2. NSAIDs & Heel Cups
4. New Running Shoes/Orthotics

---

Victims & Culprits

**Victim**
- Plantar Fascia

**Culprits**
- Tight Heel Chord (70%)
Biomechanics of Walking 101

Victims & Culprits

**Victim**
- Plantar Fascia

**Culprits**
- Tight Heel Chord (70%)
- Training Error
- Muscular Weakness
- Overpronation
- Shoes
### Plantar Fasciitis

#### Treatments for Victims & Culprits

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- **Heel Cord Stretching**
- **Increase 10% per wk**
- **Towel Toe Heel Drop Ex**
- **Orthotics**
- **www.aapsm.org**
Plantar Fasciitis

Treatment

First Line

• **Stretching** of Plantar Fascia/Achilles
  – a MUST for prolonged relief
• **Strengthening**
  – calf & foot intrinsics
  – strong muscles absorb shock that would otherwise injure fascia
• **Ice**
• **Activity Modification**
  – Decrease running to 50% pre-injury level
  – If pain changes gait, d/c running

Second Line

• **Orthotics**
  – first line for those with significant pes planus/cavus
  – “off-the-shelf” for 1st time PF
• **Night Splints**
  – most helpful for chronic PF pain (w/ stretching)
  – Newer studies show less benefit
• **Steroid Injection**
  – effective for short-term pain control
  – use proper injection technique
• **Referral Therapies – 3rd Line Treatments**
  – Platelet Rich Plasma (PRP) Injection
  – Extra-Corporal Shock Wave Therapy
• **Surgery**
  – Recommend 12 months of conservative tx first
Plantar Fasciitis

**Patient Speak**

- But Doctor, what about my heel spurs?
- Stretch & Strengthen!

“Ice, Ice, Baby!!!”

- But Doctor, what about my ibuprofen?
Welcome to the GRAMP-C’s

“Great Research; And Maybe Practice-Changing”

Fantastic Reviews Awards

“Plantar Fasciitis – Trojan & Tucker, AFP June 2019”
&
“Common Foot Problems – Becker and Childress, AFP 2018”

Both Well-Done Reviews of Primary Care Treatment of Plantar Fasciitis by Sports Medicine Physicians!
- Recommended Reading!!

Conclusions:
#1 – Plantar Fascia >> Achilles stretching
#2 – Toe Raise Heel Drop Exercises
2014-2015 – Masochistic 3rd Line Therapies
Lots of Studies about Steroid Injections
vs Platelet Rich Plasma Injections
vs Organic Bear Snot Injections
vs Etc.

What does it all mean?

Summary:
#1 – What can you do in your office?
#2 – Steroid injections ARE effective for pain relief, probably 3-6 weeks.
#3 – PRP might be more effective… but not much!
#4 – Ultrasound-guided injection might be more effective than palpation guided… but not much!

Li Z, Corticosteroid versus placebo injection for plantar fasciitis: A meta-analysis. Exp Ther Med. 2015
Hsiao MY, Comparative effectiveness of aut blood-derived products, shock-wave therapy, CSI. Rheumatology (Oxford). 2015

What’s the Deal with Shock Wave Therapy?

“Clinically relevant effectiveness of focused extracorporeal shock wave therapy in the treatment of chronic plantar fasciitis: a randomized, controlled multicenter study”

Good study (246 patients!), definitively proves:
• Shock Wave Therapy is PAINFUL!!!!
• Shock Wave better than placebo for people with 6 months or more of pain
  – 69% shock wave vs 35% placebo group at 12 weeks
  – Less difference (but still significant) at 1 year

My Conclusion:
• Before having surgery, patients should consider shock wave
  “Shock wave therapy works better if patients continue their plantar fascia stretching program!!”

Rompe JD. Radial shock wave treatment alone is less efficient than radial shock wave treatment combined with tissue-specific plantar fascia-stretching in patients with chronic plantar heel pain. Int J Surg. 2015
#1- Stretch, Strengthen, #2 – Orthotics, #3 – Steroid Injection

**Overview**

- **Overview of Musculoskeletal Exam**
- **3 Common Conditions**
  - Victims and Culprits
  - Evidence-Based Treatment
    - Case 1 – Plantar Fasciitis
    - Case 2 –
    - Case 3 –
- **Coding Minute**
- **Annoying Editorial Comments**

**Plantar Fasciitis**

**Treatments for Victims & Culprits**

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- #1- Stretch, Strengthen
- #2 – Orthotics
- #3 – Steroid Injection

- [www.aapsm.org](http://www.aapsm.org)
Common Culprits & Victims

Case #2

- 38 yo male with L ankle pain
- Was playing tennis yesterday afternoon and…
- He is limping, but can bear weight
- PMHx “weak ankles,” no surgeries

Exam:
- Swollen, esp lateral, echy
- No TTP over shaded areas
- Very TTP antero-distal to lateral malleolus
- Xrays – tech on vacation to Ottawa…

Diagnosis?
Why the Anterior Talo-Fibular Ligament (ATFL)?
- Biomechanics 101
- The “buckle point”

Why do I care?

Medial Sprains are scary!

Differential Diagnosis:
- Ankle Fracture
- Foot Injury
Lateral Ankle Sprain

Differential Diagnosis:
- Ankle Fracture
- Foot Injury
- Other Sprains:
  - Medial Ankle Sprain
  - Tibialis posterior or peroneal tendons
  - Syndesmotic (High Ankle) Sprain

Victims & Culprits

Victim
- ATFL

Culprits For Re-Injury
- The Tennis Court?
- Loss of Motion
- Loss of Strength
- Loss of Balance (Proprioception)
Poll Question #6
After a Grade I-II Ankle Sprain, How Long Should You Wear an Ankle Brace?
A. Not at all  
B. 6-8 days  
C. 6-8 weeks  
D. 6-8 months  
E. Indefinitely

Lateral Ankle Sprain
Treatments for Victims & Culprits

**Victim**  
– ATFL

**Culprits**

**Treatments**
- RICE
- NSAIDs
- Brace
Lateral Ankle Sprain

Treatments for Victims

Victim – ATFL

Culprits For Re-Injury

– Loss of Motion
– Loss of Strength
– Loss of Proprioception

Medial Ankle Sprain

– Be skeptical & cautious

It’s a sprain, but patient can’t walk…
– Need a brace?
– Need crutches?
Medial Ankle Sprain
It’s a sprain, but patient can’t walk...
What brace do I use and for how long?
  – Who is your patient?
  – Decrease re-injury rates for 6-8 months
When should pt come back if not better?
  – 6 weeks

Lateral Ankle Sprain

Thinking Points

Welcome to the GRAMP-C’s

“Great Research; And Maybe Practice-Changing”
Best Ankle Sprain Reviews of 2012 & 2017 (and Probably All Time!)

“How can we minimize recurrent ankle sprains”

• #1 - Wear Ankle Braces (SOR: A)
  – Lace-up, semi-rigid braces prevent primary and secondary injury
  – Bigger effect in secondary prevention, but still significant in primary
  – NNT – 22 (combined 1º and 2º)

• #2 - Do Balance Training (SOR: A)
  – Effective for primary prevention: NNT = 22
  – VERY effective for secondary prevention: NNT = 9

So Which is Better?
Bracing, Balance Training, or Combination

“Bracing superior to neuromuscular training for the prevention of self-reported recurrent ankle sprains: a three-arm randomized controlled trial”

• 3 Arm RCT (n=384!) looking at re-sprain rate after 1 year
  1. Balance training for 8 weeks = 27% recurrence
  2. Semi-rigid brace with sport activity for 12 months = 15% recurrence
  3. Combination (balance x 8 wks; brace w/ sport x 8 wks) = 19% recurrence

So Which is Better?
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- Bracing also results in significant cost savings!
- Speaking of Cost – Home PT = Referral PT efficacy for ankle sprain
    - Brison RJ, The BMJ, 2016 Nov 16; 355: i5650

Patient Speak:
But Doctor, I Can’t Jump in Braces!

“Effects of prophylactic ankle bracing on dynamic reach distance and obstacle course performance in military cadets”

- 37 Healthy military cadets
- Did obstacle course and functional measures with & without braces

Findings:
#1 – Small difference in range of motion when braced
#2 – NO DIFFERENCES in agility, run-times, or other performance measures

Your Answer: “Suck It Up and Wear Your Brace!”
Lateral Ankle Sprain

# Treatments for Victims & Culprits

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## Treatments
- RICE
- NSAIDs
- Bracing

- ABC Exercises
- Towel Drag Exercises
- Balance Drills

### Overview
- Overview of Musculoskeletal Exam
- 3 Common Conditions
  - Victims and Culprits
  - Evidence-Based Treatment
    - Case 1 – Plantar Fasciitis
    - Case 2 – Lateral Ankle Sprain
  - Case 3 –
- Coding Minute
- Annoying Editorial Comments
Case #3

- 28 yo female with bilateral knee pain for 6 weeks
- No trauma, PSHx
- No swelling, locking, or giving way
- Started an exercise program (on your advice) 8 weeks ago
- Hurts worst going up and especially down stairs

Poll Question #7

What is your most likely diagnosis?

A. Meniscus Injury
B. ACL Tear
C. Patellofemoral Pain
D. Iliotibial Band Pain Syndrome
Patellofemoral Pain

Epidemiology

• Pain syndrome – accounts for ~ 90% of knee pain to military primary care clinics

• Unclear link with osteoarthritis

• Natural Selection vs Military Recruitment

Synonyms

• Patellofemoral Synd
• PFPS
• PFCS
• Anterior Knee Pain

Patellofemoral Pain

Pathoanatomy & Diagnosis

Keeping Train on Tracks

• Biomechanical imbalance → pain in peri-patellar structures
• Many possible pain generators

Diagnostic Clues

• Bilateral
• Vague, no discrete injury
• Pain with stairs, esp. down
• Theatre sign
• “Effusion” very uncommon
Poll Question #8

What is the best treatment for patellofemoral pain?

A. 21-day course of NSAID at anti-inflammatory dosage range
B. Rest, Ice, Compression and slow return to activity
C. Kinesio tape or patellar bracing
D. Quadriceps & core strengthening exercises
Patellofemoral Pain

The Dirty Truth About NSAIDs

• “There is only limited evidence for the effectiveness of NSAIDs for short term pain reduction in PFPS.”

–Cochrane Review 2007

Victims & Culprits

Victim
- Patellofemoral Joint

Culprits
- Muscle Tightness
  - Quads, Hams, Gastroc
- Muscle Weakness
  - Quad, Glut Medius
- Mal-alignment
  - Pes planus, patellar tilt

Treatments
- RICE – Acute 4 Chronic
- NSAIDs – Acute 4 Chronic
- Brace – Works well 4 few

Assess for Muscular Tightness

- Hamstrings
  - Popliteal Angle
  - Normal: Women ~0°
    Men < 30°
Patellofemoral Pain

Assess for Muscular Tightness

- Hamstrings
  - Popliteal Angle

- Quadriceps & Hip Flexor
  - Modified Thomas Test

- Gastrocnemius
  - You already know
  - 15° dorsiflexion
Patellofemoral Pain
Assess for Muscular Strength

- Quadriceps
  - Listen
  - LOOK
  - Single Leg Squat

- Gluteus Medius
  - Single-leg stance
  - Single-leg squat
  - Step-down
Patellofemoral Pain

Assess for Muscular Strength

- Quadriceps
  - Listen
  - LOOK
  - Single Leg Squat
- Gluteus Medius
  - Single-leg stance
  - Single-leg squat
  - Step-down
Patellofemoral Pain

Assess Anatomic Alignment

- **Pes Planus**

  Whether the problem is the track or the train…. Derailment is BAD!

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**Treatments**
- RICE – Acute 4 Chronic
- NSAIDs – Acute 4 Chronic
- Brace – Works well 4 few

- Popliteal Angle, Thomas Test, 15° dorsi
- Single Leg Squats & Single Leg Step-Downs
- Orthotics (OTC vs Custom)
Feel Like You’re Drowning?

Annoying Editorial Comment

• How to Find a Good Physical Therapist
  – Fingers do the walking
  – Phone a friend

– Refer patellofemoral pain
  • If patient returns with stretching, strengthening = Good Therapist!
  • If patient gets lots of ice, heat, and fancy gels = Don’t waste your time…. 
Welcome to the GRAMP-C’s
“Great Research; And Maybe Practice-Changing”

Best Patellofemoral Articles

3 Incredible Reviews of Effective Therapy for Patellofemoral Pain

What Do They All Say?

1. Muscle strengthening exercise therapy is best treatment for PFP
2. Exercise therapy works better if a big hunk trainer helps you do it!

- van der Heijden RA. Cochrane Database Syst Rev. 2015
- Covey CJ. J Fam Pract. 2014
- Crossley KM, BJSM, 2016
Best Patellofemoral Articles

A Closer Look

• Look for mismatches:
  – Muscular Strength, Flexibility, Alignment (Big 3 !)
  But also:
  – Weight
  – Postural control
  – Excess activity (especially in kids/adolescents)

- Foroughi F, Arch Phys Med Rehabil, Feb 2019

Maybe You DO Need to Look For Risk Factors!

Additional Effects of an Individualized Risk Factor-Based Approach on Pain and the Function of Patients With Patellofemoral Pain Syndrome: A Randomized Controlled Trial

53 patients with PFPS randomized to standard or tailored rehab

• Findings:
  Both groups improved
  But TAILORED rehab group showed greater pain relief

Nearly identical study with IDENTICAL findings:
  (Drew BT, BMC Musculoskeletal Disord Aug 2017)

Patellofemoral Pain

Victims & Culprits

**Victim**
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- Muscle Tightness
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#1- Strengthen Quads/Hip/Core, #2 – Supervised/Expert Rehab, #3 – Orthotics/Brace

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**Overview**

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  ✓ Case 1 – Plantar Fasciitis
  ✓ Case 2 – Lateral Ankle Sprain
  ✓ Case 3 – Patellofemoral Pain

- Coding Minute
- Annoying Editorial Comments
Coding Minute
Take Credit for What you Do

- **Military Disclaimer**

### 5 Dos and Don’ts of Coding

1. Do capture time required for:
   - Exercise Teaching (E&M or CPT 97110)
   - Crutch Training (E&M or CPT 97116)
   - Brace Fitting and Care Coordination (E&M)
5 Dos and Don’ts of Coding

1. Do capture time required
2. Don’t forget to code injections
   – Most injections - CPT 20610

3. Do use a 25 or 29 modifier
   – Diagnosis and treatment in same visit requires the modifier in many states
5 Dos and Don’ts of Coding

1. Do capture time required
2. Don’t forget to code injections
3. Do use a 29 modifier
4. Don’t forget to bill Durable Medical Equipment
   – Ankle braces, crutches, etc…

5. Do phone a friend
   – Orthopedic coder
   – Ortho P.A.
   – Ortho R.N.
Overview

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Practice Recommendations

• Plantar Fasciitis:
  1st Line: Stretching and Strengthening Exercises (See handouts)
  2nd Line: Orthotics (Start with over the counter)
  3rd Line: Steroid Injection (For pain causing limp or recalcitrant symptoms)

• Ankle Sprain:
  1st Line: ROM, Strength, and Balance (See handout)
  2nd Line: Brace for 8-12 months!
  3rd Line: Re-evaluate if still painful after 6 weeks

• Patellofemoral Pain:
  1st Line: Strengthen Hips/Quad/Core
  2nd Line: Supervised Strengthening (Find a good PT or Athletic Trainer)
  3rd Line: Orthotics/Bracing
Contact Information

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Questions