Ankle Instability

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About Me

• Live in Kansas City, MO and work at Modern Physical Therapy
• Went to KU Med for PT School and graduated in 2016
• Introduced to IAOM during school and have been assistant faculty since January 2018
• Will complete my fellowship this summer

Objectives

• Understand the prevalence and complication of ankle instability
• Identify common types of ankle instability and mechanisms of injury
• Assess for ankle instability
• Organize a plan of care for ankle instability using evidence-based approach
• Acknowledge preventative measures to avoid developing ankle instability

Chronic Ankle Instability


IAOM - 50-70% of the people who sustain a lateral ankle sprain (LAS) develop chronic ankle instability
• Symptoms of chronic ankle instability demonstrate an onset as early as 6 months after initial injury
• Continuation of post-injury symptoms more than 6 months following the initial injury
Chronic Ankle Instability: Symptoms

- Lingering pain
- Instability injury
- Recurrence
- Balance deficits
- Swelling
- Giving way
- Impaired strength

Chronic Ankle Instability: Consequences

- Increased ligamentous laxity
- Proprioceptive deficits
- Activity limitations
- Up to 72% of people are unable to return to prior level of function
- 85% of people develop problems in the contralateral ankle

Type of Instabilities

- Functional Instability
- Mechanical Instability

Functional Instability

- Recurrent ankle sprains and frequent sensation of instability
- Examination Findings:
  - Normal motion
  - (LJ) ligament laxity testing
  - Self-reported symptoms such as weakness and pain
  - Injured ankle “feels different”
  - Feeling of instability could be attributed to:
    - Muscle weakness
    - Altered muscle recruitment patterns
    - Decreased ROM
    - Balance deficits
    - Impaired proprioception and joint position sense

Functional Instability Continued

Those who performed coordination exercises during recovery demonstrated lower incidence of functional instability.

Potential Causes of CAI:
- Changes in the motor component of sensorimotor control
- Impaired postural control
- Diminished ankle eversion strength
- Alterations in motor control of proximal muscles

Functional instability represents the sensorimotor cause of persistent injury.

Mechanical Instability

- Pathologic ligamentous laxity around the ankle joint complex
  - (+) Ligamentous laxity testing
  - Occurs in 30% of patients following the initial ankle sprain

Updated Model of Chronic Ankle Instability

8 Primary components
1. Primary Tissue Injury
2. Pathomechanical Impairments
3. Sensory-Perceptual impairments
4. Motor-behavioral impairments
5. Personal Factors
6. Environmental factors
7. Component interactions
8. Spectrum of clinical outcomes
Primary Tissue Injury

- For CAI to develop, patient must sustain an injury
- Lateral ankle sprains are most common pathology
  - Anterior talofibular ligament is most commonly injured ligament
  - Calcaneofibular ligament is present in more severe ankle sprains
- Other potential injuries from inversion–internal-rotation mechanism of injury
  - Fibular fracture
  - Fifth metatarsal fracture
  - Osteochondral lesion of talus
  - High ankle sprain (chronic inferior tibiofibular ligament and tibiofibular syndesmosis)*
  - Subtalar joint instability*

Pathomechanical Impairments

- Structural abnormalities to the ankle joint and surrounding tissues that contribute to ankle dysfunction and CAI
- Pathologic Laxity (Mechanical Instability)
  - Loss of structural integrity of lateral ankle ligaments
  - Talarional joint laxity
- (+) Ligament Laxity Tests
  - Anterior drawer for ATFL
  - Inversion Stress Test (10 degrees PF + ADD+ inversion) for CFL
  - Squeeze Test: Syndesmosis
- Arthrokinematic Restrictions
  - Restricted anterior-to-posterior glide of talus on tibia
  - Articular displacement of the talus on the distal tibia
- Osteokinematic Restrictions
  - Restricted DF

Considerations of the Subtalar Joint

- Subtalar joint instability appears to be more frequent than is generally described.
- About 25% of the cases presenting with combined injuries of the lateral ankle and the subtalar joint.
- In particular, the calcaneofibular ligament (CFL) bridges the subtalar joint and contributes essentially to subtalar joint stability.
- Current imaging options do not reliably predict subtalar joint instability.
- Distinction between chronic lateral ankle instability and subtalar joint instability remains challenging.

Clinical Tip: Anterior Drawer

- Acute LAS: Pull talus anterior via calcaneus
- Recurrent LAS: Push tibia posteriorly
- ATFL: 10 degrees PF
- CFL: Neutral

Sensory-Perceptual Impairments

- Conditions that the patient senses or feels about the body, the injury, or the self
- Diminished Somatosensation
- Damage to proprioceptors, ligaments and possible nerve injury
- Increased proprioceptive errors
- Increased recurring ankle sprain
- Decreased cutaneous sensation
- Poor plantar sensation
- Pain
- Perceived Instability
- May be perceived instability
- Cumberland Ankle Instability Tool
- Identification of Functional Ankle Instability
- Fear of movement

Screening Tools

- Cumberland Ankle Instability Tool
- Identification of Functional Ankle Instability

Foot and Ankle Ability Measure (FAAM)
Motor-Behavior Impairments

- Deficiencies and alterations in muscle contractility, motion patterns, and physical activities
- Motor aspect of sensorimotor function
- Altered reflexes
  - Delayed reaction time of proximal muscles
- Neuromuscular inhibition
  - Proximal muscles inhibited such as hamstrings and quadriceps
- Muscle Weakness
  - Hip abduction
  - Eversion
  - Plantar flexion/dorsiflexion
- Balance Deficits

Personal Factors

Demographics
- Age
- Gender
- BMI

Medical History
- Comorbid factors
- Structural deficits due to previous injury

Physical Attributes
- Strength and condition
- Flexibility
- Foot morphotype

Psychological Profile
- Self-efficacy
- Anxiety

Environment Factors

- Societal expectations and home life
- Sports participation access to healthcare facilities
- Social support networks
- Workplace environment

Spectrum of Clinical Outcomes

Chronic Ankle Instability
- 12 months removed from initial sprain
- Propensity for recurrent ankle sprains
- Frequency giving way episodes
- Persistent pain, swelling, weakness
- Feeling unstable
- Changes the type of sport or physical activity they participate in

Coper
- 12 months removed from initial sprain
- No recurrent ankle sprains
- Minimal symptoms
- Minimal deficits in self-reported function
- Full recovery
The Development of CAI

- Advanced age
- Neuromuscular control
- Previous history of trauma
- Proximal stability
- Etc.

Intrinsic Factors

- Court conditions
- Opposing players
- Uncontrollable environment

Extrinsic Factors

Sensorimotor Deficits Associated with CAI

- Ligamentous structural damage has more effects than anatomical restrictions
  - Disrupts afferent-efferent communication
  - Central control issues that manifest peripherally

Doherty et al performed several tests at acute stage following LAS injury to analyze kinematics and kinetics:
1. Star Excursion Balance Test (SEBT)
2. Maximum hip-knee-ankle flexion-extension moments
3. Reach test (Anterior, PL, PM)
4. Landing and drop vertical
5. Gait analysis
6. Self-reported measures (Cumberland Ankle Instability Tool and Foot and Ankle Ability Measure)

Associated Deficits with CAI

- Static Postural Control Deficits
- Dynamic Postural Control Deficits
- Gait Deficits
- Deficits in Jumping and Landing Tasks

- Reduced hip-knee flexion moment and ankle dorsiflexion during star excursion balance test (SEBT)
- Reach distances were reduced in PL and PM directions
- SEBT deficits manifested bilaterally
- Highlights L4 and CAI is not exclusive to peripheral symptoms but have central manifestations

**Associated Deficits with CAI**

- Increase in hip flexion before initial contact (preparation for landing)
- Reduction in hip flexor activity after initial contact
- Hip stiffness and bilateral increased extension moments during landing
- Inter-limb asymmetries
  - Tendency to off-load injured limb and shift load to non-injured side
  - Contralateral injury

**Deficits in Jumping and Landing Tasks**


**Predicting Chronic Ankle Instability**


**Four Pillars of Prevention After Initial Sprain**

- Protection of healing structures
- Evaluate all joints affected by injury
- Correction of hypomobility
- Strategies to correct hypermobility
Protection of Healing Structures

- Bracing
  - Bracing elicited more synchronous motion throughout gait
  - Coordination variability decreased with bracing
  - Greater pattern stability
  - Bracing increases coordination patterns
  - May work to guard against malalignment
  - Push Brace is our favorite
  - Care: Recurring
  - Med: Acute or Secondary

Protection of Healing Structures: Bracing

- Kinesiotape
- Transverse Friction
- Pacing Program


Protection of Healing Structures: Kinesiotape

- Swelling
  - Lymphatics
- Bruising
- Tenosynovitis
- Wearing off a brace

Protection of Healing Structures: Transverse Friction

- Fibroblast proliferation
- Collagen realignment
- Analgesic
- Micro lymphatic Drainage

Transverse Friction Review

- Ligament
  - Start with 2/10 and progress once pain free
  - One direction

- Tendinitis
  - Start 2/10 and progress once pain free
  - One direction

- Tenosynovitis
  - Start extremely light and stay light
  - Tendon on slack
  - Perform tendon glides after tenderness is reduced

- Tendinosis
  - Start aggressive and stay aggressive
  - Both directions
  - Stimulate blood flow or jumpstart inflammatory response

Protection of Healing Structures: Pacing Program

- Acute/Inflammatory
  - Pain increases for hours to 3-4 days

- Proliferation
  - After 4 days, pain levels off

- Early remodeling
  - 11 to 21 days

- Late remodeling
  - 3 to 6 weeks

- Back to sports
  - 8 to 12 weeks (with supportive device for up to one year)

Evaluation of All Joints Affected by Injury

- Talocrural Joint
- Syndesmosis
- Subtalar Joint
- Hip
- Knee
- Proximal Tib-Fib

Correction of Hypomobility

- Can lead to adjacent instability by altering the kinetic chain
  - Talocrural joint hypomobility may lead to subtalar instability

- Assess
  - Talocrural joint
  - Subtalar joint
  - Gastrocnemius fascia
  - Proximal tibiofibular joint
  - Patellofemoral joint
  - P. patellar

- Limited Dorsiflexion is common
  - Anterior translation of talus on tibia
Correction of Hypomobility

Talocrural Traction
Talocrural Posterior glide

Correction of Hypermobility

Neuromuscular Control

Somatosensory Activation

Proprioception

Balance

Fundamental Performance

Senmocor™

Advanced Performance

Correction of Hypermobility: Neuromuscular Control

- Unconscious efferent response to an afferent signal concerning joint stability
- Preparatory (anticipatory) and Reactive (reflexive) activation
- Pre-activating muscles
  - Short foot
  - Pronation control

sneak peek
Correction of Hypermobility: Somatosensory Activation
- Reflex modulation
- Proprioception
- Balance management
- Postural Control

Correction of Hypermobility: Fundamental Performance
- Sagittal Plane Control
- Flexion/Extension Correctives
- Frontal Plane Control
- Add/Abd Correctives
- Transverse Plane Control
- Rotational Correctives

Correction of Hypermobility: Advanced Performance
- Fundamental Movements with ankle stability
  - Hinge
  - Squat
  - Lunge
  - Push
  - Pull
  - Twist
  - Ambulation

Correction of Hypermobility: Functional Advancement
- Agility Strategies
- Performance Training
### Tests for Ankle Instability

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### Tests for Ankle Instability: Stress Test

- Max PF + Inversion = ATFL
- 10 deg PF + Inversion = CFL
- DF + Inversion = PTFL
Tests for Ankle Instability: Anterior Drawer

- Anterior Drawer
  - 10 degrees PF: ATFL
  - Neutral: CFL
  - 15 degrees DF + Neutral: CFL
- DF Laxity < Neutral laxity = ATFL
- DF Laxity = Neutral laxity = CFL


Tests for Ankle Instability: Squeeze Test

Tests for Anterior Instability: Squeeze Test

Tests for Ankle Instability: External Rotation Test

Tests for Ankle Instability: External Rotation Test

Case Review
Ankle-Foot Case: WHO

WHO:
• 64-year-old female, retired high school teacher.
• Daily activities include housework and volunteering at the local senior center.
• She generally enjoys traveling both within the United States and internationally.
• She notes that she has been able to ride her stationary bicycle with minimal discomfort, and it actually seems to help her symptoms.

Ankle-Foot Case: WHAT & WHERE

WHAT:
• Dull aching at the right ankle, with warmth and swelling; burning pain at the distal foot.

WHERE:
• Patient places her hand at the anterolateral aspect of the ankle to indicate her aching pain, where it also feels swollen and warm.
• Pain in her foot is located at the dorsum and plantar aspect of the distal foot between the 2nd and 3rd metatarsal and refers proximally along the sole of the foot.

How does this apply to Instability?
• A previous history of ankle sprain may have led to:
  - Laxity of the tibiofibular syndesmosis leading to increased loads on the TCJ
  - Leading to early osteoarthritis of the TCJ
  - Potential insufficiency of the anterior talofibular ligament leading to flat foot
• Leading to Morton’s neuroma.
• This is further complicated by the slight knee valgus due to:
  - Early osteoarthritis, promoting the hyperpronation, which can lead to a hypermobile 1st ray
  - And that can lead to increased load on the metatarsals, and perpetuate the Morton’s neuroma

Treatment Ideas
• TCJ
• STJ
• Midfoot
• Knee
• Hip
• Tib Post
• Foot intrinsics
• Balance
• Proprioception
• Reflexes
• Anticipatory
• Muscle
• Sensorimotor
• Control
Thank you

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