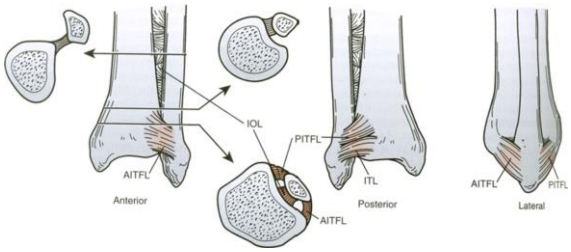
Slotervaart Center of Orthopedic Research & Education

Daniël Haverkamp

Syndesmotic Instability
Physical Exam & Imaging

Disclosure

- Research Support from:
  - Implantcast
  - Mathys Medical
  - Imove Medical
  - Cotera
  - Carbylan
- Consultancy agreement
  - IMove Medical
  - Cotera



European Society of Sports Traumatology, Knee Surgery & Arthroscopy

AFAS

Ankle & Foot Associates
A section of ESSKA

Consensus Meeting Rome 2013

Acute

- High index of suspicion

Rome, consensus meeting 2013

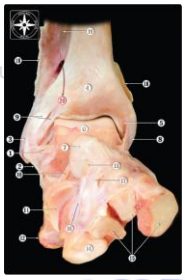
Acute

- High index of suspicion
- The tenderness length measurement

Rome, consensus meeting 2013

Acute

- High index of suspicion
- The tenderness length measu
- Deltoid ligament



Rome, consensus meeting 2013

Acute

- High index of suspicion
- The tenderness length measurement
- Deltoid ligament
- Stable/Unstable

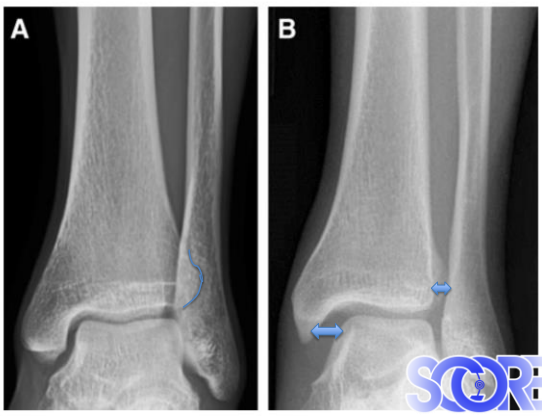
Rome, consensus meeting 2013

Cotton Test

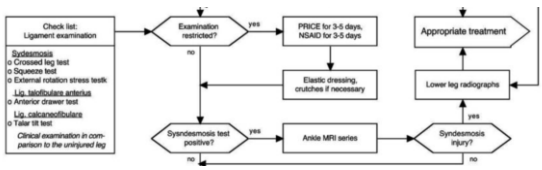
Squeeze test

Fibula Translation test

External Rotation test

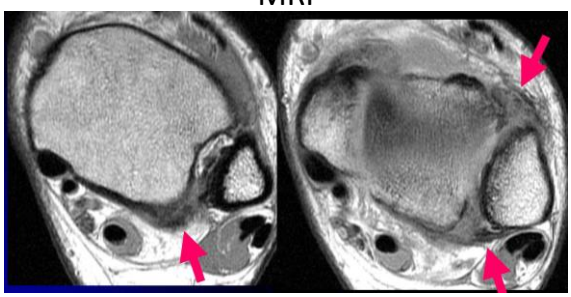


Stress X-ray



Polzer 2012, Orthopedic Reviews

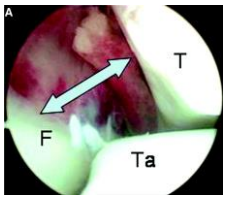
MRI



Howard, Sports Health 2012

Ultrasound

Arthroscopy



Imaging

- Comparative Weightbearing X-rays should be made
- Stress views might be an option
- MRI is the most appropriate addiotonial tool
- Dynamic Sonography might play a role in selected centers
- Diagnostic arthroscopy can be performed in cases with a high clinical suspicion with a non-conclusive MRI (Chronic instability).


SCORE

Principles of conservative management of syndesmosis injuries

James Calder TD, MD, FRCS(Tr & Orth) FFSEM(UK)
Chelsea & Westminster Hospital, London
The Fortius Clinic, London
www.fortiusclinic.com



fortius clinic

Key to success

- Accurate assessment of degree of instability / grading
- Early stabilisation / immobilisation
- Assessment during rehabilitation

Longer recovery than ATFL/CFL injuries
Nussbaum, AJSM 2001
Wright, AJSM 2004
Jones, CORR 2007

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What are the aims / pitfalls?

- Subtle instability - antero-lateral synovitis / impingement
- Chronic instability
- Medial deltoid instability / pain

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Which injuries are suitable for conservative management?

- Isolated syndesmosis injury:
  - AITFL +/- IOL
  - ?PITFL
  - ATFL/CFL injury protective?

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Which injuries are suitable for conservative management?

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- Concomitant ATFL/CFL injury indicates:
  - SER with syndesmosis extension
  - Milder injury

Calder & Roche, FA meeting St George's 2014

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Which injuries are suitable for conservative management?

- Isolated syndesmosis injury:
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  - ?PITFL
  - ATFL/CFL injury protective?
- Concomitant ATFL/CFL injury indicates:
  - SER with syndesmosis extension
  - Milder injury

Calder & Roche, FA meeting St George's 2014

- Consider fixation / intervention:
  - Medial deltoid injury
  - Fibula fracture
  - Posterior malleolar fracture

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What does this translate into clinically?

West Point Classification - syndesmosis no fracture

Gerber Foot Ankle 1998

- Grade I – mild AITFL sprain
  - Conservative Mx
- Grade III – definite instability with complete disruption of all ligaments
  - Operative Mx

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What does this translate into clinically?

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- Grade I – mild AITFL sprain
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- Grade II – vague "slight instability" with tear of AITFL and partial tear IOL

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  - Operative Mx
- Grade II – vague "slight instability" with tear of AITFL and partial tear IOL

Arthroscopy Grade II?

Wolf & Amendola, Cur Op Orthop 2002

- Grade II a – stable
  - Conservative Mx
- Grade IIb – "latent" instability
  - Operative Mx

Mcollum, KSSTA 2013

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Conservative Management - Grade I and IIa injuries

Nussbaum, AJSM 2001

- 60 pts "aggressive" rehabilitation

Level 4

- Phase I - 1-4 days immobilisation NWB
- Phase II – PWB with ankle brace (proprioception, ROM, resistance/functional training)
- Phase III – when 10 single leg toe-hops
- RTS – with tape & brace after functional testing

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Conservative Management - Grade I and IIa injuries

Nussbaum, AJSM 2001

- 60 pts "aggressive" rehabilitation

Level 4

Results

- Mean RTS 13.4 days (5-24)
- Length of tenderness = longer RTS
- At 6/12:
  - 6/53 – pain/stiffness
  - 3/53 – recurrent sprains
  - 1/53 – heterotropic ossification
  - 35/53 – excellent; 18/53 – good
- No MRI
- ?ATFL sprain not syndesmosis

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Conservative Management - Grade I and IIa injuries

Hopkinson, FAI 1990

- 1334 military pts
  - Partial syndesmosis longer recovery vs ankle sprain (55 vs. 28 days)
  - Significant +ve squeeze test @ 20 months
  - 9/10 heterotopic ossification
- Problems:
  - Retrospective; No MRI ?diagnosis; few late f/u

Level 4

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Conservative Management Principles - Grade I and IIa injuries

Few level 4 studies on conservative Mx
No level 2 or 3 studies

Specific conservative management:
Grade I recommendation

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Conservative Management Principles - Grade I and IIa injuries

Few level 4 studies on conservative Mx
No level 2 or 3 studies

Specific conservative management:
Grade I recommendation

What follows is a summary but Level 5!!

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Conservative Management Principles - Grade I and IIa injuries

Phase I

- Week 1:
  - RICE
  - NWB boot
  - Avoid NSAIDs
- Week 2:
  - PWB as tolerate boot
  - Physio supervised ROM & proprioception

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Conservative Management Principles - Grade I and IIa injuries

Phase 2

- Week 3
  - FWB boot / if no pain - tape
  - Strength & proprioception
  - Plyometric exercises (leg press, aero-mat, toe standing, single leg hop)
  - **Clinical marker**:

    Improved pain with forward lunge

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Conservative Management Principles - Grade I and IIa injuries

Phase 2

- Week 4+
  - Support brace / tape
  - Light running:
    - 30 sec single leg toe hop
    - Improved knee-to-wall
  - ?Progress to multi-directional training

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Conservative Management Principles - Grade I and IIa injuries

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Conservative Management Principles - Grade I and IIa injuries

Phase 2

- Week 4+
  - Support brace / tape
  - Light running:
    - 30 sec single leg toe hop
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Clinical markers:
Forward lunge test
Pain-free single leg toe hop 30 secs
Pain-free ext rotation on exam couch

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Conservative Management Principles - Grade I and IIa injuries

Phase 3

- Continue taping 12 weeks
- Return to training Running – Alter-G treadmill
- Multi-directional training

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Conservative Management Principles - Grade I and IIa injuries

Phase 3

- Continue taping 12 weeks
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- Multi-directional training

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Summary

Accurate assessment of grade

- ATFL injury “good sign”
- Beware higher grade injury:
  - Medial deltoid & PITFL injury
  - +ve squeeze test
  - “high ankle pain”
- Consider arthroscopy to differentiate Grade IIa/b

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Summary

- Accurate assessment of grade
  - ATFL injury "good sign"
  - Beware higher grade injury:
    - Medial deltoid & PITFL injury
    - +ve squeeze test
    - "high ankle pain"
  - Consider arthroscopy to differentiate Grade IIa/b
- Early "aggressive" immobilisation (not rehabilitation)
- Progress depends on clinical assessment
- Maintain taping
- Warn of RTS 6-10 weeks

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University Campus Bio-Medico of Rome
Department of Trauma and Orthopaedic Surgery
Head Prof Vincenzo Denaro

Acute Syndesmotic Injury in the Athlete: Indications & Approach for Operative Treatment

Presenter: Umile Giuseppe Longo *MD, MSc, PhD*

Conflicts of interest

No conflicts to declare

"Acute" injury: **Definition**

M.Vd Bekerom, CN van Dijk - 2009
- Acute
- Subacute > 6 w
- Chronic > 6 m

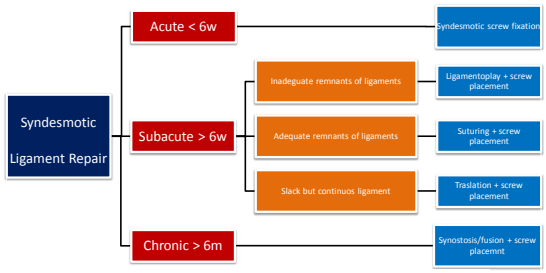
Espinoza 2012
- Acute < 3 weeks
- Subacute > 3 weeks
- Chronic> 3 months

Valkering 2012 - Scraton - 2000
- Acute < 6 weeks
- Subacute > 6 weeks
- Chronic > 3 months

Porter - 2009
- Acute < 4 weeks
- Subacute > 4 weeks
- Chronic > 3 months

Magan A, Golano P, Maffulli N, Khanduja V. Br Med Bull. 2014;111(1):101-15.

Treatment of syndesmotic instability - Flow Chart



Review

Delayed operative treatment of syndesmotic instability. Current concepts review

Michel P.J. van den Bekerom *, Peter A.J. de Leeuw, C. Niek van Dijk

Department of Orthopaedic Surgery, Academic Medical Center, Amsterdam, The Netherlands

Classifications

Porter Classification

I. injury is characterized by lesion of the AITFL, IOL and anterior deltoid ligament
II. injury is characterized by lesion of a significant portion of the syndesmosis, and disruption of the anterior and deep deltoid ligament. Occult instability.
III. injury consists of extensive disruption of the syndesmosis and complete disruption of the deltoid ligament

Edwards and DeLee classification

I. lesion of the AITFL without involvement of the deltoid ligament.
II. rupture of the AITF and deltoid ligaments leading to occult instability
III. fibular shortening (plastic deformation of the fibula) and widening of tibiofibular space visible on standard plain radiographs.

Treatment ??

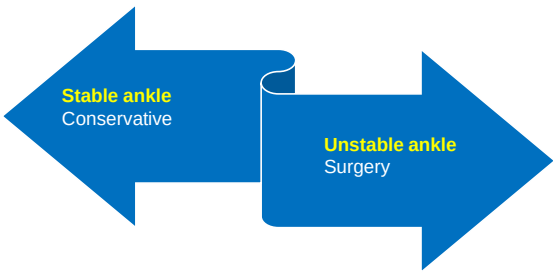
Sikka Classification

I. lesion is an isolated injury of the AITFL
II. injury of the AITFL, IOL and interossesous membrane.
III. injury of the AITFL, IOL, interossesous membrane and PITFL.
IV. disruption of all the previous ligaments associated with the rupture of the deltoid ligament.

West Point Ankle Grading System

I. injury consists of a mild sprain or tear of the AITFL with no instability of the ankle.
II. lesion of the AITFL and partial tear of the IOL with slight instability of the joint. Latent instability.
III. complete disruption of all the ligaments with frank instability of the ankle

Magan A, Golano P, Maffulli N, Khanduja V. Br Med Bull. 2014;111(1):101-15.



Indications

Stable ankle:

- Syndesmotic ruptures without injury of the deltoid ligament

→ **Conservative Management**

Unstable ankle

- Frank diastasis or
- Latent instability with proved deltoid ligament rupture

→ **Surgical Management**

Indications

Sprains without instability: nonoperative

- Short leg cast or brace
- Rehab program as pain allows
- Double the time to recover compared to a typical lateral ankle sprain

Indications

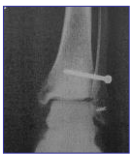
Frank diastasis: operative

- Repair of the ligament?
- If reduction blocked by deltoid ligament:

exploration and repair

Removal of interposed soft tissue

- Syndesmosis screw
- NWB short leg cast



Approach for Operative Treatment

Available surgical techniques:

- Traditional metal screw fixation
- Bioabsorbable screws
- Suture-Button
- Fixation with a staple
- Cerclage wires
- Kirschner wires

Approach for Operative Treatment

Syndesmotic screw

- Aims to temporarily stabilize the reconstructed mortise
- Potential complications
  - Synostosis or ossification of the distal tibiofibular joint
  - Impairment of full ankle dorsiflexion, limit tibiotalar range of movement in terms of rotation (Data from Experimental cadaveric studies)

Approach for Operative Treatment

Suture-button (TightRope®)

- Similar outcome compared with the syndesmotic screw or bolt fixation
- Might lead to a quicker return to work
- Rate of implant removal is lower compared to the syndesmotic screw
- Insufficient evidence on the long-term effects of the TightRope®

Approach for Operative Treatment

Diameter of the screw

- No consensus on the optimal screw size for syndesmotic fixation (3.5 mm or 4.5 mm cortical screw)
- Experimental data: screw of larger diameter provide greater resistance to an applied load

Approach for Operative Treatment

Number of cortices

- No consensus (three or four cortices)
- Four-cortical fixation: more rigidity and stability of the ankle, but higher risk of screw breakage
- Three-cortical fixation: better syndesmosis biomechanics (possibility of hardware failure is diminished while the risk of loosen the screw is increased than four-cortical fixation)

Approach for Operative Treatment

Absorbable screw

- To prevent the removal of the screw and the risks associated with this procedure
- Inferior biomechanical properties compared with those of conventional metallic implants.
- Good clinical outcomes
- No differences compared to metallic screws

Approach for Operative Treatment

Position of the ankle during fixation

- Debated issue.
- Recommended to fix an injured syndesmosis with the foot in dorsiflexion to prevent a limited dorsiflexion of the ankle.
- Recent studies show that the position of the ankle during syndesmotic fixation is probably irrelevant

Approach for Operative Treatment

Positioning of the screw

- Screw should be positioned parallel to the joint line and angled about 30° anteriorly (anatomically the fibula is posterior and lateral to the tibia)
- Optimal position of the screw with respect to the tibial plafond is still debated
  - Sproule et al.: the screw 4 cm proximal to the ankle joint
  - McBryde et al. less syndesmotic widening when using the screw at 2 cm than at 3.5 cm.
- Screw positioned too far proximally, it can deform the fibula and the mortise is more likely to widen.

Approach for Operative Treatment

Retain or remove a syndesmotic screw prior to weight-bearing

- Still debated
- At 6–8 weeks to prevent the possibility of breakage of the screw?
- Leaving the screw in place may save patients from one extra surgical procedure
- Outcome appears to be similar or better when the screw is retained
- Van den Bekerom et al.: removal of four-cortical screws after 6–8 weeks, and removal on indication in three-cortical screws.

Approach for Operative Treatment

- Syndesmotic injuries require an early recognition
- Late repairs are less favourable
- 3.5 or 4.5 screw? Proposal: 3.5 mm
- 3 cortices or 4 cortices? Proposal: 4 cortices in heavy patient, 3 in patients with low BMI
- Screw or suture-button? Proposal: both
- Absorbable non absorbable? Proposal: non absorbable
- Position for fixation Proposal: neutral to slightly dorsiflexion position
- Lag or positioning screw? Proposal: Both possible (prob positioning more safe)
- Removal of soft tissue Proposal: between 3-6 weeks
- Removal of screw Proposal: at 8 weeks
- Partial weightbearing: Proposal: 6-8 weeks

Thank You!

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University Campus Bio-Medico of Rome
Department of Trauma and Orthopaedic Surgery

Operative Techniques for chronic syndesmotic injury

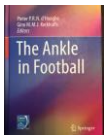
Pieter D'Hooghe
Aspetar Orthopaedic Surgery Dept, Doha, Qatar

ASPETAR سبيتار

inspired by aspire*

ASPETAR سبيتار

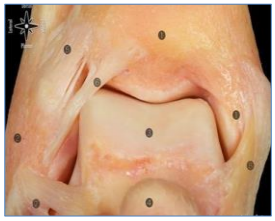
- Orthopaedic Sportssurgeon
- ISAKOS Chair "Leg, Ankle & Foot Committee
- ESSKA AFAS Member
- No disclosures

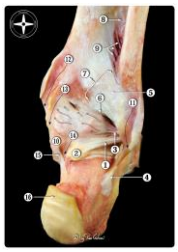


ASPETAR سبيتار

Courtesy Pau Golano - Niek van Dijk

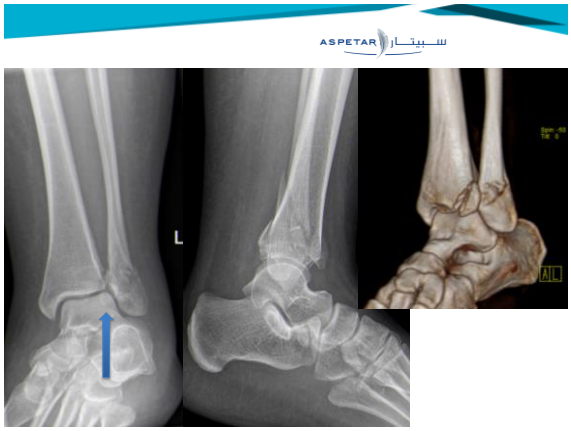
anterior and **posterior** inferior tibiofibular ligaments (AITFL and PITFL) as well as the **interosseous** tibiofibular ligament (IOL). The transverse tibiofibular ligament (TTFL) is considered a continuation or deep portion of the posterior PITFL





Mechanism of injury

Courtesy James Calder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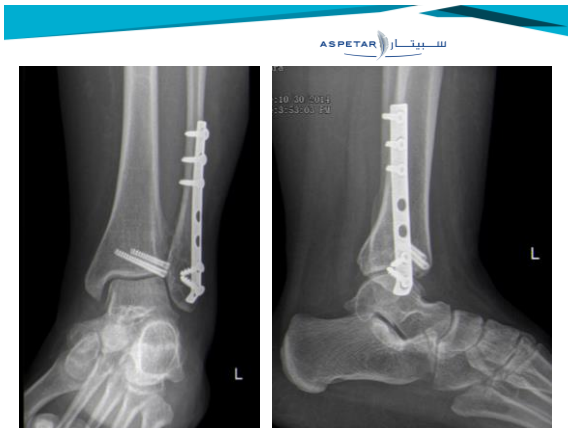
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Late syndesmotic widening

History:

- Persistent pain after fracture/sprain
- Giving way
- Difficulty with walking on uneven ground

Delayed operative treatment of syndesmotic instability. Current concepts review.
Van den Bekerom M, de Leeuw P, van Dijk CN
Injury 2009

Late syndesmotic widening

Physical examination

1. Swelling pressure pain over syndesmosis
2. Stiffness/ limited dorsiflexion upper ankle joint
3. Cotton test, fibular translation test
4. External rotation test is not reliable (false negatives)

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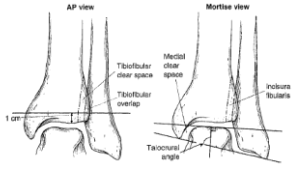
Late syndesmotic widening

Radiology:

- Arthrogaphy (Olsen 1981) (Katznelson 1983)
- MRI (Han 2007) (Kim 2007)
- Arthroscopy (Lui 2005) (Sri-Ram 2005)



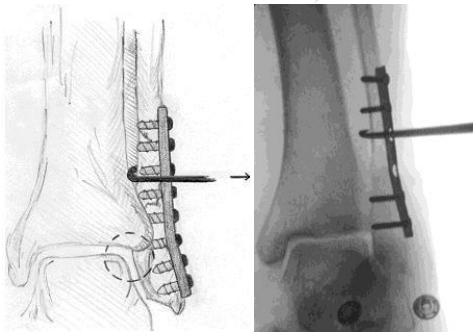
Delayed operative treatment of syndesmotic instability. Current concepts review.
Van den Bekerom M, de Leeuw PAJ, van Dijk CN
Injury 2009

IMAGING

- Comparative weightbearing X-rays should be made
- MRI is the most appropriate additionial tool
- CT (comparitive) might be usefull in assessing rotational deformities
- Dynamic sonography might play a role in selected centers
- Diagnostic arthroscopy can be performed in cases with a high clinical suspicion with a non-conclusive MRI.

Arthroscopic syndesmotic instability assessment

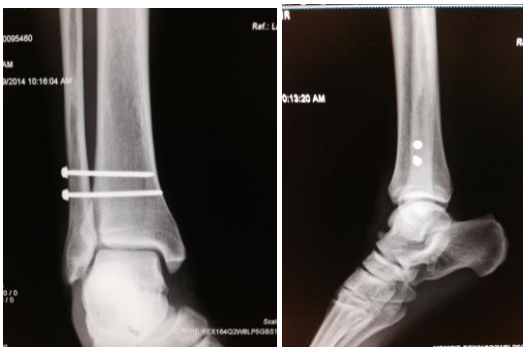
Hook test

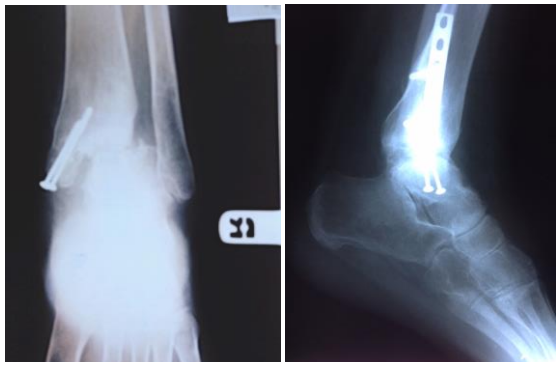


Delayed operative treatment of syndesmotic instability. Current concepts review.
Van den Bekerom M, de Leeuw PAJ, van Dijk CN
Injury 2009

TREATMENT

- Untreated have poor prognosis
- No distinction between subacute and chronic
- Syndesmotic enhancement with lag screw or positioning screw (3 or 4 cortices) or suture button technique or combination
- Arthroscopic debridement with lag screw or positioning screw (3 or 4 cortices) or suture button technique or combination





Late syndesmotic widening

- Treatment options for late syndesmotic widening

- Syndesmotic screw fixation
- Debridement (with screw fixation)
- Repair (with screw fixation)
- Reconstruction (with screw fixation)
- Bone block transfer (with screw fixation)
- Correction osteotomy
- Arthrodesis

Delayed operative treatment of syndesmotic instability. Current concepts review.
Van den Bekerom M, de Leeuw PAJ, van Dijk CN
Injury 2009

Late syndesmotic widening

Syndesmotic screw stabilisation

- Late syndesmotic screw fixation was advocated by Key (1934) and Mullins (1958)
- Opinion: only screw fixation for chronic instability is not sufficient

Delayed operative treatment of syndesmotic instability. Current concepts review. Van den Bekerom M, de Leeuw P, van Dijk CN Injury 2009

Late syndesmotic widening

Arthroscopic debridement and screw stabilisation

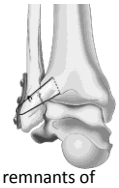
- Harper MC, FAI, 2001
  - 6 patients, 4 males, 2 females, mean age 41
  - PER stage IV
  - 15 months post-trauma
  - 23 months follow-up
  - 5/6 patients are satisfied
- Opinion: only debridement to aim for a fibrotic union (with screw fixation) is not sufficient

Delayed operative treatment of syndesmotic instability. Current concepts review. Van den Bekerom M, de Leeuw PAJ, van Dijk CN Injury 2009

Late syndesmotic widening

Repair (+ arthroscopic debridement and screw stabilisation)

- Mosier-LaClair, Foot Ankle Clin, 2000
  - 8 patients
  - 5 Weber C #, 3 ankle sprains
  - 48 months post-trauma
  - 24 months follow-up
  - 8/9 satisfied. 1/9 dissatisfied
- Opinion: only possible when there are adequate remnants of the syndesmotic ligament.



Delayed operative treatment of syndesmotic instability. Current concepts review. Van den Bekerom M, de Leeuw P, van Dijk CN Injury 2009

Late syndesmotic widening

Reconstruction (+ arthroscopic debridement and screw stabilisation)

- Grass, FAI, 2003
  - Reconstruction with peroneus longus
  - 16 patients, 2 males, 14 females, mean age 40
  - 14 PER, 2 PA
  - 14 months post-trauma
  - 16 months follow-up
  - 16 are relieved of chronic instability, 15 are relieved of pain

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Late syndesmotic widening

Reconstruction (arthroscopic debridement and screw stabilisation)

- Other options
  - Extensor Dig V (Kelikian)
  - Plantaris tendon (van Dijk, Kelikian)
  - Fascia (Kelikian)
  - Dura mater (Kelikian)
- Opinion: Reconstruction with plantaris tendon or gracilis tendon is a good option when there are no adequate remnants and there is no slack intact ligament

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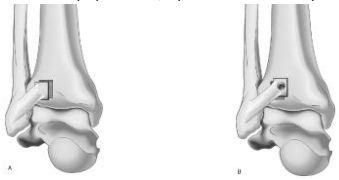
Late syndesmotic widening

Bone block transfer (screw stabilisation)

- Beumer, Acta Orthop Scand, 2000
  - Bone block transfer with syndesmotic screw fixation, 9 patients.
  - 45 months post-trauma
  - 9/9 are relieved of chronic instability, 2 developed dystrophy, 1 nerve entrapment
- Van Dijk, Tech Foot Ankle Surg, 2006
  - Bone block transfer with syndesmotic screw fixation, 6 patients.
  - No patient was symptom free, 2 patients had a later synostosis



Late syndesmotic widening

Bone block transfer (+ screw stabilisation)

- Opinion: a good technique when there is a slack but intact ligament
- Beumer (2000) stated that even in late cases, the ligament was slack but always present
- Bahr (1997) stated that anatomic repair with the original (TibioFibular) ligament should be better

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Late syndesmotic widening

Correction osteotomy (+ arthroscopic debridement)

- Opinion: when there is a syndesmotic widening and a malunion, an osteotomy is regarded the first treatment step.
- All components of the malunion should be corrected
- When there is a severly disturbed ankle function, an arthrodesis should be considered.

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Late syndesmotic widening

Tibiofibular fusion

- Katznelson et al, Injury, 1983
  - 5 patients, 3 males, 2 females, mean age 20 yr.
  - Ankle sprains
  - 10 months post trauma
  - 5/5 pain free, 4/5 free ROM
- Opinion: this technique can be used for syndesmotic instability lasting > 6 months.

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Injury 2009

Chronic Syndesmotic injury

TAKE HOME MESSAGE

- First consider the fibular malalignment
- Repair of the ligament with/when adequate remnants
- Otherwise a reconstruction (ligamentoplasty)with gracilis tendon is advised
- When there is a slack but intact ligament: a bone block translation osteotomy is advised

- Debridement to aim for a fibrotic union
- Tibiofibular joint fusion (synostosis with graft)

Syndesmotic impingment

Arthroscopically resection of the distal fascicle of the AITFL should be considered when there:

(1) is contact between the AITFL and the talus,

(2) is increased contact between the talus and the ligament and this continued until maximum dorsiflexion with abrasion of the articular cartilage,

(3) bending of the fascicle on the anterolateral edge of the talus with dorsiflexion and dorsiflexion-inversion,

(4) is a distally inserting fascicle on the fibula, close to the origin of the ATFL on the fibula. This finding may be missed if the distraction is preserved throughout the procedure

The distal fascicle of the anterior inferior tibiofibular ligament as a cause of tibiotalar impingement syndrome: a current concepts review. van den Bekerom MP, Raven EE. Knee Surg Sports Traumatol Arthrosc 2007

Thank You