ANKLE INSTABILITY: WHAT YOU NEED TO KNOW

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DISCLOSURE

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TALK OBJECTIVE

- Ankle Instability: All U Need to Know.
- Don’t Miss Big Stuff: Pitfalls in Diagnosis
- Treat appropriately: What is new?
- When to refer, when to operate?
- LOOK GOOD
Lateral Ankle

Burks & Morgan AJSM 1994

- Anterior Talo-Fibular Ligament (ATFL)
  L 24.8mm, W 7.2mm, Center 10mm from tip of fibula
- Calcaneo-Fibular Ligament (CFL)
  L 35.8 mm, W 5.3mm, Center inferior to ATFL
- Posterior Talo- Fibular Ligament (PTFL)
Lateral Subtalar

- Interosseous Talo-Calcaneal Lig. (ITCL)
  Tochigi & Amendola 2004
- Cervical Ligament
- Inferior Extensor Retinaculum
- Lateral Talo-Calcaneal Ligament (LTCL)
DELTOID LIGAMENT ANATOMY

A. Superficial deltoid ligament

B. Deep deltoid ligament

Deltoid (medial) ligament of ankle

Medial view (inside of ankle)

Posterior tibiotalar ligament
Tibiocalcaneal ligament
Anterior tibiotalar ligament
Tibionavicular ligament

Fig. 1
KNOW: MUSCULAR ANATOMY

- **Lateral**
  - Peroneal Tendons
  - Delayed recruitment in Unstable ankles
    Karlsson & Andreasson AJSM, 1992
  - 15% of Static stabilizers
    Hatch & Labib 2003

- **Medial**
  - Tibialis Posterior and Toe Flexors
DON’T MISS: BONY ANATOMY

- Varus Plafond and Vaus Hindfoot predisposed to ankle instability
  Myerson, 1993
- Varus Hindfoot
  Unstable > Controls
  CCVA angle $\uparrow 4^\circ$
  Van Bergeyk, F&A Int 2002
ANKLE INJURIES IN SPORTS: STATS

ANKLE SPRAIN #1
Men B-ball > 25%
Women B-ball
Soccer/ Lacrosse

▸ NBA: 40-50%
▸ NFL: 17-24%
▸ NCAA: 20%
ANKLE SPRAIN
80% INVERSION TYPE

- EVOLUTION TYPE
- SYNDESOMOSIS

HIGH ANKLE SPRAIN, SQUEEZE SIGN, > 6 MONTHS

ONE WEEK OF HEALING PER INCH OF SYNDESOMOSIS TENDERNESS

- + FRACTURE/TENDON TEAR
- NFL 2004 = 105

+KNEE MCL INJURY
DON'T MISS: DELTOID INJURY

Superficial Deltoid: External Rotation
Testing = DIAL TEST

Deep Deltoid: Valgus / Posterior Drawer
CLASSIFICATION OF SUPERFICIAL DELTOID INJURY

  Foot Ankle Clinic N Am
  - Type I: proximal tear of or avulsion of the deltoïd (72%)
  - Type II: intermediate tear of the deltoïd (9%)
  - Type III: distal tear or avulsion of deltoïd and a spring (19%)
MEDIAL ANKLE INSTABILITY
HINTERMAN ET AL (2004) AM J SPORTS MED

- Prospective study of 52 cases
- 100% had pain in the medial gutter
- 77% associated with lateral instability

- 3 types identified arthscopically

- Stage 1
  - Stable; cannot open tibio-talar joint more than 2 mm

- Stage 2
  - Moderately unstable; able to introduce 5 mm scope into space

- Stage 3
  - Severely unstable, able to see posterior ankle joint with traction
FUNCTIONAL CLASSIFICATION OF COMPLEX DELTOID INJURIES: BEALS ET AL, 2010

- Type I: Talus ER Rotational Instability = Superficial Deltoid Insufficiency

- Type II: Talus Coronal Angulation or Translation = Superficial and Deep Deltoid Insufficiency.

- +/- Mal alignment = Flat-Foot Deformity

LEVEL OF EVIDENCE V = EXPERT OPINION
DON’T MISS: SUBTALAR INSTABILITY

- DORSIFLEXION- INVERSION
- DIFFICULTY WITH UNEVEN TERRAIN/ AT NIGHT
- TENDER SINUS TARSAL
- PROVOCATIVE TEST: 10° DORSIFLEXION/ FOREFOOT ADDUCTION

THERMANN ET AL, F&A INT 1997
IMAGING

**Acute Sprain:**
- Plain Xrays - fractures
  - Malleoli / Fifth MT
  - Talus OCD
  - Calcaneus

**Chronic Instability**
- Stress Xrays
  - Baker et al 2000
- MRI
STRESS X-RAYS

Stress views: AP/ LAT/ Broden

> 15 degrees of talar tilt angle
> 5 mm of anterior Talar translation
> 7 mm of Talo Calcaneal gapping

compare with normal side

Anterior drawer difference > 4 mm
Talar tilt difference > 6 degrees

100 Normal Volunteers: 11% Asymmetric Ankle Laxity

Scranton et al F&A Int. 2000
MRI – INDICATIONS

- **Acute Sprain:**
  - Loose body
  - Occult fracture
  - Peroneal tears
  - Ligament disruption

- **Chronic Instability:**
  - Same + OCD
PROPRIOCEPTIVE TESTING

TIME TO STABILIZATION

➤ STATIC
SINGLE LEG BALANCE
Freeman Mar, JBJS(B) 1965

➤ DYNAMIC:
SINGLE LEG JUMP - LANDING
Ross & Gusiewicz, Clin J Sport Med 2004
DIFFERENTIAL DIAGNOSIS

- Bony: Fracture / ankle, talar process, calcaneus, navicular, fifth metatarsal
- Cartilaginous: OCD, talar lesions
- Ligamentous: Sprain/ Midfoot, subtalar
- Muscular: Peroneal tendon tear/ Dislocation
- Neural: Neuropraxia/ Sural, Superficial Peroneal nerve.
DON’T MISS: SUBTLE FRACTURES
DON’T MISS: PERONEAL DISLOCATION

- **Acute**
  - Sudden dorsiflexion with firing of peroneal tendons – back side of a mogul while skiing
  - Inversion with the foot in plantarflexion

- **Chronic**
  - Repeated sprains, varus hindfoot lead to attenuation of SPR and synovitis
HISTORY & EXAMINATION

- Lateral peroneal tenderness
- Popping at ankle when everting or “driving to the hoop”
- Test with knee flexed, the ankle is actively dorsiflexed and plantarflexed with resisted eversion
- LOOK FOR PERONEAL DISLOCATION
PERONEAL DISLOCATION TREATMENT

- Immobilization can be attempted
- Escalas found 28 (74%) of 38 patients had no improvement after immobilization
- Operative treatment recommended in most cases with 95% success*

*Success rate

[Image of surgical procedure]
NATURAL HISTORY OF CHRONIC ANKLE INSTABILITY

Lofvenberg R et al: F&A Int. 1994

- 37 patients treated conservatively
- 18 - 23 years follow-up evaluation
- 60 % or 22/ 37 still unstable
- 10 unilateral and 12 bilateral involvement
- 6/37 had Degenerative changes but no correlation to age or instability.
INJURY PREVENTION

- TAPE + HIGH-TOP SHOES IN BASKETBALL
  GARRICK ET AL 1973
- LACED-UP BRACE + LOW-TOP SHOES
  ROVERE ET AL 1988
- ATHLETIC PERFORMANCE BRACES > TAPPING
  RENSROM&LYNCH 1999
- SEMI- RIGID BRACES BETTER
  UBEll ET AL 2003
TREATMENT: WHEN TO OPERATE?

- **Acute Injuries (primary repair):** Athletes with momentary dislocation/Associated fractures/Grade III better to operate
  
  Pijnenburg et al JBJS 2000

- **Chronic Instability:** Symptomatic Mechanical instability
  Failed functional treatment for minimum 3 months.
27 Randomized, controlled trials reported between 1966 and 1998

Time lost from work, residual pain, and giving-way

No-treatment strategy lead to more residual symptoms.

Operative treatment > functional treatment > cast immobilization for six weeks.

- Challenged their conclusions.
- Agreed with Brostrom: “when conservative treatment fails, secondary operative reconstruction of the ruptured ligaments can be performed, with similar good results, even years after the initial injury.”
KERKHOFFS, G. M. M. J., ET AL. "SURGERY VERSUS CONSERVATIVE TREATMENT FOR ACUTE ANKLE SPRAINS IN ADULTS." (2010). COCHRANE REVIEW

- 20 RCTs reviewed
- Methodological flaws in 8 trails

Return to pre-injury level of sports

Ankle sprain recurrence

Long-term pain

Subjective or functional instability

**Positive Trend - No Stat Significance**
Acute repair in professional athletes improves objective measures (Talar tilt and Anterior Drawer).

- Season Management
- Type of Sport
- Athlete Expectations
- Time since injury
- Level of Surgeons Expertise
TREATMENT: CHRONIC LATERAL ANKLE INSTABILITY

- 20% OF ALL ANKLE SPRAINS
- TRY PT / STABILIZATION
- SURGERY: ANATOMIC REPAIR
  92% SUCCESS IN ATHLETES
SURGICAL TREATMENT  
(LIGAMENTOUS RECONSTRUCTION)

**Anatomic:**

- **Brostrom L, 1966:**
  Late repair of ATFL +/- CFL.
  2.9 years F/U in 60 patients
  46/60 “Back to Normal”
  1 Failed with CMT disease
- **Gould N, 1980:**
  Extensor retinaculum + LTCL sutured to Fibula.

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Fig. 4. The operation. After repair of anterior talo-fibular and calcaneofibular ligaments, the reinforcements are made.
Non-Anatomic (Tenodesis):

- Premise: chronically torn ligaments are deficient
- Most uses Peroneus Brevis tendon
- Evans, Watson-Jones, Chrisman-Snook.
- Problems: Difficult, Supination deficit.
ANATOMIC REPAIR IS BETTER

► Short term:
Prospective, randomized comparison: 29 mos.- Brostrom > Chrisman- Snook in excellent results/ less complications
Henndrikus et al: AJSM 1996
5 years Follow up: Full activity and no instability in 91% anatomic reconstruction versus 54% Tenodesis patients
Mabit et al: Foot and Ankle Surgery 1998

► Long term:
12.3 years Retrospective review: Brostrom > PB tenodesis in Stability testing, arthritis and patient satisfaction
Krips R et al: Foot and Ankle Int. 2001
BIOMECHANICAL TESTING

- **Tenodesis: Alter Ankle Kinematics**
  Bahr et al, AJSM 1997

- **Anatomic Repair: Restore Ankle Kinematics**
  Schmidt et al, F&A 2004
ANKLE ARTHROSCOPY IN UNSTABLE ANKLES

- 13 - 35% Residual pain post stabilization.
- 95% Concomitant intra-articular Pathology
- Up to 55%: Medial Chondromalacia/ OCD
- 40% Deltoid ligament injury
- Synovitis, Bone spurs, Loose Bodies

Ankle arthroscopy before stabilization improved results re: pain and disability= 100% G/Excellent

Van Dijk CN, JBJS- B 1996
Komenda G & Ferkel R, F&A Int. 1999
Ferkel R & Chams R, F&A Int. 2007
GOLD STANDARD - 2016

- Diagnostic and Therapeutic Ankle Arthroscopy
- Do open ATFL + CFL imbrication with non absorbable suture +/- Anchors
- Tie sutures with the ankle in neutral
- Advance the Inferior Extensor Retinaculum to the distal fibula periosteum (3-4 Sutures)
- Splint Ankle in Neutral/ Eversion
- **Arthroscopic Stabilization????**
ARTHROSCOPIC STABILIZATION

- **Percutaneous Staple**

- **Suture Anchors**

- **Thermal Shrinkage**
  Berlet et al, F&A Clin N Am 2002
  Maiotti et al, Arthroscopy 2005

- **ArthroBrostrom**
  Cottom et al, JFAS 2013
  Labib et al, TFAS 2015
NEW: Minimally Invasive

Smaller incision than an open Brostrom
Treat intra-articular pathology and repair the lateral ankle instability simultaneously, with minimal incisions
Potential for less pain and swelling

- Technique Described
- Mild to Moderate, CFL??
- Retrospective review
- 14 Patients with good Clinical results
- AOFAS score average 93
NEW : NON ABSORBABLE TAPE AUGMENTATION.

- Biomechanical Testing = ATFL
- Added Cost
- Potential for “Over-tightening”
- Early Results shows accelerated return to sports.
- Unknown Long Term Results.
DON’T MISS: CHRONIC INSTABILITY + NONUNION
DISTAL FIBULA AVULSION

- 7/60 of Brostrom’s original series.
- Bony avulsion of ATFL insertion
- Usually in Adolescents and young adults
- ORIF restores stability
Nonweightbearing for first 2 weeks after procedure while in splint or cast. Walking boot for next 2-4 weeks

Partial weightbearing until week 6 after procedure

Gentle ROM exercises starting at week 4 *avoiding* inversion motion until 6-8 weeks post surgery

Begin strength program and proprioceptive program at week 6 once out of walking boot

Running at week 12 if full ROM, normal strength and good neuromuscular control. *No cutting or pivoting* until 4 months post surgery
NEW: DELTOID INSTABILITY IN ATHLETES

- Check for Alignment/ PTTD/ Lateral Collateral Instability/ Syndesmosis

- Acute Superficial Injury = Direct Repair
- Chronic Superficial Insufficiency = Deltoid Advancement Reconstruction
- Chronic Superficial + Deep Insufficiency = Allograft or Autograft Reconstruction
26 year old male with acute onset of left ankle pain after being involved in a collision while refereeing for the Atlanta Roller Derby
Fibula fracture with shortening

Medial Clear Space Widening

Talus shifted laterally
FIBULA FRACTURE REDUCED BRINGING IT OUT TO LENGTH STABILIZED WITH LAG SCREW AND PLATE FIXATION
WEBER CLAMP APPLIED TO REDUCE SYNDESMOTIC WIDENING AND TIGHT ROPE PLACED
AFTER FIXATION OF FIBULA FRACTURE AND SYNDESMOSIS

Talar tilt remains + ER Instability
INTRA OPERATIVE PICTURE
PRE AND POST DELTOID LIGAMENT REPAIR
POST – OPERATIVE REHAB

- Weight bearing cast for 2 weeks
- Walking Boot and ROM for 6 weeks
- Conditioning and agility for additional 6 weeks.
- Return to sports 4 months
DON’T MISS: GLOBAL INSTABILITY

- 22 y.o. professional skateboarder
- Complains of left ankle instability and increased pain with recent sprain
- Multiple ankle sprains for 3 years;
  - Both inversion and eversion injuries
- Attempted physical therapy, brace with no improvement
PHYSICAL EXAM

- Painful ROM of left ankle
- + anterior drawer, + lateral tilt, +posterior drawer, and + increased external rotation
  - All increased compared to contralateral side
- Tenderness to palpation over anterior talofibular ligament and deltoid ligament (medial gutter)
- Palpable Os distal to fibula
- Neutral hindfoot alignment
- No evidence of hyper-laxity in other joints
AP Ankle Joint
IMAGING; VARUS STRESS

Lateral Stress View
IMAGING: VALGUS STRESS

Medial Stress View
IMAGING: MR
IMAGING
PATIENT K.R.

- Patient surgically treated for lateral and medial ankle sprain/ instability

- Procedure performed
  - Ankle arthroscopy with debridement
  - Excision of os subfibulare
  - Brostrum-Gould lateral ligament repair
  - Deltoid ligament repair
ANKLE ARTHROSCOPY FINDINGS

- Large amounts of synovitis
- Copious joint with talus able to tilt medial and lateral
- Drive through of both medial and lateral gutters possible
- ATFL and CFL attached to os subfibulare
- Complete superficial deltoid disruption, partial deep deltoid disruption
ARTHROSCOPY
OS SUBFIBULARE
MEDIAL ANKLE REPAIR
LATERAL ANKLE REPAIR
MEDIAL REPAIR
LATERAL REPAIR
FINAL STRESS RADIOGRAPHS
FINAL RADIOGRAPHS
POST OP REHAB

- Splint in Neutral/ NWB
- 2 WKs: ROM/ PWB
- 6 WKs : FWB/ PF-DF
- 12 WKs: Activities AT
- Agility
- Sports Specific
Surgery recommended when conservative treatment fails

Bell et al, AJSM 2006 performed a 26 year follow up study of the Broström procedure in a group of men enrolled in the United States Naval Academy (22/31 original patients). 91% described their function as excellent or good. Average score for ankle function was 91.2/100
THANK YOU
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