Advances in Foot and Ankle Arthroscopy

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Disclosures

- Arthrex: consultant and royalties
- Bone Solutions Inc : SAB/ Stock
- Arc Techtonics: Stock
- Miach : Stock
- Rubber City Bracing: Stock
- WolterKluwer: royalties
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Ankle Arthroscopy:

Standard Indications:

- **Soft tissue/bony impingement**
- **Loose bodies**
- **OCL talus(OLT) : medial/lateral**
- **OA/chondromalacia**
- **Arthrofibrosis post fracture**
- **synovitis**

Ankle Arthroscopy: technique

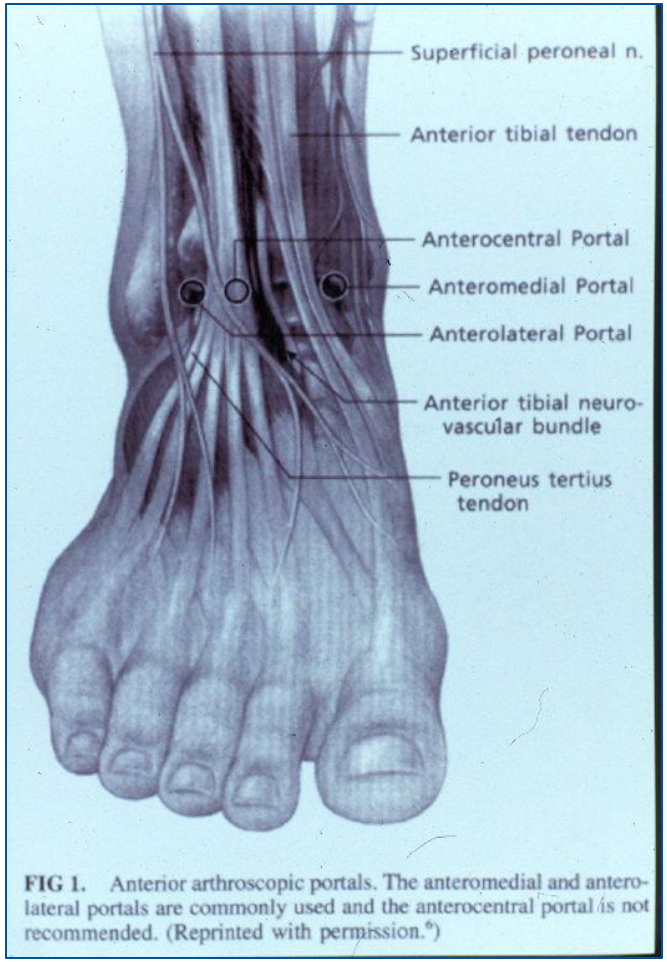


FIG 1. Anterior arthroscopic portals. The anteromedial and anterolateral portals are commonly used and the anterocentral portal is not recommended. (Reprinted with permission.[6])

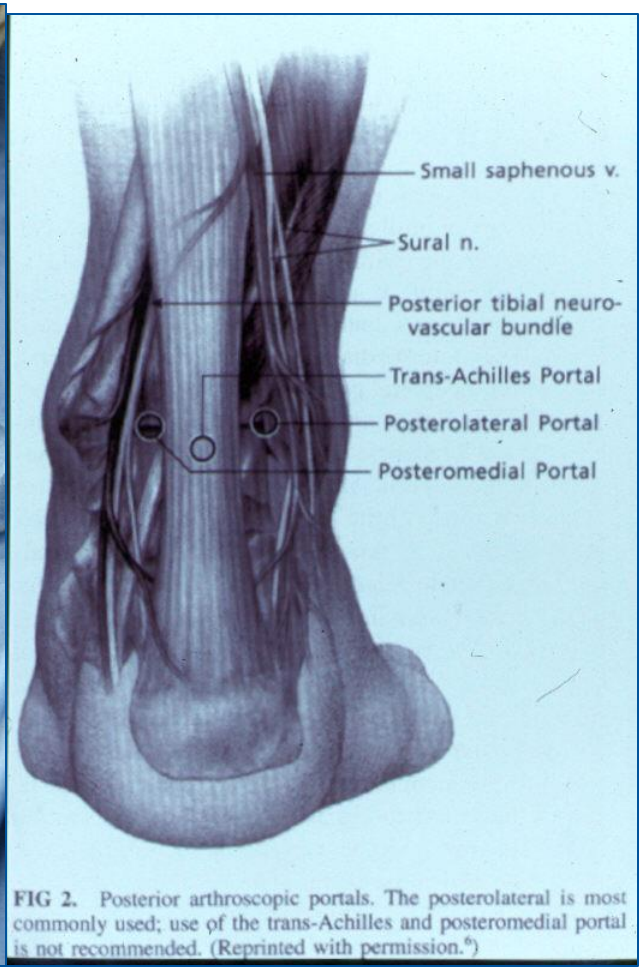


FIG 2. Posterior arthroscopic portals. The posterolateral is most commonly used; use of the trans-Achilles and posteromedial portal is not recommended. (Reprinted with permission.[6])

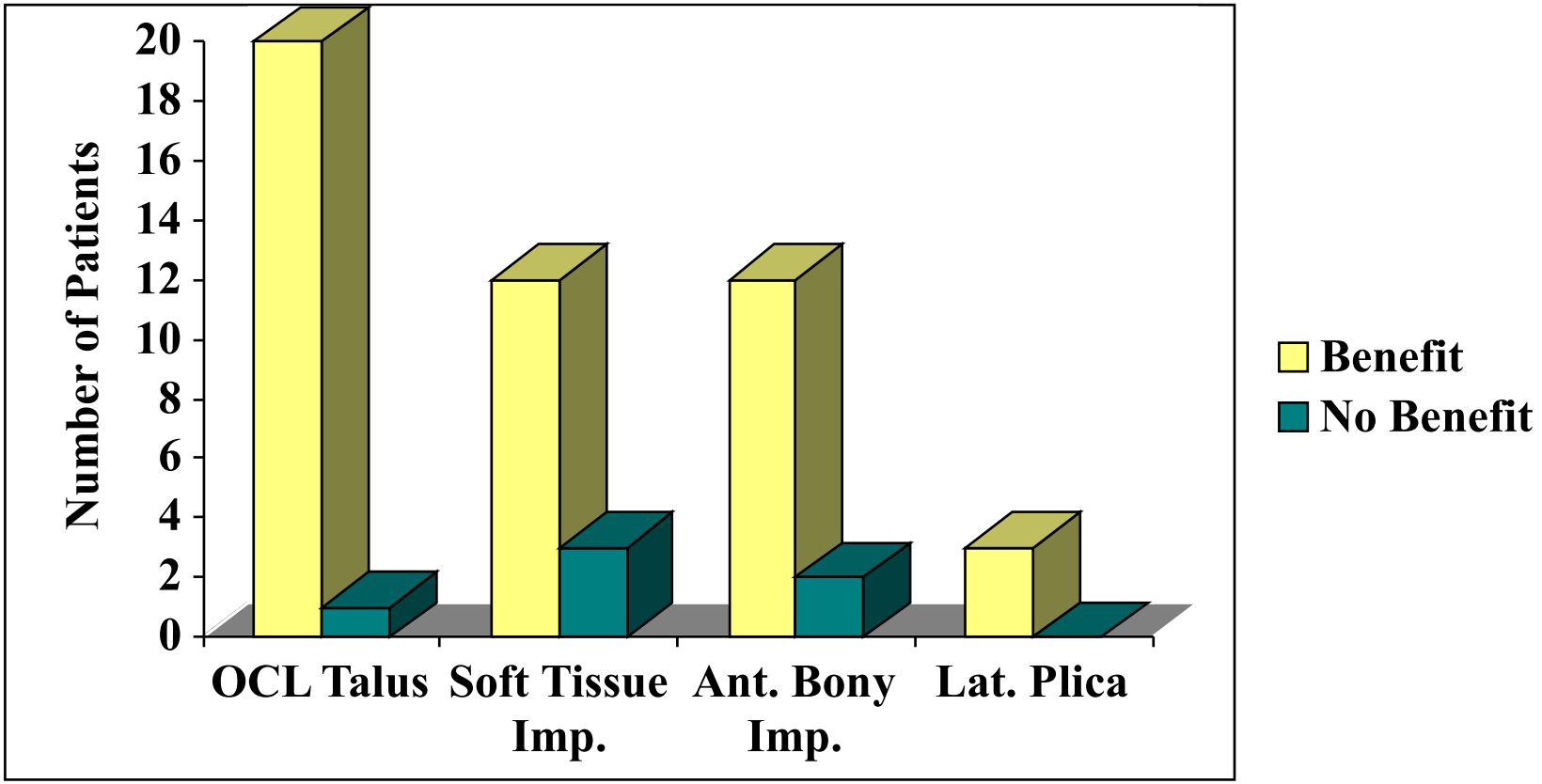
Arthroscopy : Results

- Demographics

- 79 patients
- 51 M/ 28 F
- average age 30.8 yrs (16 - 56)
- follow up 24 - 42 mos

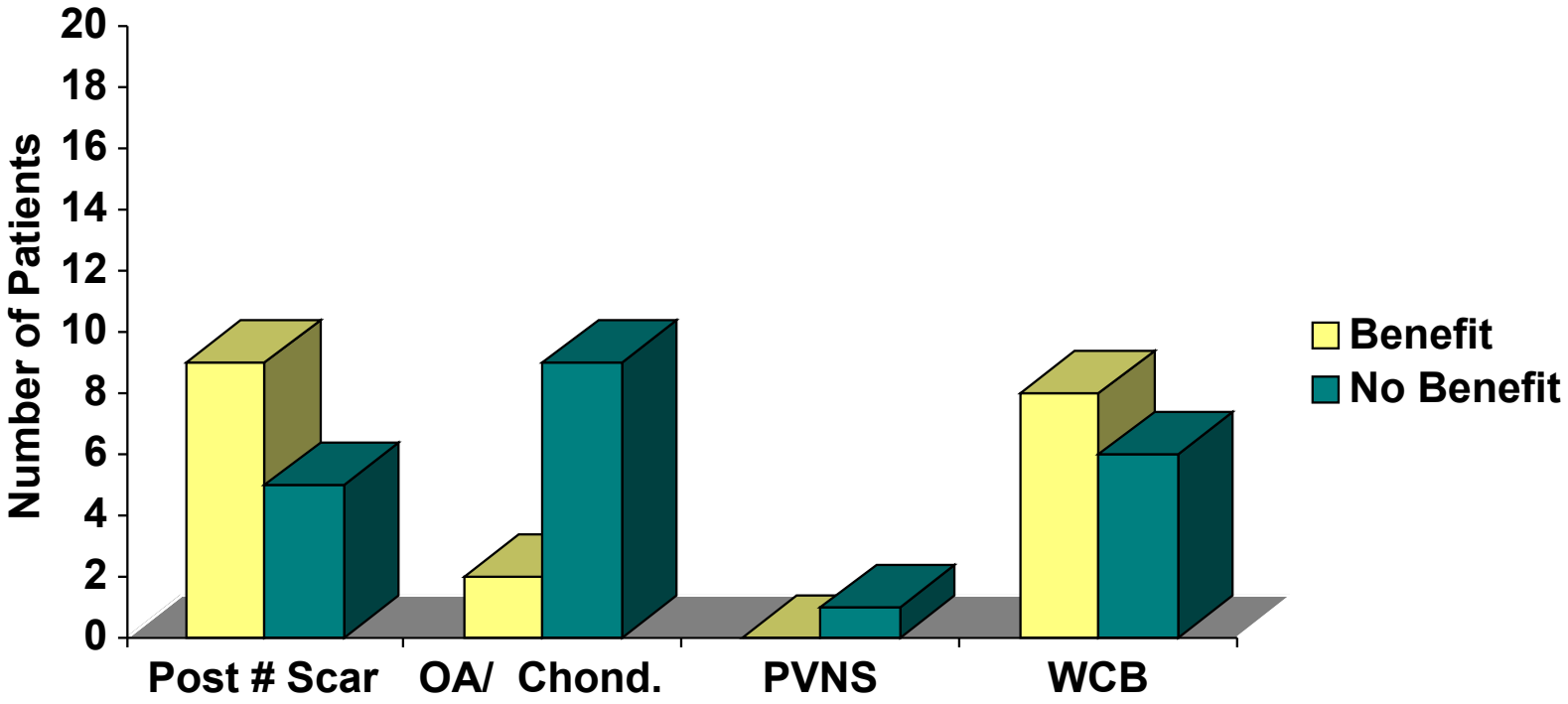
Amendola et al, Arthroscopy, 1995

Outcome of Ankle Arthroscopies



Amendola et al, Arthroscopy, 1995

Outcome of Ankle Arthroscopies



Amendola et al, Arthroscopy, 1995

INDICATIONS in SPORT

- Acute and chronic osteochondral lesions
- Acute and chronic instability
- Syndesmotic injuries
- Soft tissue/bony impingement: anterior and posterior
- Loose bodies

Ankle Arthroscopy

Evolving INDICATIONS

- Acute ankle fractures
- Posterior ankle arthroscopy/ subtalar joint
- Tendoscopy / peri-articular
- Arthrodesis : ST/Ankle

OLT long term outcomes

Ten-Year Survival Rate of 82% in 262 Cases of Arthroscopic Bone Marrow Stimulation for Osteochondral Lesions of the Talus

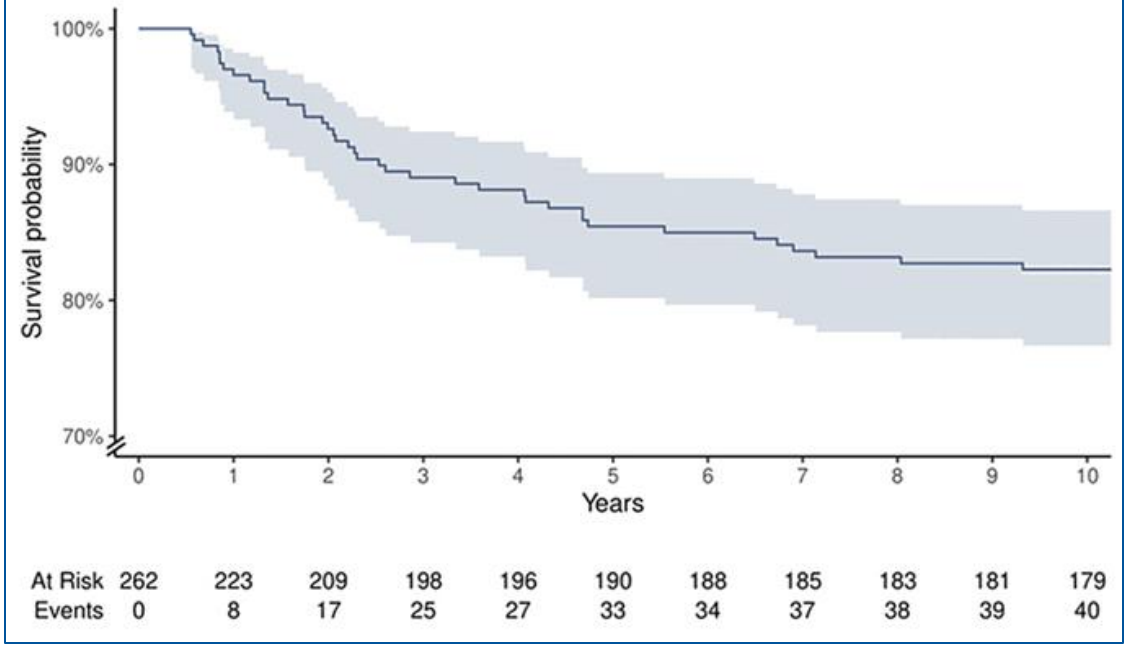
Quinten G.H. Rikken, MD, Margot B. Aalders, MD, Jari Dahmen, MD, BSc, Inger N. Sierevelt, MSc, Sjoerd A.S. Stufkens, MD, PhD, and Gino M.M.J. Kerkhoffs, MD, PhD

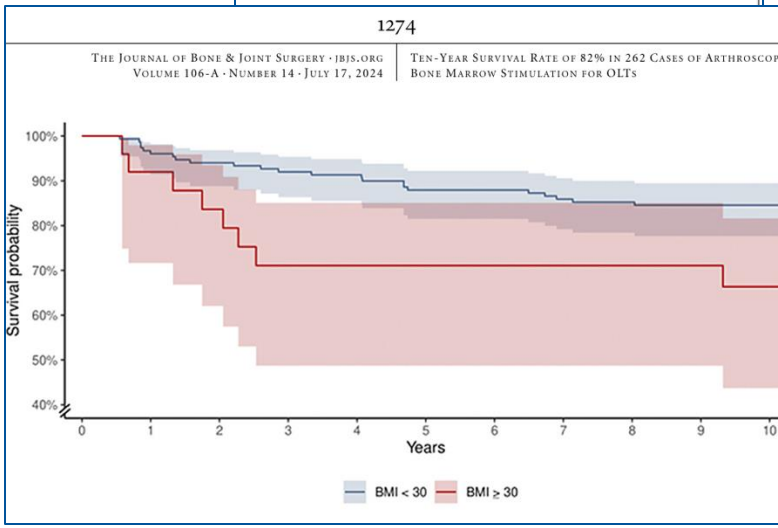
Investigation performed at the Department of Orthopedic Surgery and Sports Medicine, Amsterdam UMC, Amsterdam, The Netherlands

TABLE III Cox Regression Analysis of Baseline Factors Associated with Failure*

Analysis and Variable	HR (95% CI)	P Value
Univariate		
Lesion size		
≤100 mm²	Reference	
>100 mm²	0.93 (0.47-1.83)	0.82
Lesion type		
Primary	Reference	
Non-primary	1.78 (0.93-3.41)	**0.08**
Presence of cyst		
No	Reference	
Yes	1.02 (0.57-1.85)	0.94
BMI		
<30 kg/m²	Reference	
≥30 kg/m²	3.04 (1.44-6.43)	**<0.01**
Sex†		
Male	Reference	
Female	0.60 (0.33-1.08)	0.09*
Multivariable		
Lesion type		
Primary	Reference	
Non-primary	1.57 (0.83-3.03)	0.18
BMI		
<30 kg/m²	Reference	
≥30 kg/m²	2.82 (1.30-6.1)	**0.01**
Final model		
BMI		
<30 kg/m²	Reference	
≥30 kg/m²	3.04 (1.44-6.43)	**<0.01**

*After multiple imputation. HR = hazard ratio, CI = confidence interval. †Sex was not included in the formal analysis because of underpowering, as described in the Materials and Methods section. However, it is shown here to support the secondary analysis and should be interpreted as such.





Ankle Arthroscopy : Portals

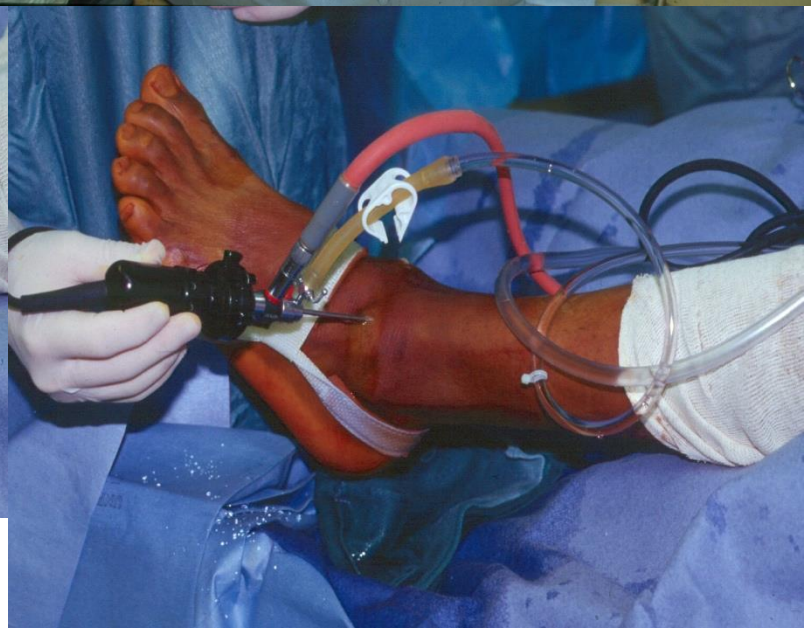
Supine position

1. anterolateral
   accessory lateral
2. anteromedial
   accessory medial
3. posterolateral
4. (transmalleolar)

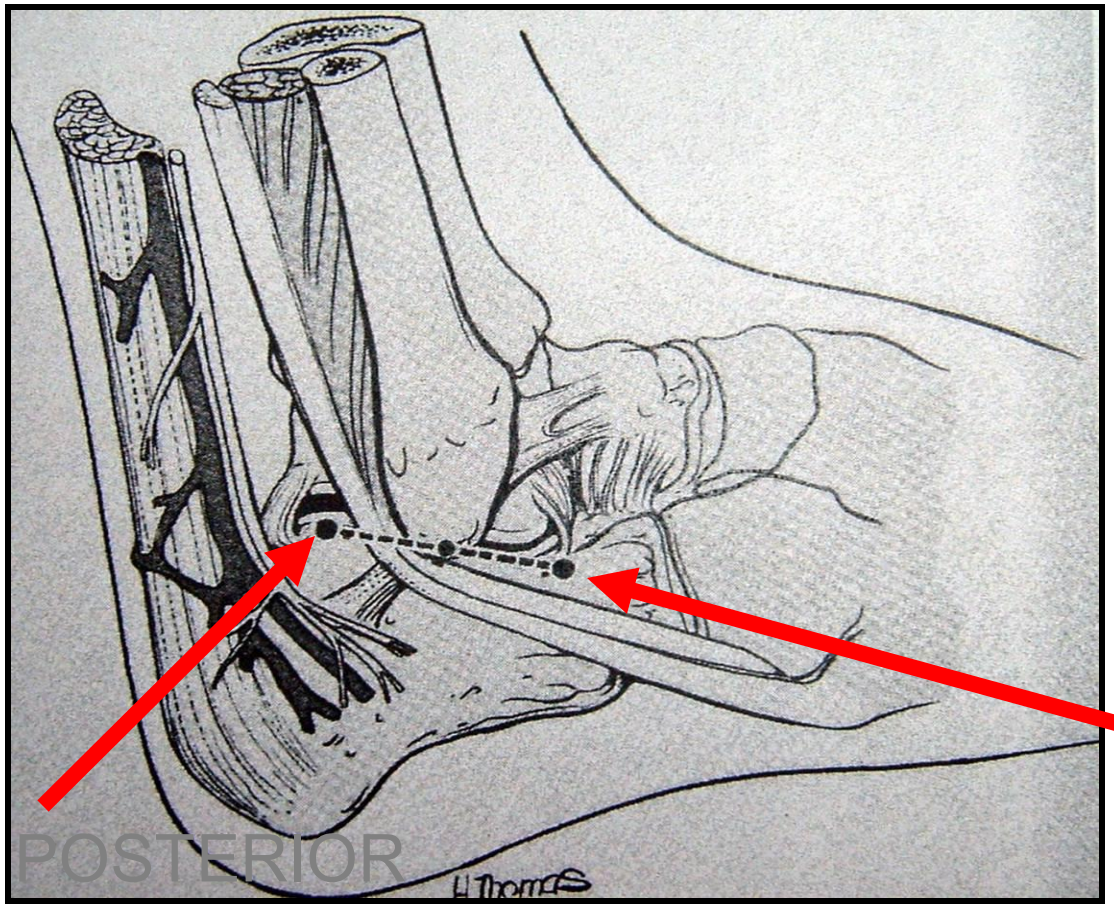
Prone position

1. **posteromedial**
2. **Posterolateral**
   accesory posterolateral


NO INPUT

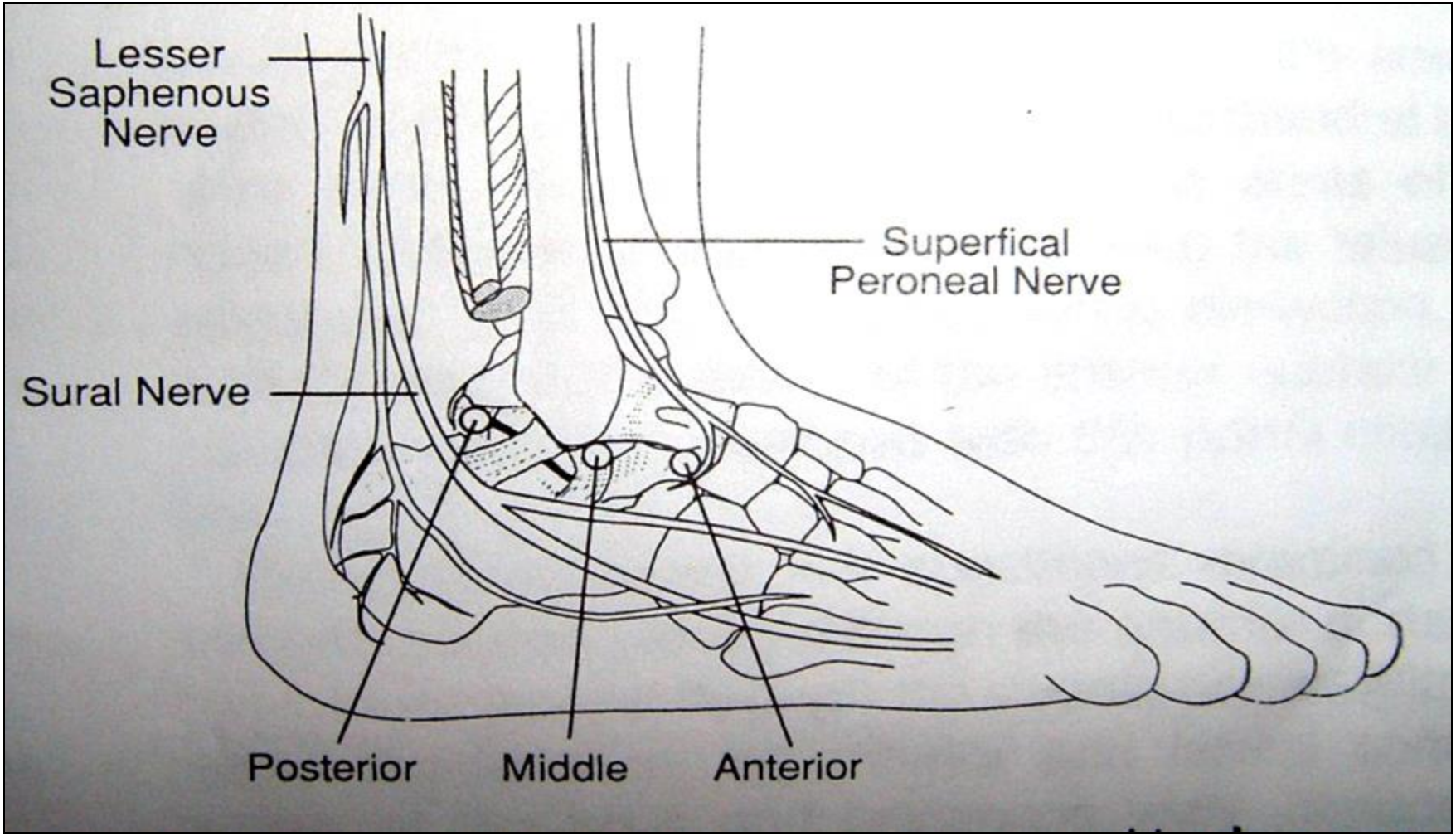


Subtalar Arthroscopy: technique

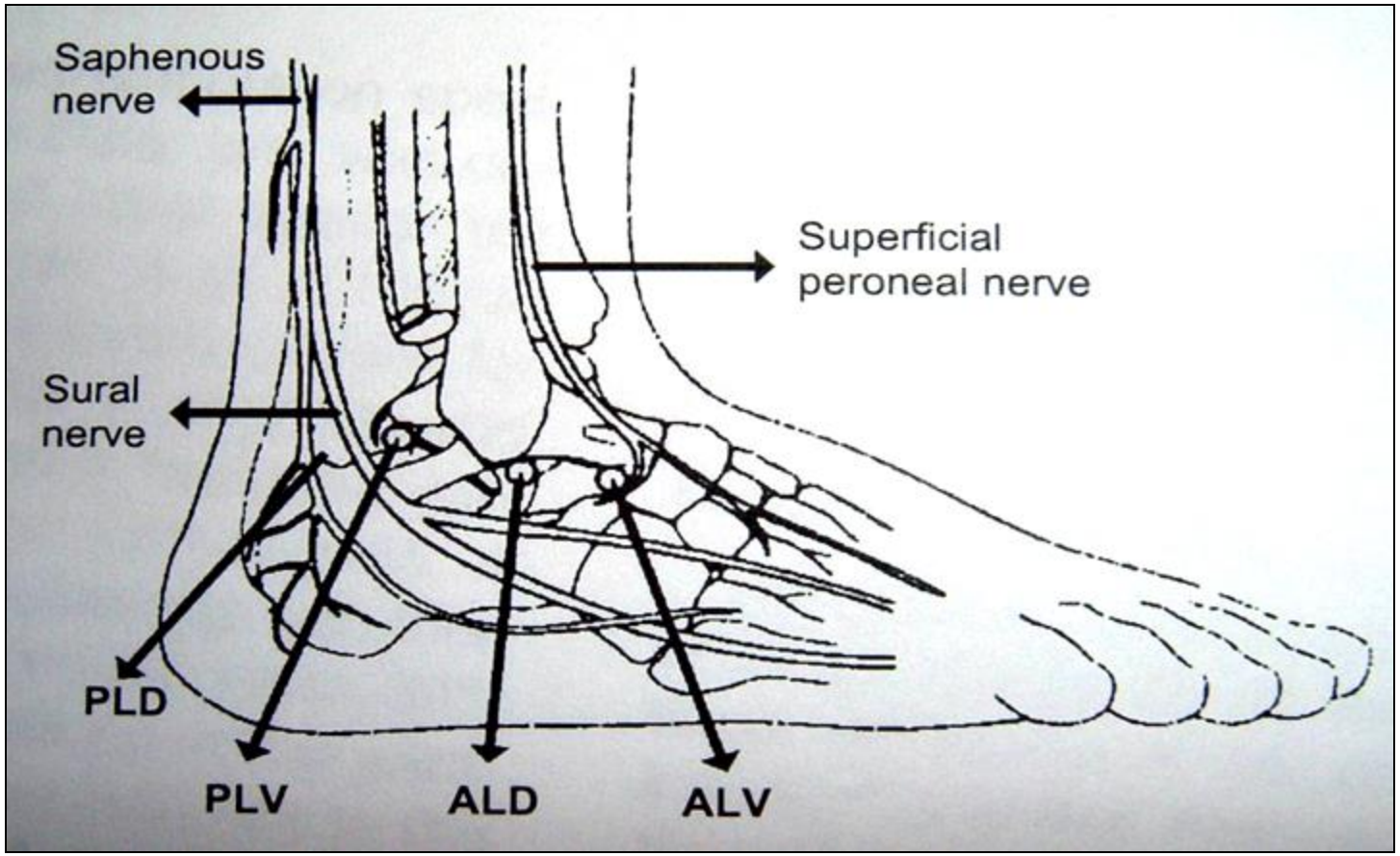


1985 Parisien et al, Arthroscopy

Frey et al, Foot & Ankle 1994



Jerosch et al, ESSKA Journal 1998

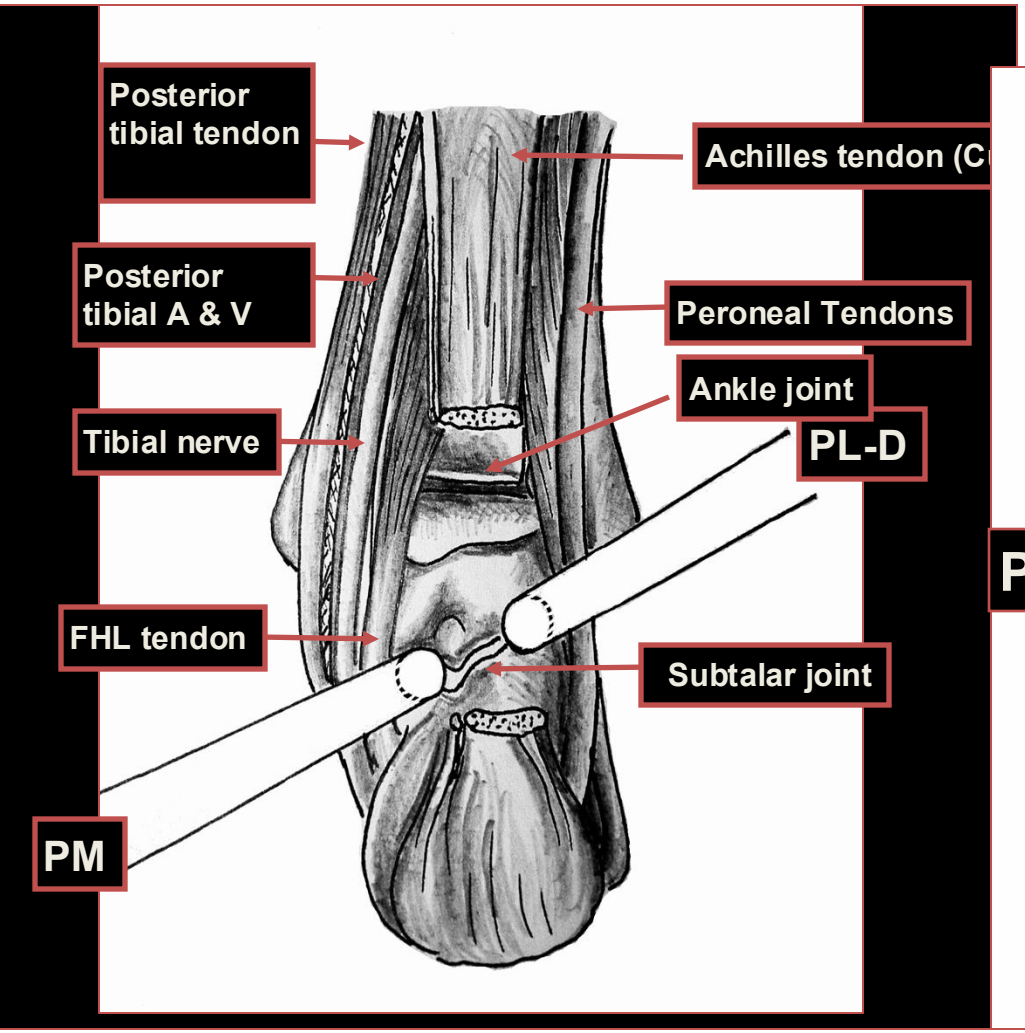


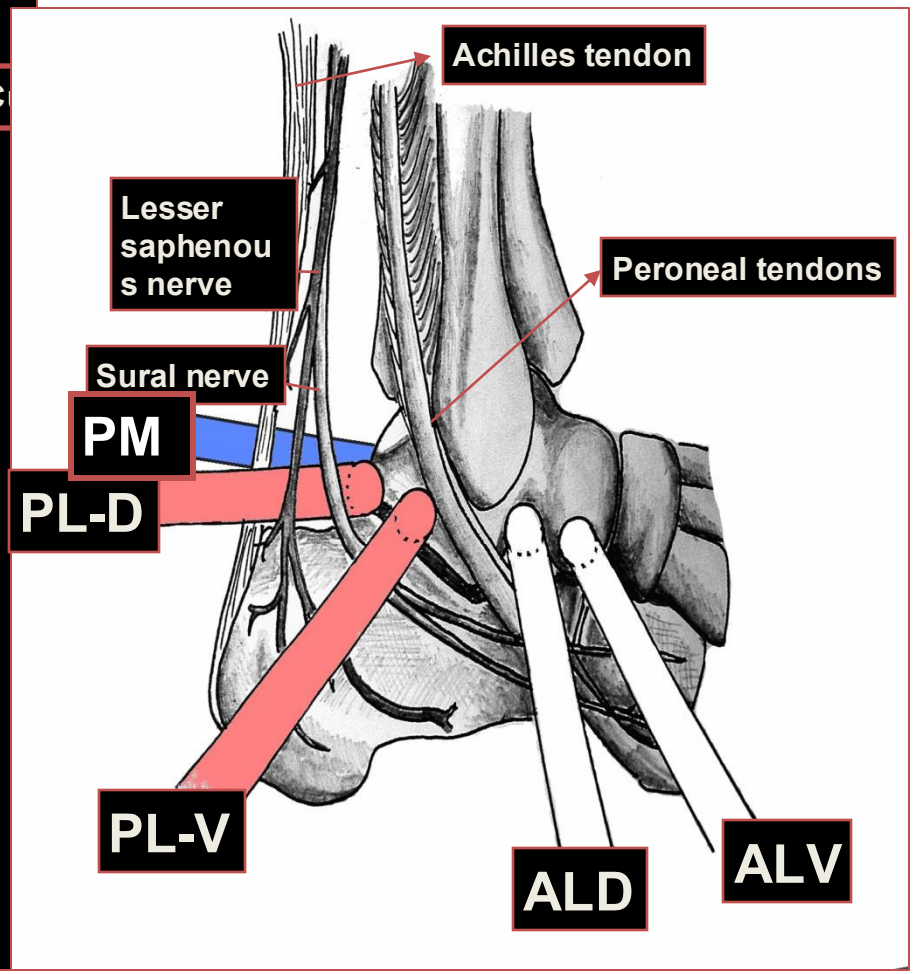
Prone Posterior Arthroscopy

Originally described by Nik van Dijk 2000

Case report of FHL impingement

Anatomy


Posterior tibial tendon
Achilles tendon (C
Posterior tibial A & V
Peroneal Tendons
Ankle joint
Tibial nerve
PL-D
FHL tendon
Subtalar joint
PM


Achilles tendon
Lesser saphenou s nerve
Peroneal tendons
Sural nerve
PM
PL-D
PL-V
ALD
ALV


ASC Dynamics
Camera – 06

Nano Arthroscopy

Fig. 1 Outside view during a 2-mm diameter arthroscopic procedure. The arthroscope is introduced through the anteromedial portal. A green needle marks the anterolateral portal

Nano Arthroscopy

Knee Surgery, Sports Traumatology, Arthroscopy (2020) 28:3080–3086
https://doi.org/10.1007/s00167-020-05889-7

ANKLE

Check for updates

Two-millimetre diameter operative arthroscopy of the ankle is safe and effective

Tobias Stornebrink[1,2,3] · J. Nienke Altink[1,2,3] · Daniel Appelt[4] · Coen A. Wijdicks[4] · Sjoerd A. S. Stufkens[1,2,3] · Gino M. M. J. Kerkhoffs[1,2,3]

Received: 10 December 2019 / Accepted: 29 January 2020 / Published online: 17 February 2020

Fig. 1 Outside view during a 2-mm diameter arthroscopic procedure. The arthroscope is introduced through the anteromedial portal. A green needle marks the anterolateral portal

Fig. 2 Points of biopsy on the anterior ankle capsule to determine surgical reach. The capsule as delimited by the white line. Cranial points 1 (most laterally), 2 (mid-tibial), 3 (most medially) and caudal points, 4 (most laterally), 5 (mid-talar), 6 (most medially)

Posterior Arthroscopy

- Complications

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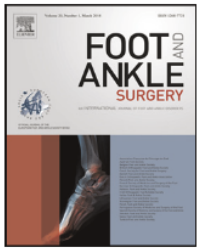


Review

A literature review of the complications following anterior and posterior ankle arthroscopy

Medhat Zekry[a], Shafiq Arif Shahban[a,*], Tarek El Gamal[a], Simon Platt[b]

[a] Heart of England NHS Foundation Trust, Bordesley Green E, Birmingham B9 5SS, United Kingdom
[b] Wirral Hospital NHS Trust, Arrowe Park Hospital, Arrowe Park Rd., Birkenhead, Wirral CH49 5PE, United Kingdom

Posterior Arthroscopy :Complications

Table 1
A list of the largest studies assessing the complications of ankle arthroscopy.

Author (year)	Type of study	Anterior/posterior	Number of procedures
Ferkel et al. (1996) [6]	Retrospective	Anterior	612
Amendola et al. (1996) [12]	Retrospective	Anterior	79
Rasmussen and Hjorth Jensen (2002) [46]	Prospective	Anterior	105
Wilits et al. (2008) [18]	Prospective	Posterior	24
Allegra and Maffulli (2010) [40]	Prospective	Posterior	32
Young et al.(2011) [10]	Retrospective	Anterior	294
Zengerink and van Dijk (2012) [13]	Retrospective	Both	1305
Deng et al. (2012) [16]	Retrospective	Anterior	405
Nickish (2012) [17]	Retrospective	Posterior	189
Vega et al.(2014) [53]	Retrospective	Anterior	74
Song et al. (2016) [58]	Prospective	Both	28
Blázquez Martín et al. (2016) [61]	Retrospective	Both	198

Complications following anterior and posterior ankle arthroscopies.

Neurovascular	Anterior ankle arthroscopy	Posterior ankle arthroscopy
SPN and branches of	1.04–8.3%	–
Deep peroneal nerve	0.2–0.77%	–
Saphenous nerve	0.16–3.3%	–
Sural nerve	0.08–4.04%	1.50%
Tibial nerve	–	0.16–2.1%
Pseudoaneurysm	0.008%	–
DVT	0.3–0.4%	
Nonfatal PE	0.08%	–
Infection		
Superficial	0.13–3.3%	0.13–1.05%
Deep	0.03–3.3%	–
Sinus tract formation	0.3–0.9%	–
Tendon injury		
Extensor hallucis longus rupture	3 case reports	–
Extensor digitorum communis rupture	1 case report	–
Flexor hallucis longus injury	–	0.20%
Temporary Achilles tendon tightness	–	2.1–4.1%
Other		
Articular cartilage injury	31%	–
Postoperative swelling	0.30%	0.30%

Ankle Arthroscopy : Access

Optimizing Arthroscopy for Osteochondral Lesions of the Talus: The Effect of Ankle Positions and Distraction During Anterior and Posterior Arthroscopy in a Cadaveric Model

Phinit Phisitkul, M.D., Craig C. Akoh, M.D., Chamnanni Rungprai, M.D., Alexej Barg, M.D., Annuziato Amendola, M.D., Kevin Dibbern, M.S., and Donald Anderson, Ph.D.

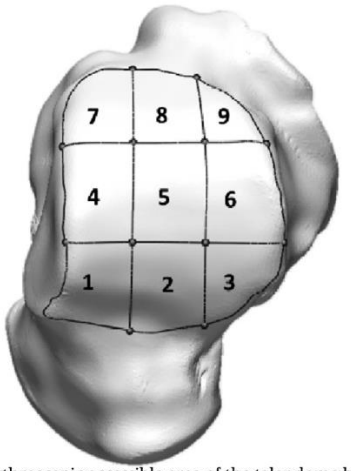


Fig 2. Arthroscopic accessible area of the talar dome by regio

Table 3. Differences in Percent Accessibility by Zone Between Anterior and Posterior Arthroscopy of the Talar Dome Articular Surface

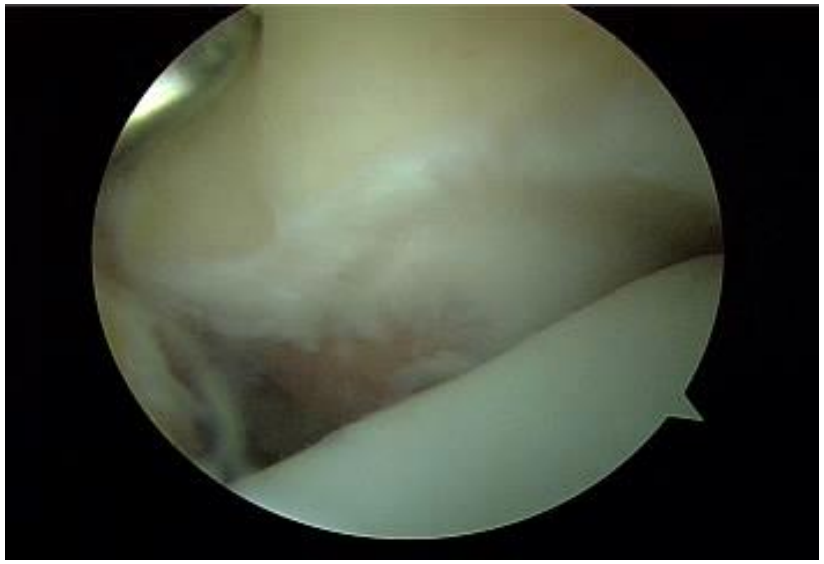
	Anterior			Posterior			Paired *t*-Test
Zone	% Accessible	Min	Max	% Accessible	Min	Max	*P* Value
1	100.0 ± 0.0 (100.0)	100.0	100.0	2.7 ± 6.2 (0.0)	0.0	19.1	<.001
2	100.0 ± 0.0 (100.0)	100.0	100.0	3.3 ± 10.0 (0.0)	0.0	37.1	<.001
3	100.0 ± 0.0 (100.0)	100.0	100.0	3.6 ± 12.5 (0.0)	0.0	46.9	<.001
Anterior zones	100.0 ± 0.0 (100.0)			3.2 ± 8.0 (0.0)			<.001
4	88.8 ± 19.1 (99.2)	43.4	100.0	77.0 ± 20.2 (82.4)	33.1	100.0	<.003
5	87.3 ± 19.0 (96.9)	39.7	100.0	75.6 ± 20.9 (80.2)	37.5	100.0	.030
6	86.9 ± 18.2 (94.4)	45.6	100.0	70.5 ± 22.9 (74.1)	30.3	100.0	.011
Central zones	87.7 ± 17.5 (94.7)			74.3 ± 19.8 (82.1)			.002
7	13.7 ± 18.3 (2.2)	0.0	56.4	100 ± 0.0 (100.0)	100.0	100.0	<.001
8	14.4 ± 20.9 (0.0)	0.0	61.1	100.0 ± 0.0 (100.0)	100.0	100.0	<.001
9	18.5 ± 26.5 (0.0)	0.0	80.5	100.0 ± 0.0 (100.0)	100.0	100.0	<.001
Posterior zones	15.5 ± 20.4 (4.2)			100.0 ± 0.0 (100.0)			<.001

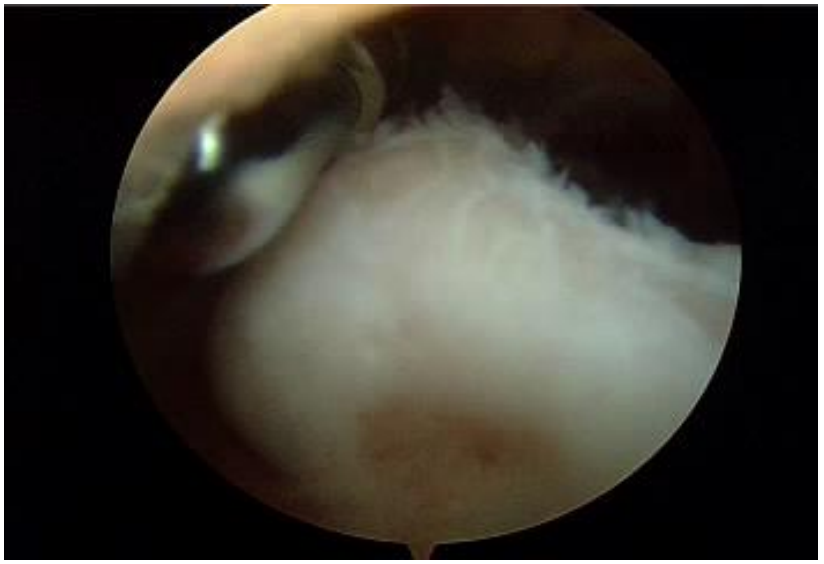
NOTE. For the anterior zones 1 to 3 and central zones 4 to 7, anterior arthroscopy had significantly higher accessibility for the talus when compared with posterior arthroscopy. For the posterior zones 7 to 9, posterior arthroscopy had significantly higher accessibility for the talus when compared with anterior arthroscopy. Paired *t*-tests were used to compare anterior versus posterior percent accessibility for each zone. Mean ± standard deviation (median) shown. Generalized linear models were used to test whether there were significant differences in percent accessibility between zones within each approach. Analyses accounted for repeated measures.

Case : 30 yo M with anterior and medial ankle pain

Anteromedial impingement

Anteromedial impingement





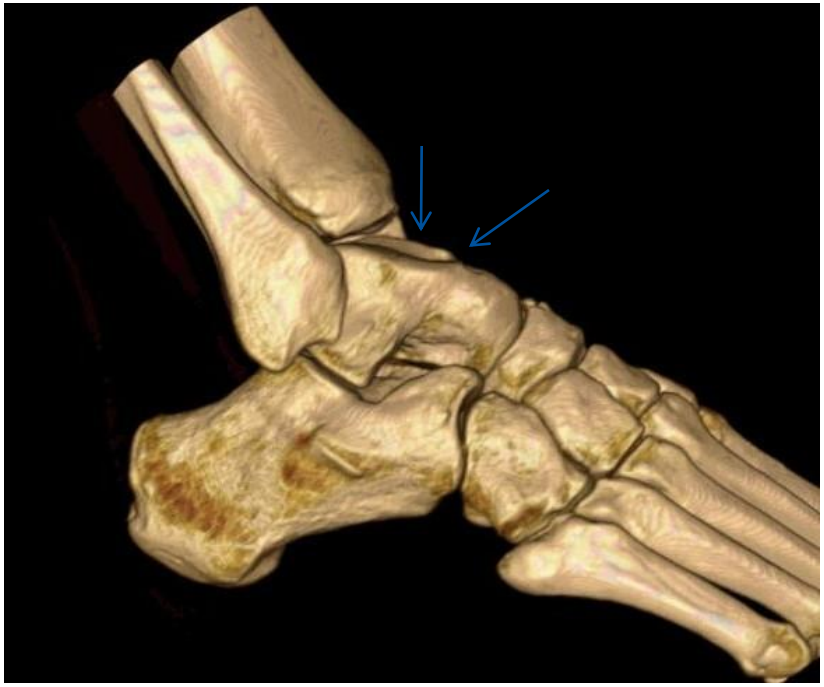
Pre

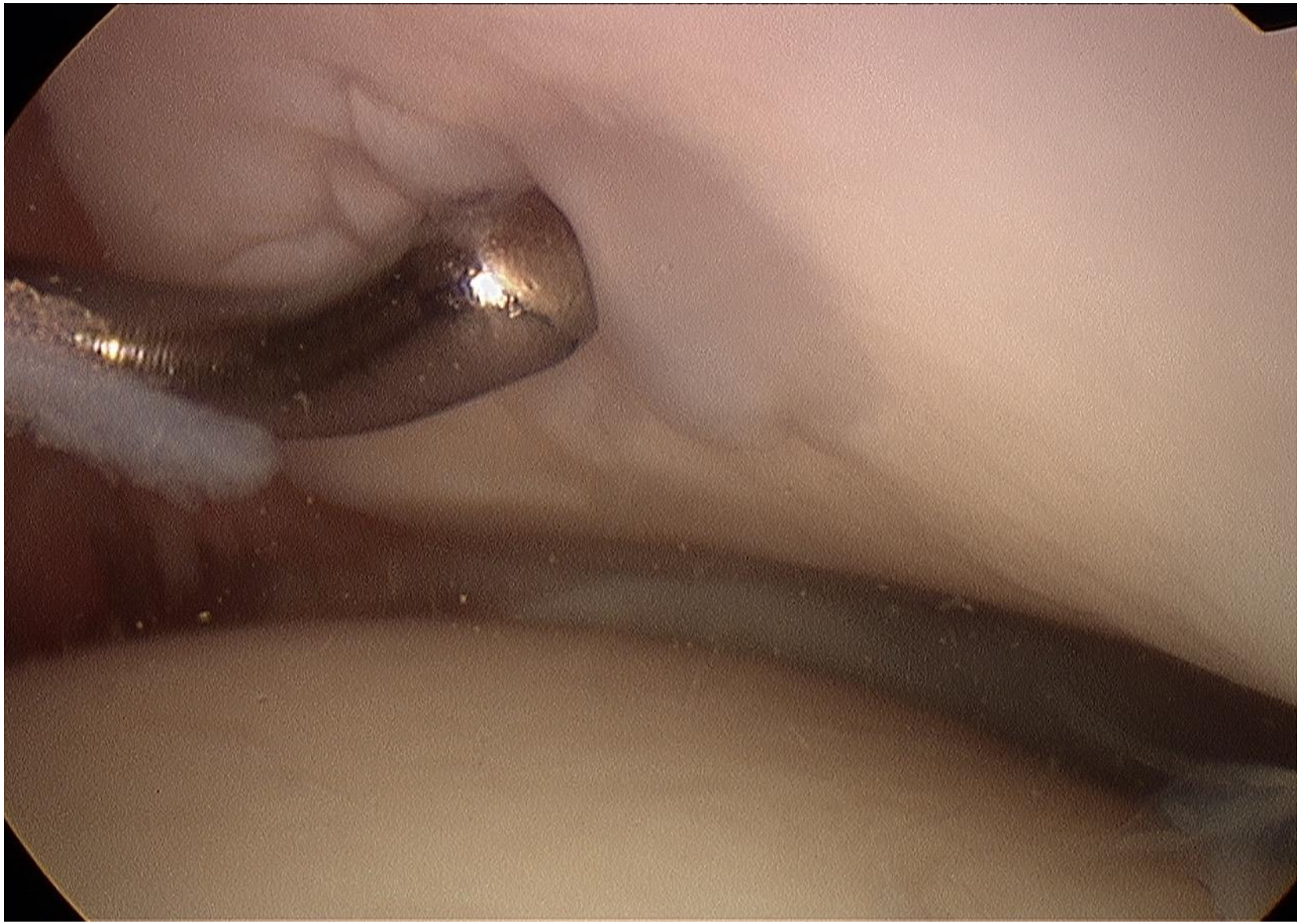
post

Case Example

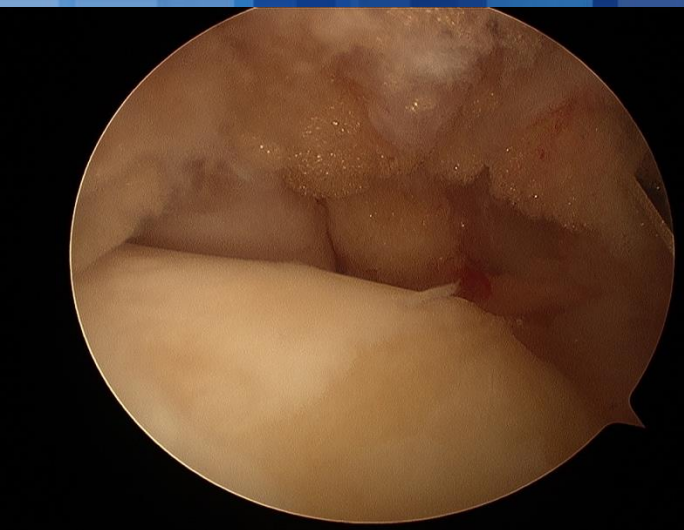
case

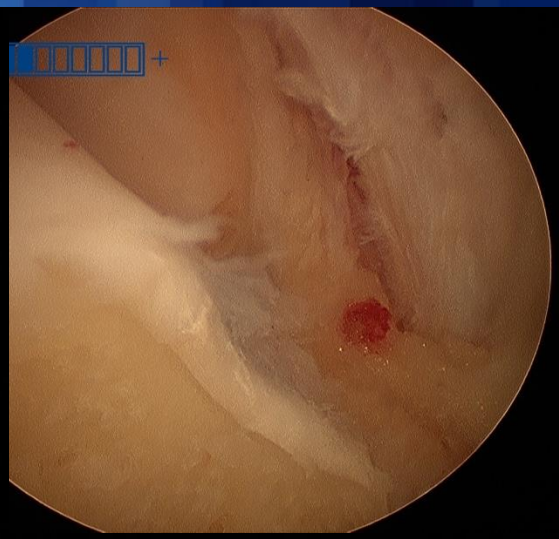
Example 2

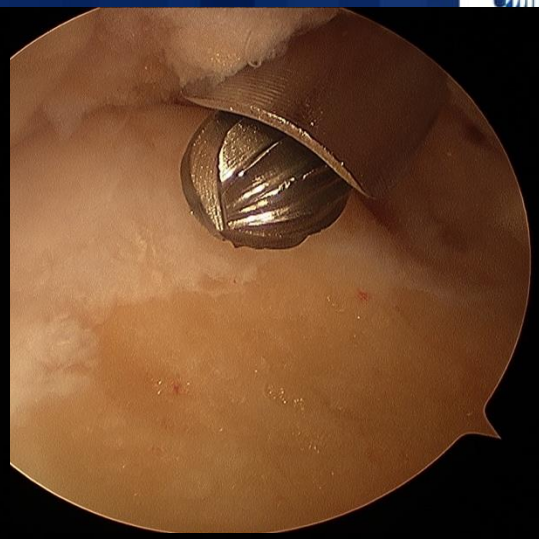


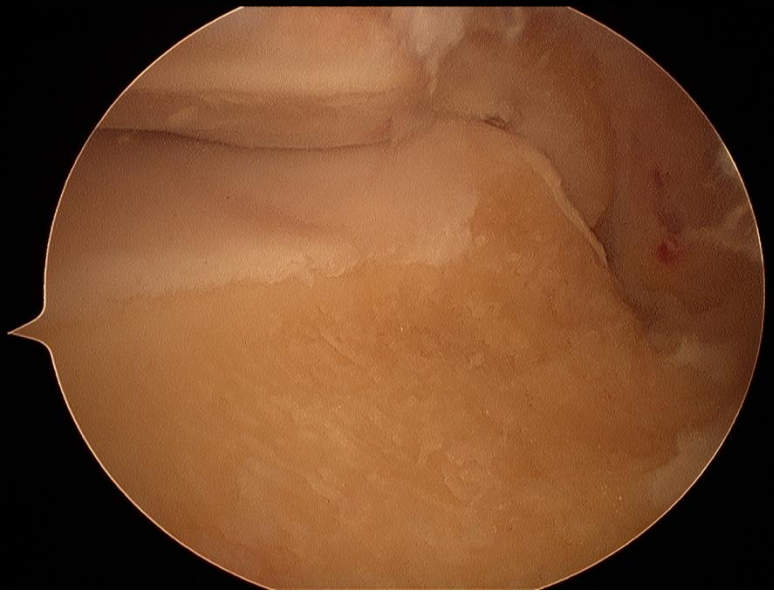


case









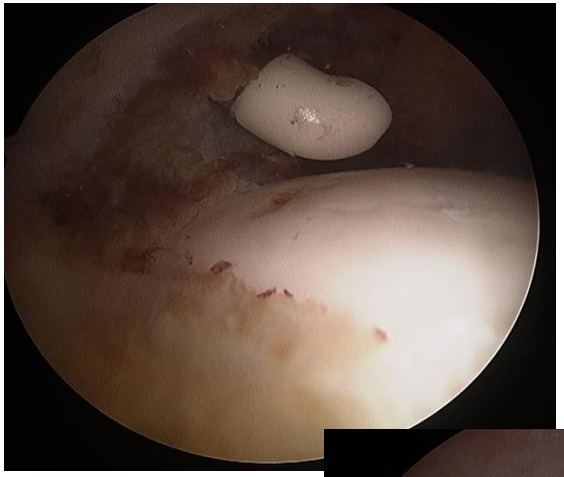
case

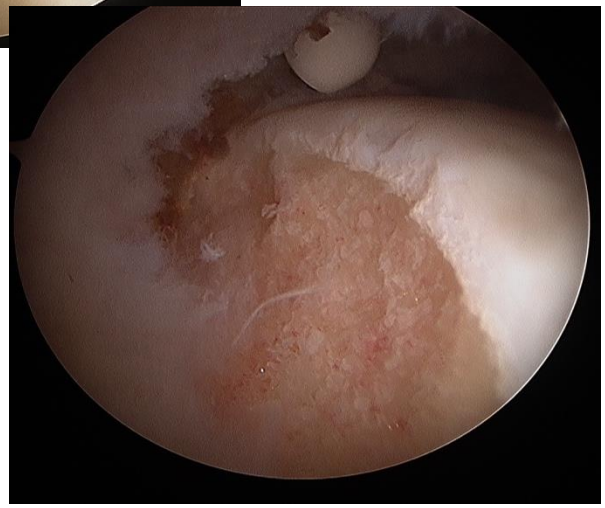
Example 2 post op

Examples - Impingement

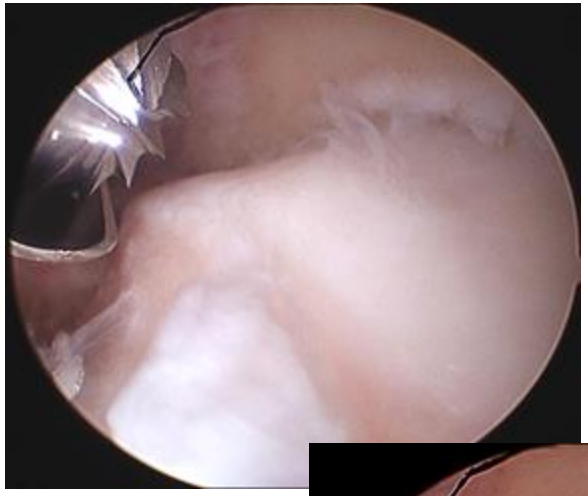
Cam impingement

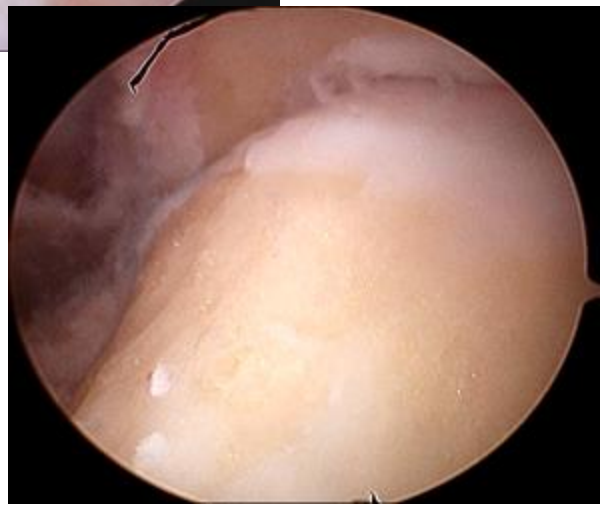
Cam impingement





Hip

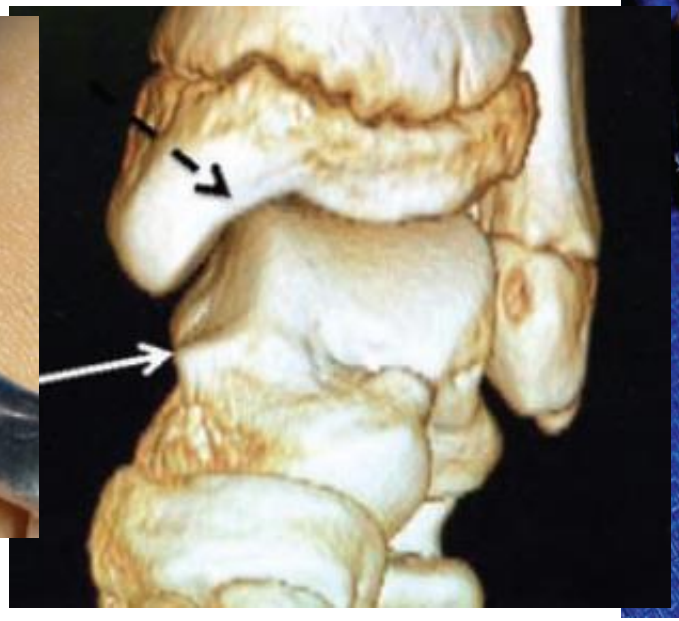


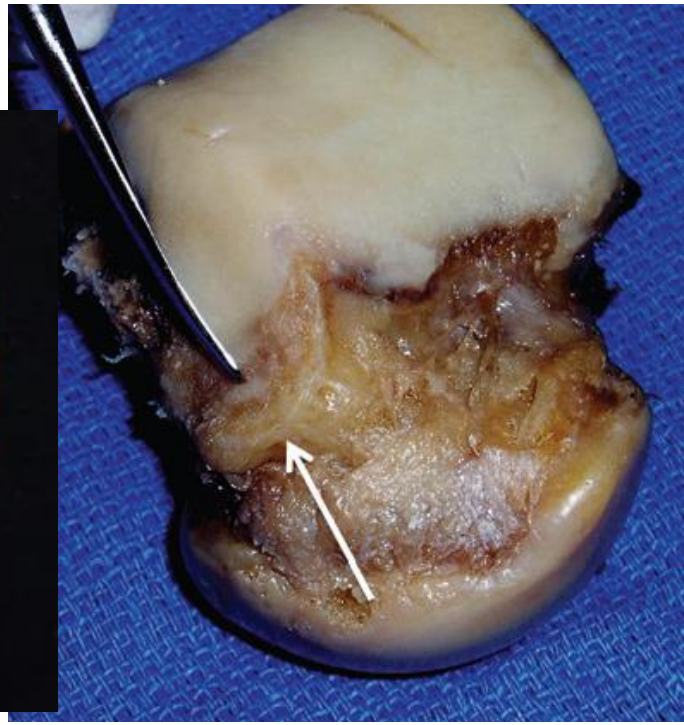


Ankle

Cam Impingement

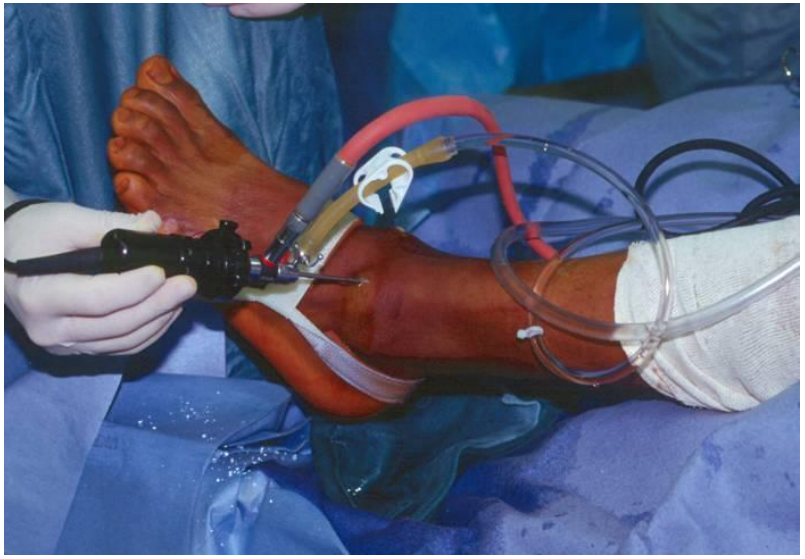
Medial Impingement of the Ankle in Athletes
Arthur Manoli II
Sports Health: A Multidisciplinary Approach 2010 2: 495
DOI: 10.1177/1941738110384570





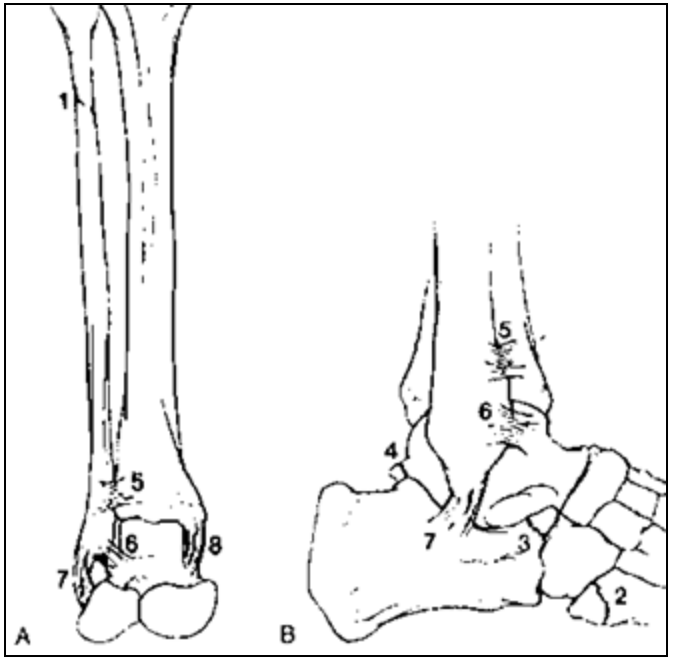
Arthroscopy: Chronic Ankle Instability

- Is Arthroscopy indicated at the time of lateral ligament stabilization?

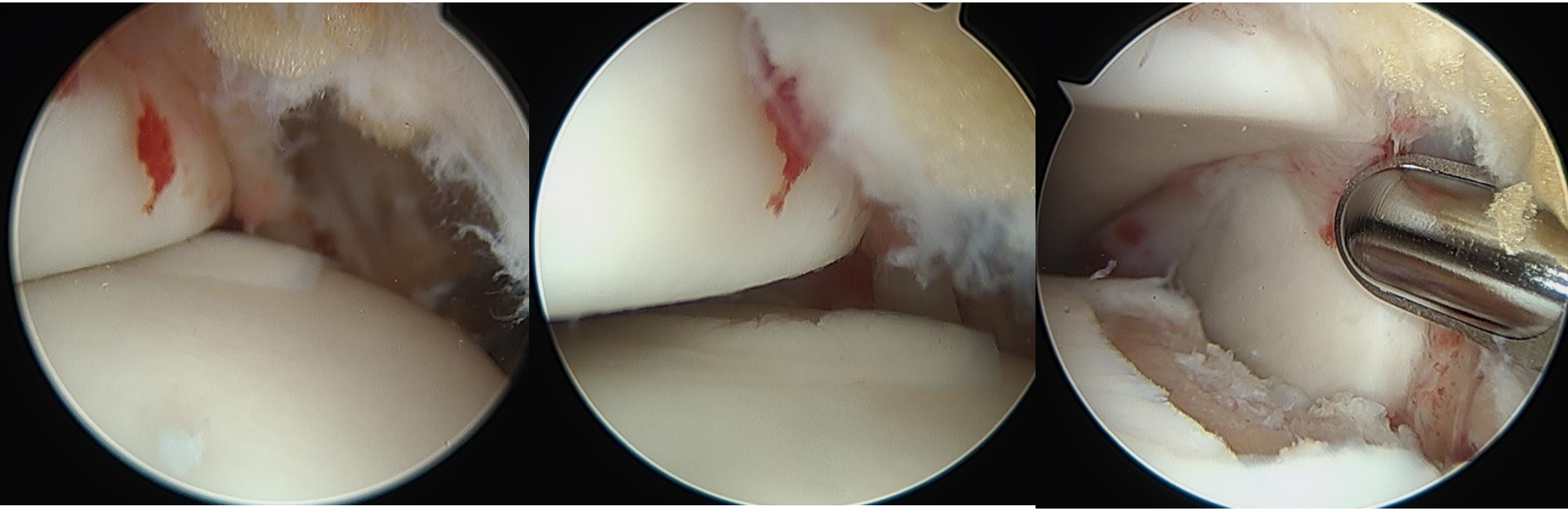


Arthroscopy: Chronic Ankle Instability

- *Ankle lesions at time of ligament stabilization:*
  - Osteochondral injuries
  - Impingement lesions
  - synovitis

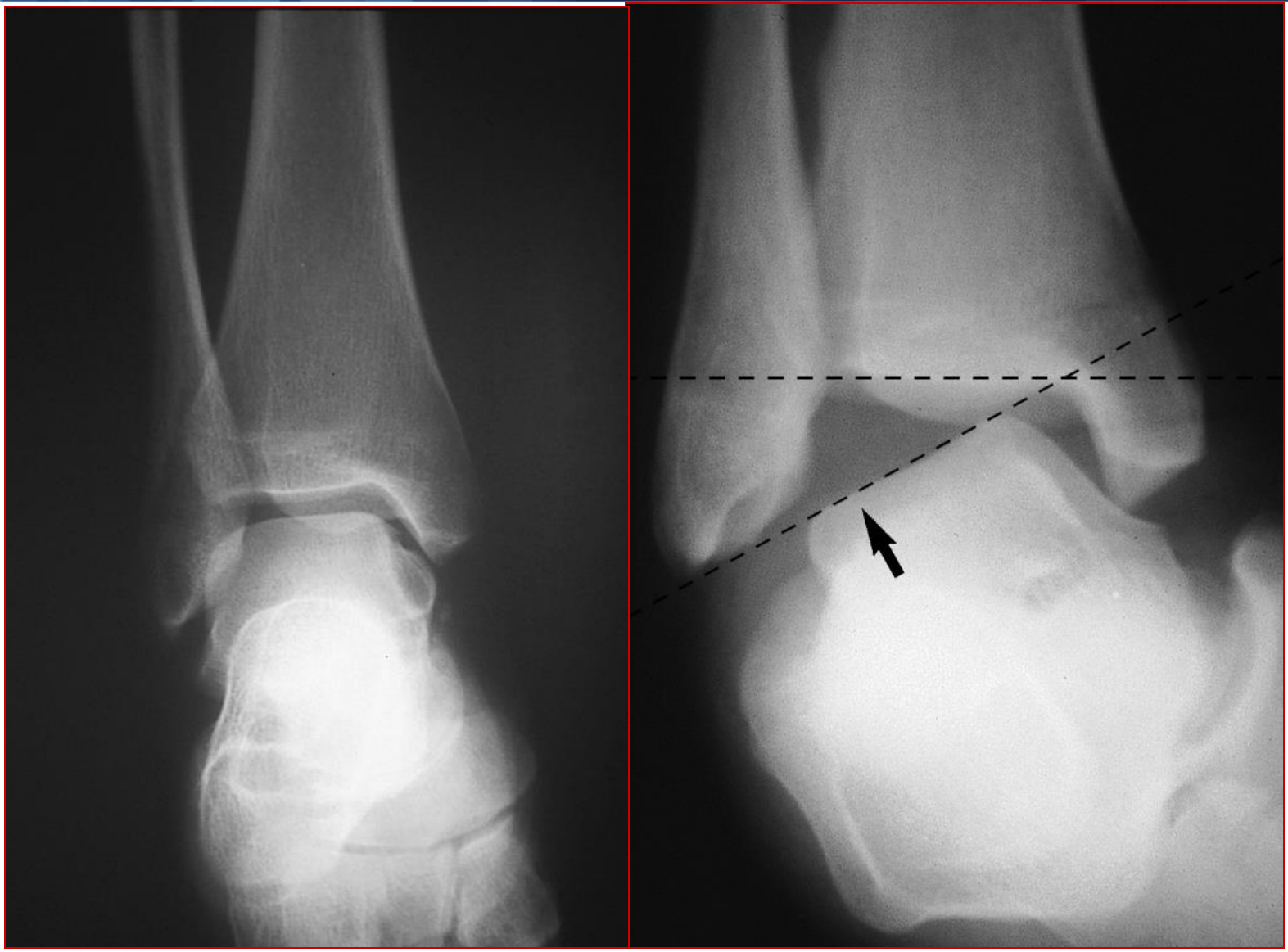


Arthroscopy with ankle instability /OCD



Arthroscopy: Chronic Ankle Instability

- *Komenda GA, Ferkel RD. Arthroscopic findings associated with the unstable ankle. Foot and Ankle Int 20(11):708-713, Nov 1999.*
- *Hinterman B, Boss A, Schafer D. Arthroscopic findings in patients with chronic ankle instability. Am J Sports Med 30(3):402-409, 2002.*
- *Kibler WB. Arthroscopic findings in ankle ligament reconstruction. Clin Sport Med 15(4):799-803, Oct 1996.*
- *Taga I, Shino K, Inoue M, Nakata K, Maeda A. Articular cartilage lesions in ankles with lateral ligament injury. Am J Sports Med 21(1):120-127, 1993.*

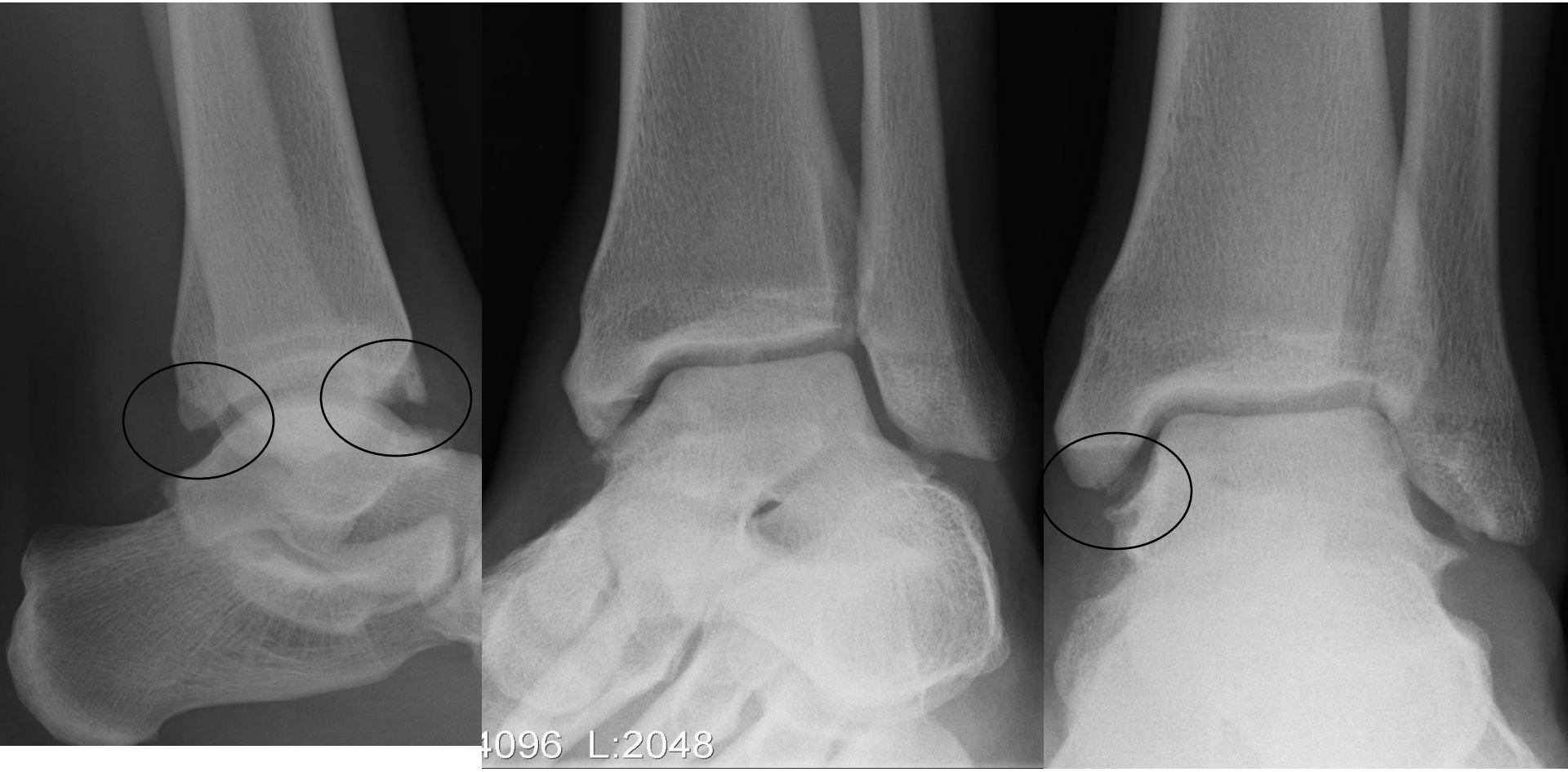


Acute Ankle Instability

- Acute Ankle Arthroscopy:

- van Djik (1994)
  - 66% medial talar chondral lesion

Ankle pain ; recurrent sprains



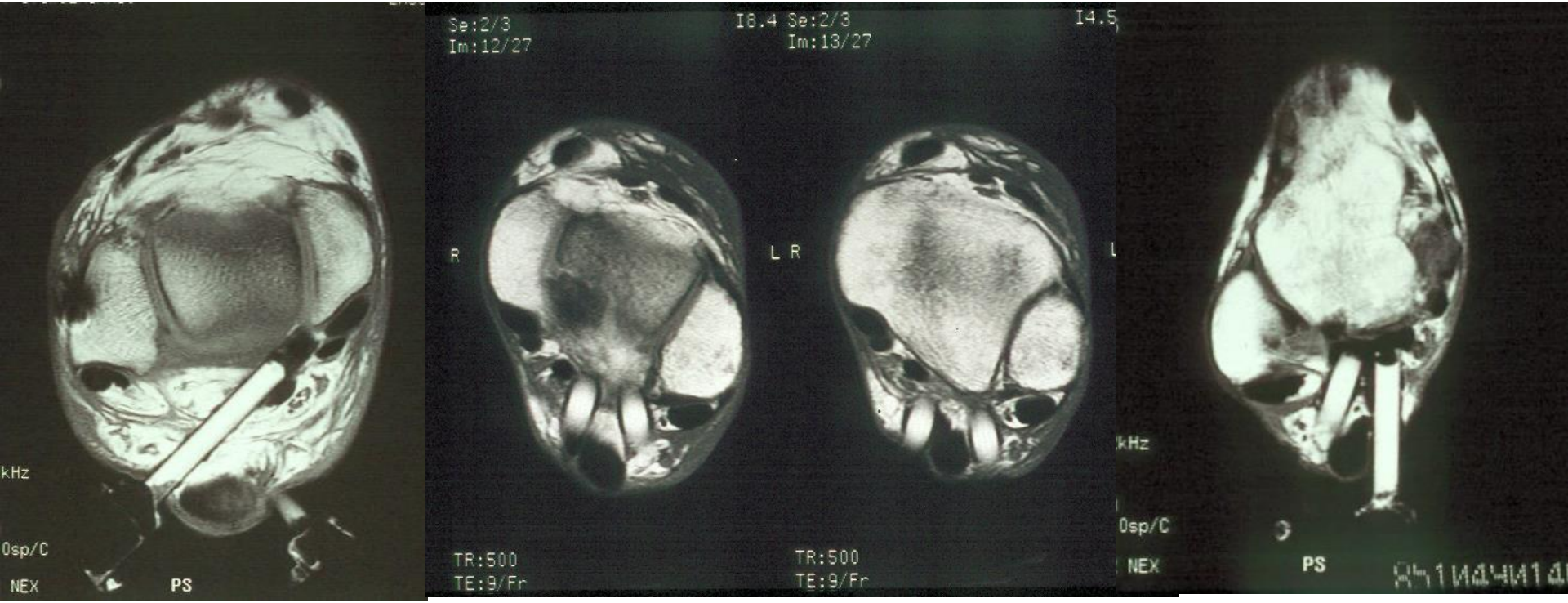
Ankle Arthroscopy

Evolving Indications:

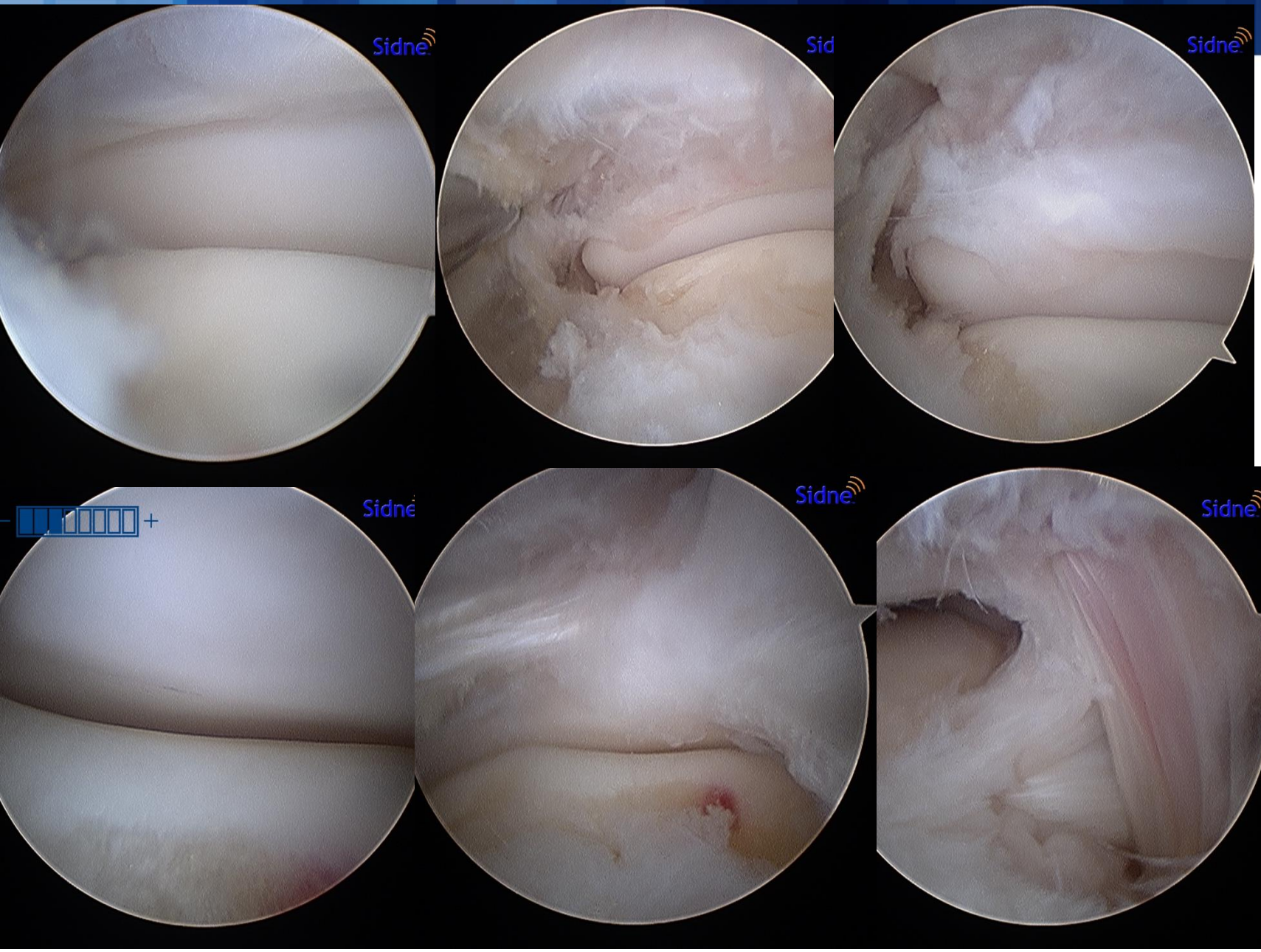
- Arthrodesis
- Acute ankle fractures
- *Posterior ankle arthroscopy/ subtalar joint*
- Tendoscopy / periarticular

Prone Ankle Arthroscopy

Sitler et al, Anatomical Study



Sitler, D., M.D., Amendola, A., M.D., Bailey, C.S., M.D., Thain, L., M.D. and Spouge, A., M.D. Posterior Ankle Arthroscopy, An Anatomic Study.JBJS, May 2002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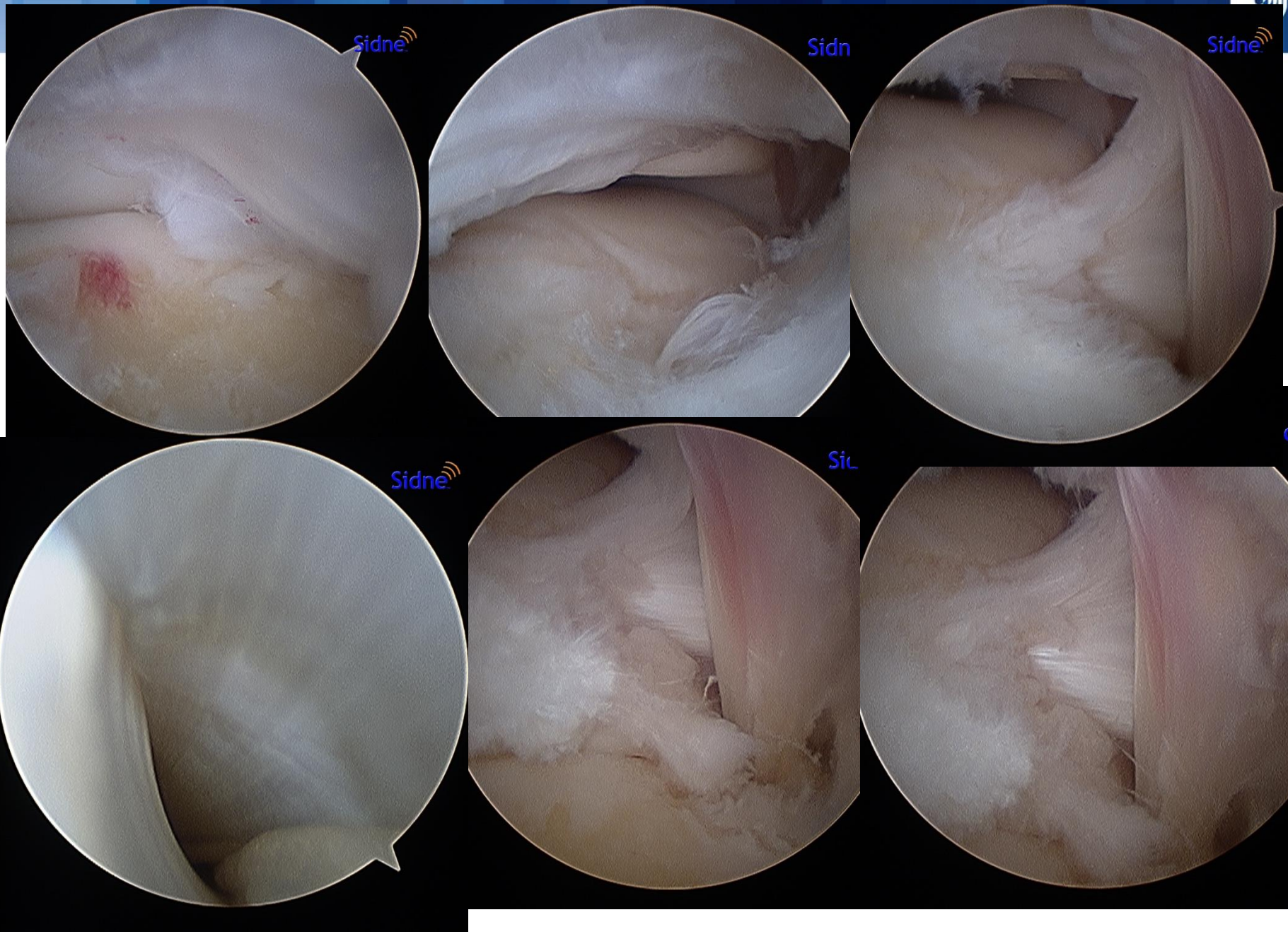


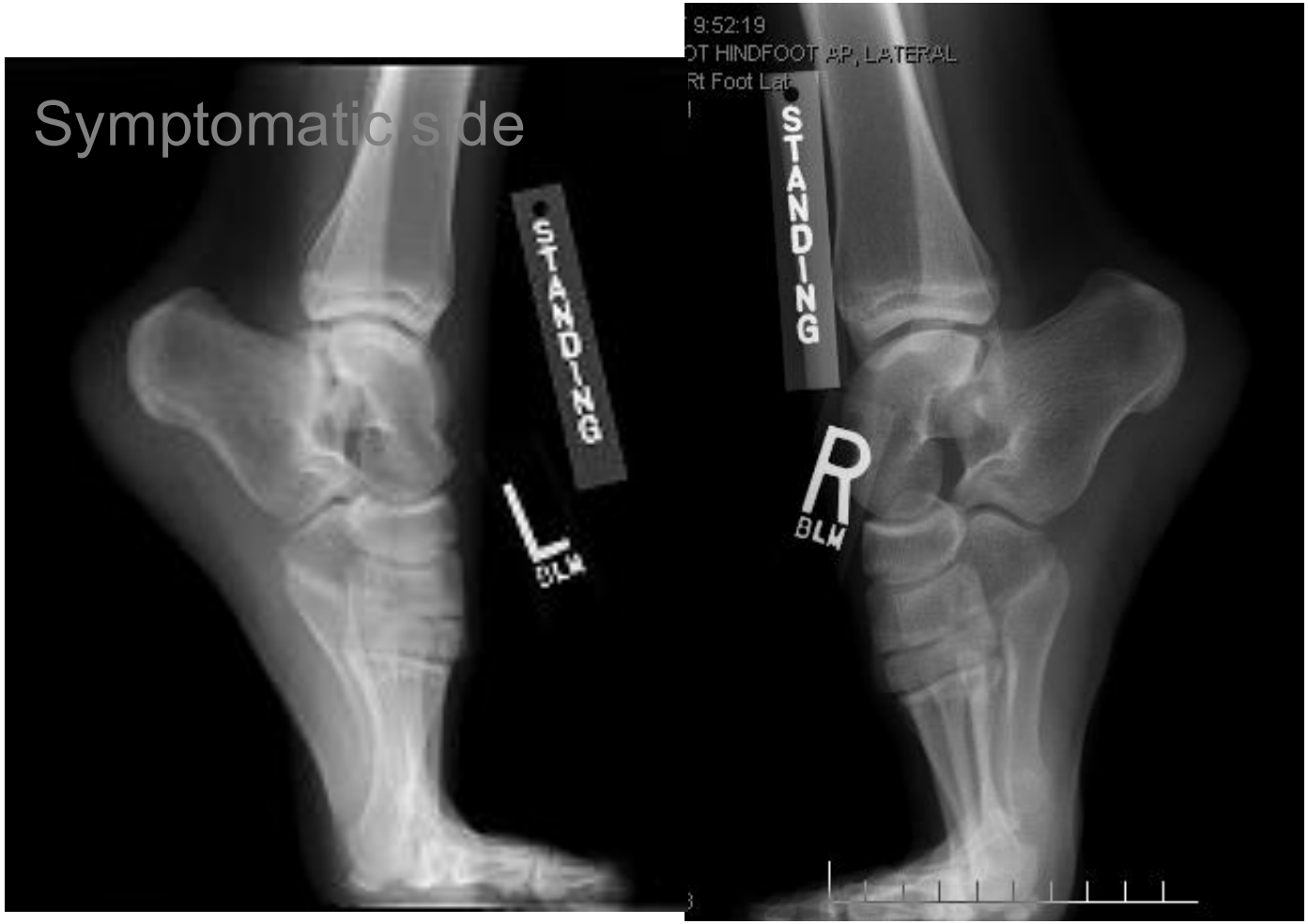
Posterior Arthroscopic Approach

Indications

- Os trigonum / FHL impingement
- Posterior ankle impingement
- Posterior OLT
- Posterior talar body fractures
- PASTA : ST Arthrodesis

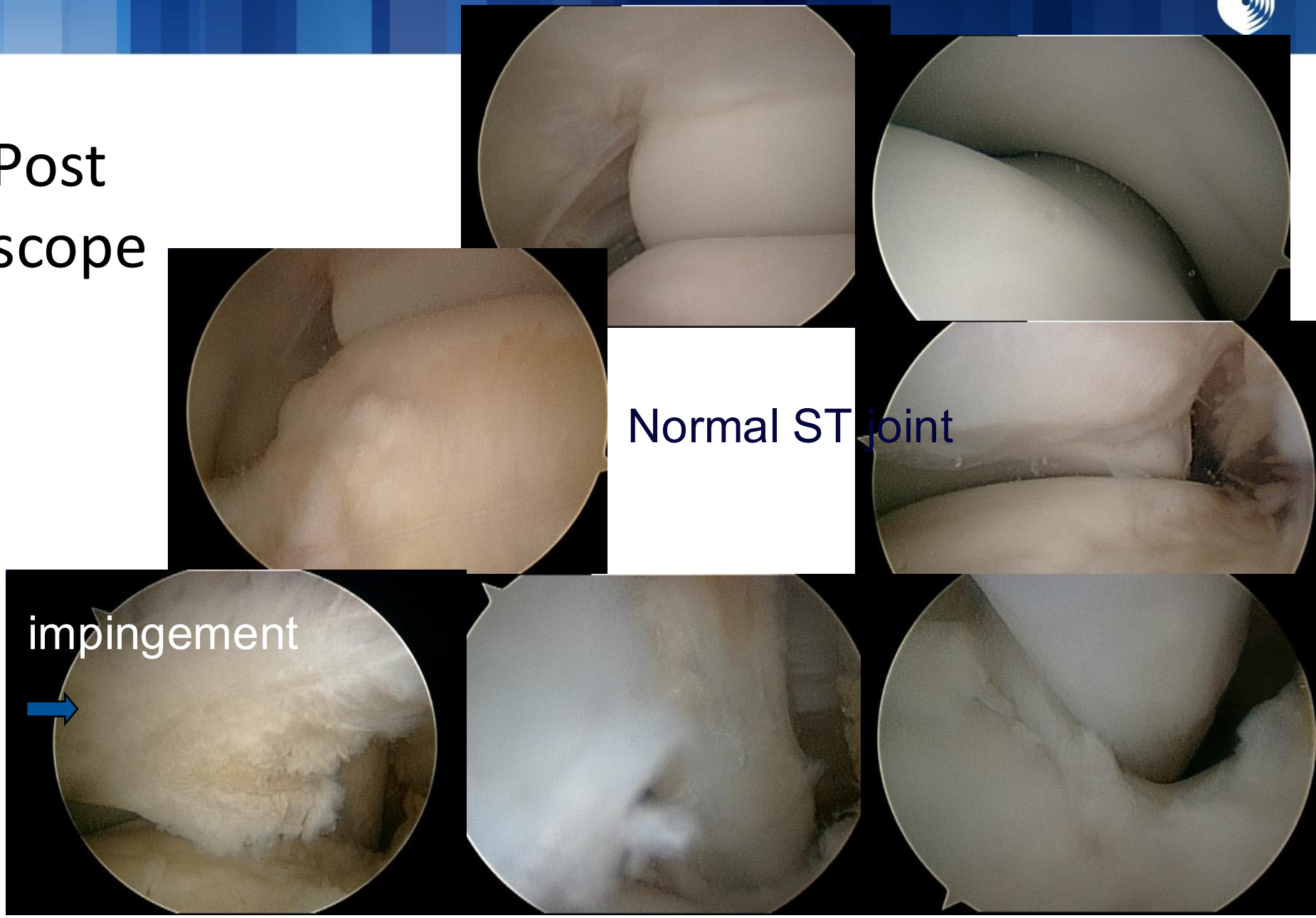
1. Kevin Willits, Heleen Sonneveld, Annunziato Amendola, J. Robert Giffin, M.D, Sharon Griffin, and Peter J. Fowler, Outcome of Posterior Ankle Arthroscopy for Hindfoot Impingement, Arthroscopy, 2007
2. Amendola A, Lee KB, Saltzman CL, Suh JS Technique and early experience with posterior arthroscopic subtalar arthrodesis. Foot Ankle Int. 2007 Mar;28(3):298-302

Posterior impingement in ballet dancer



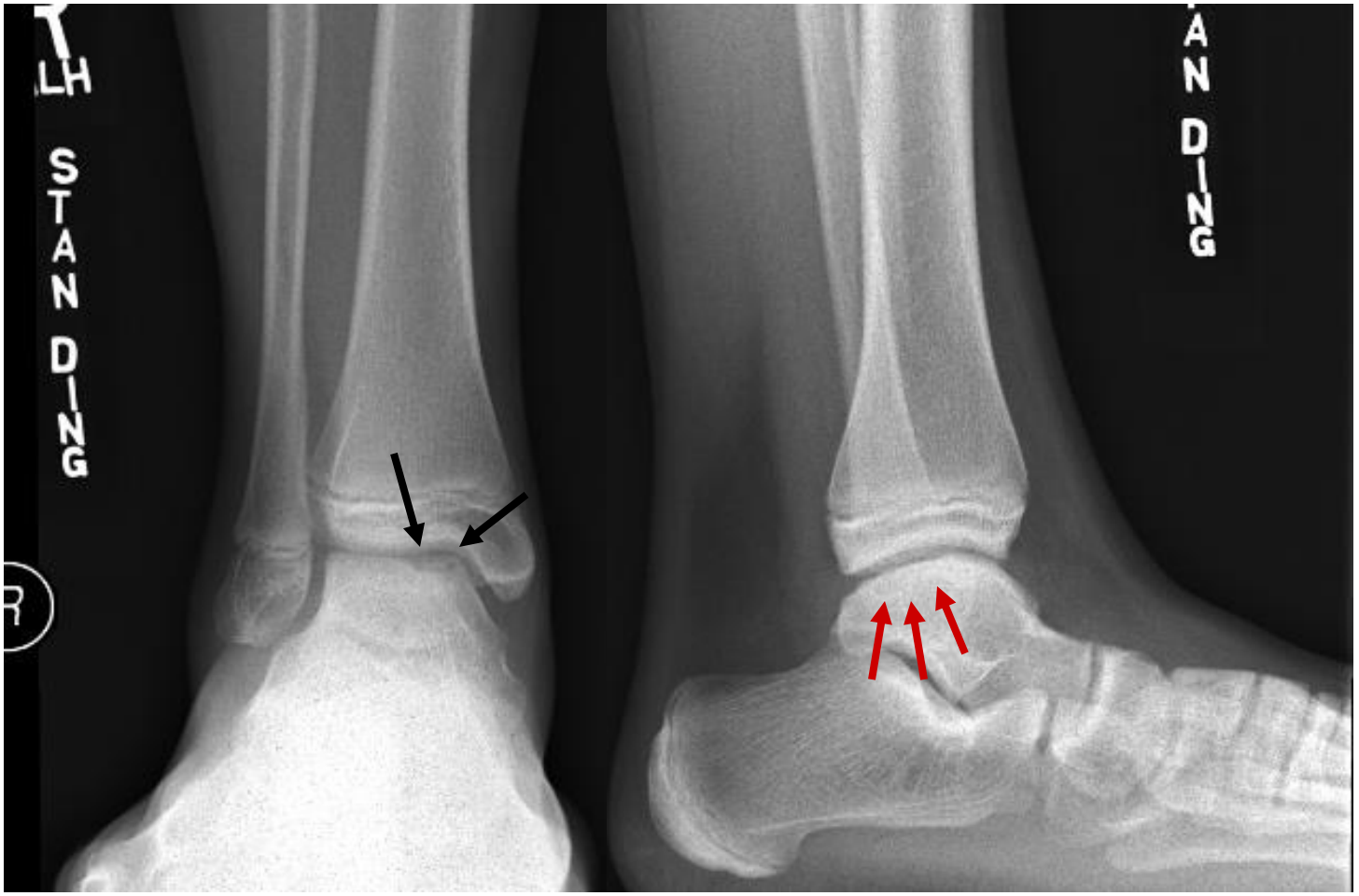
xrays

Post scope



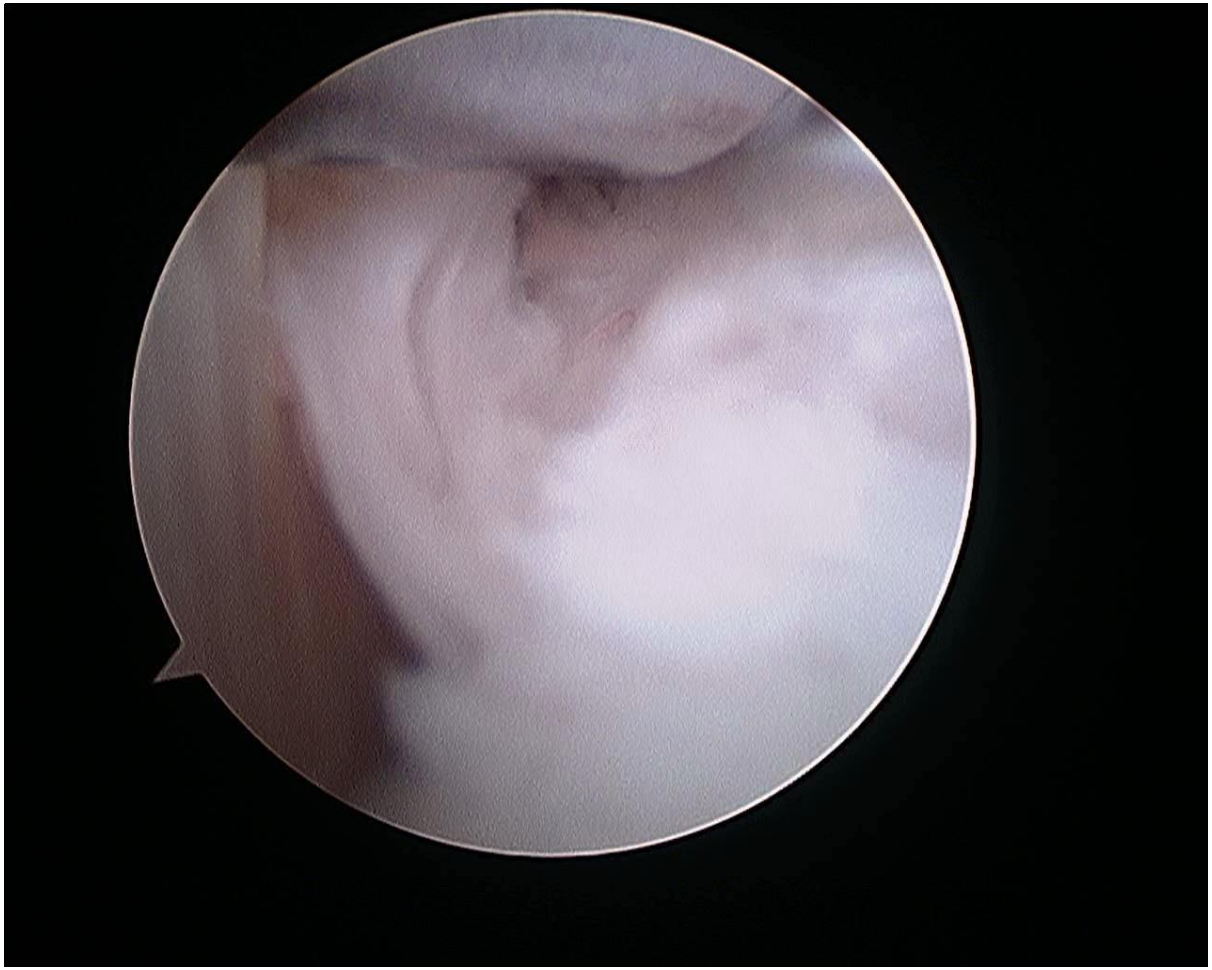
Os Trigonum

15 yo F Posteromedial OLT



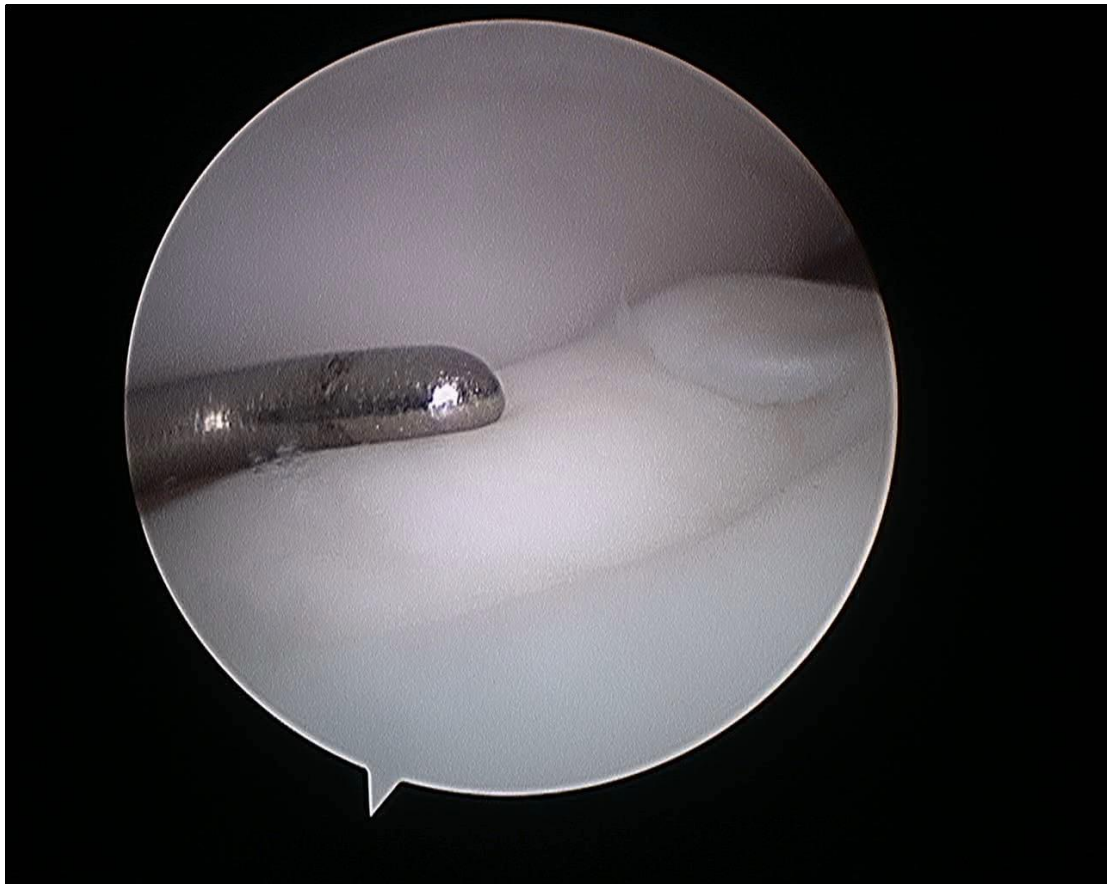
Posterior arthroscopy

- Ankle
  - OLT



Posterior arthroscopy

- Ankle
  - OLT



Prone posterior arthroscopy

Posterior ankle arthroscopy

- tarsal (talocalcaneal) coalition

- *Technique for arthroscopic excision of tarsal coalition ; Journal of Arthroscopy and Related Surgery , 2010*

Posterior ST/ankle arthroscopy

- tarsal coalition

Posterior ST/ankle arthroscopy

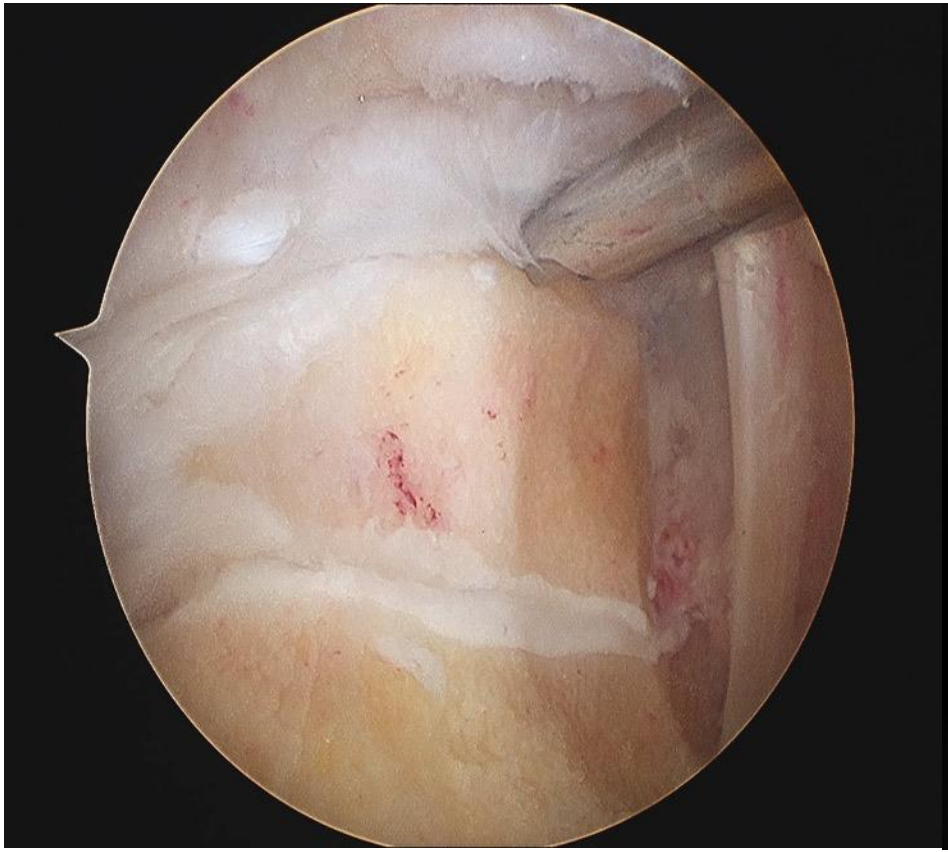
- tarsal coalition

Posterior ST/ankle arthroscopy

- tarsal coalition

Posterior ST/ankle arthroscopy

- tarsal coalition post excision



Posterior ankle arthroscopy

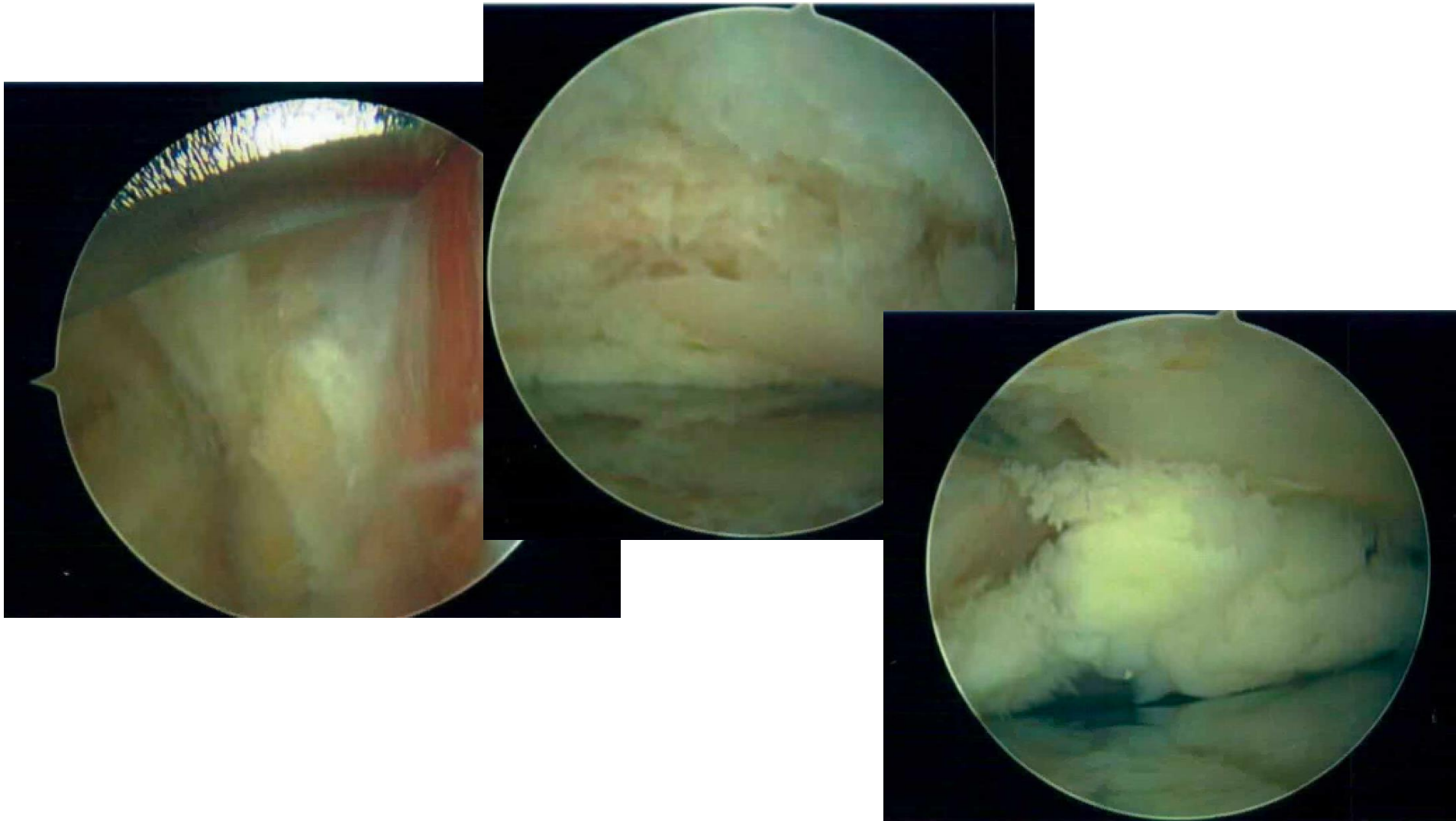
- TAR posterior impingement

Posterior ankle arthroscopy

- TAR posterior impingement

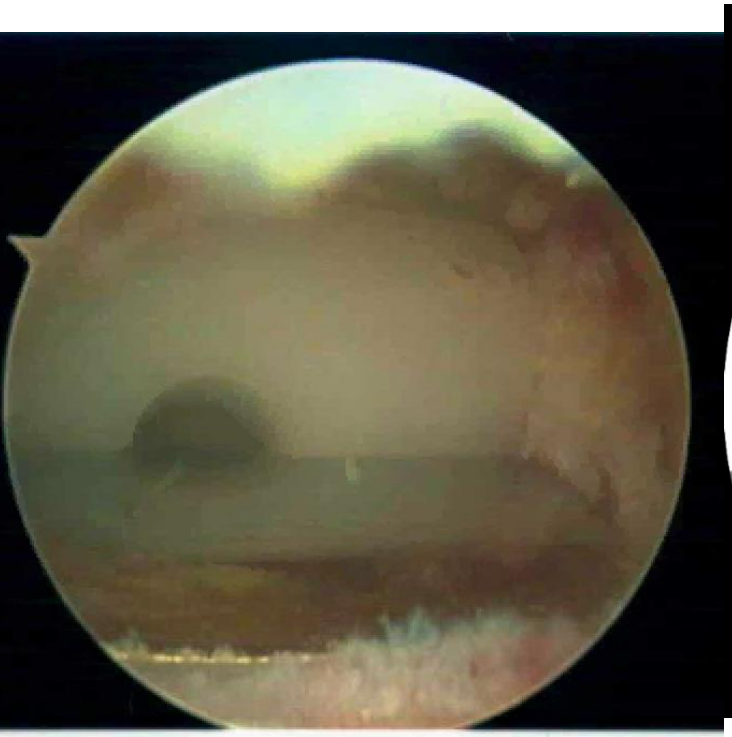
Posterior ankle arthroscopy

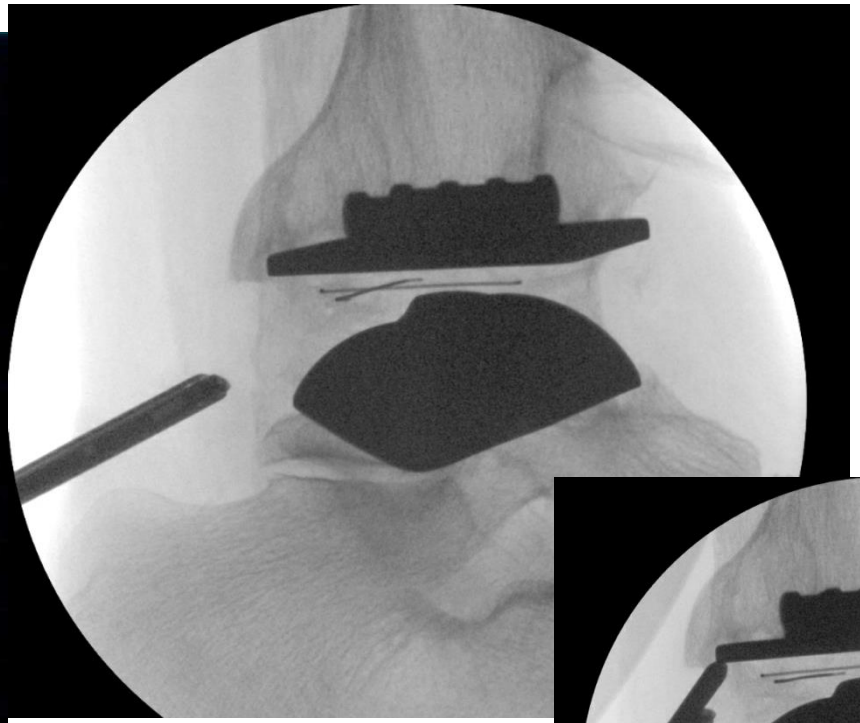
- TAR posterior impingement



Posterior ankle arthroscopy

- TAR posterior impingement





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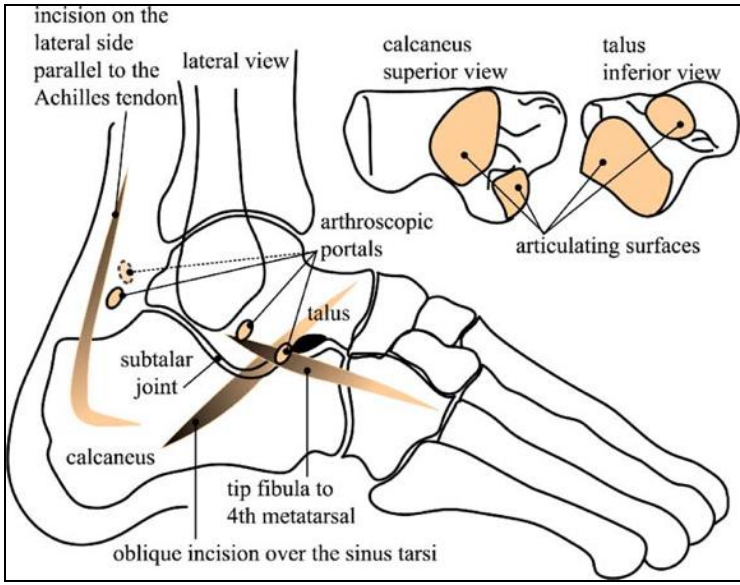
2. Amendola A, Lee KB, Saltzman CL, Suh JS Technique and early experience with posterior arthroscopic subtalar arthrodesis. Foot Ankle Int. 2007 Mar;28(3):298-302

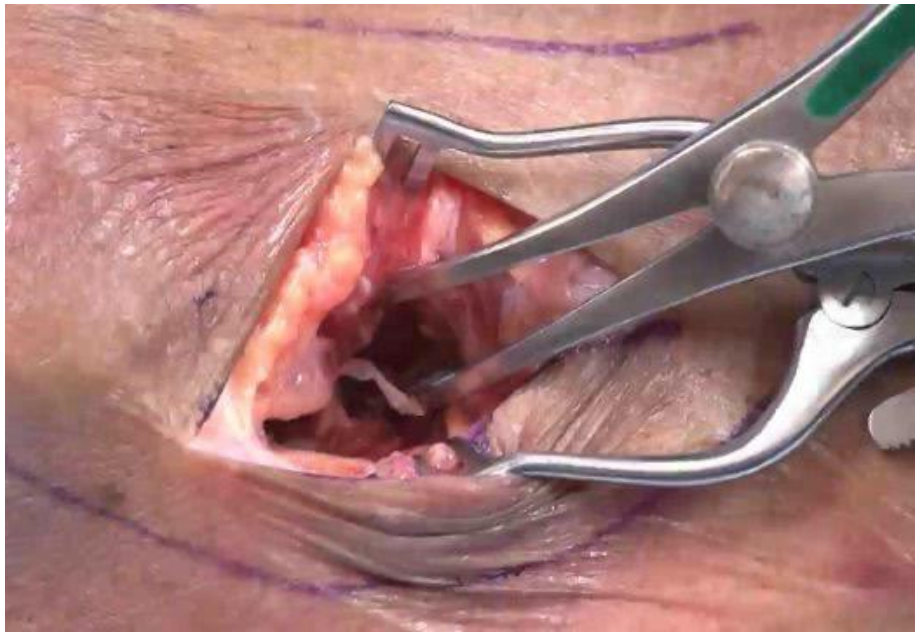
Introduction:

- Open subtalar arthrodesis
- Traditional treatment
  - Isolated joint involvement
  - Minimal deformity
- Effective in terms of
  - Relieving pain
  - Improve function

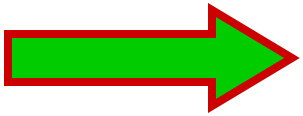
Van Dijk et al, 2010



ST arthrodesis (PASTA)



Plain



Beautiful

Introduction:

- Arthroscopic arthrodesis

Table 1
Arthroscopic techniques

Author	N	Preoperative Diagnosis	Technique (portals)	Fusion Rate (%)	Average Time of Fusion (weeks)	AOFAS
Scranton[22] (1999)	5	Subtalar arthrosis	AL, PL, PLacc	100	n/r	n/r
Tasto[4,5] (2003)	25	Subtalar arthrosis	AL, PL	100	8,9	n/r
Glanzmann and Sanhueza-Hernandez[14] (2007)	41	Primary arthritis, posttraumatic osteoarthritis	AL, PL	100	11	53–84
Amendola et al[11] (2007)	11	Primary arthritis, posttraumatic osteoarthritis, tarsal coalition	PL, PLacc, PM	91	10	36–86
Beimers et al[8] (2009)	3	Tarsal coalition	PL, PM, PLacc	100	6	n/r
El Shazly et al[15] (2009)	10	Posttraumatic arthritis (calcaneal fracture)	AL, ALacc, PL	100	11.4	38–74
Gómez et al[21] (2010)	12	Posttraumatic arthrosis	PL, PM, PLacc	84	15	n/r
Lee et al[7] (2010)	16	Posttraumatic arthritis (calcaneal fracture)	PL, PM	94	11	35–84

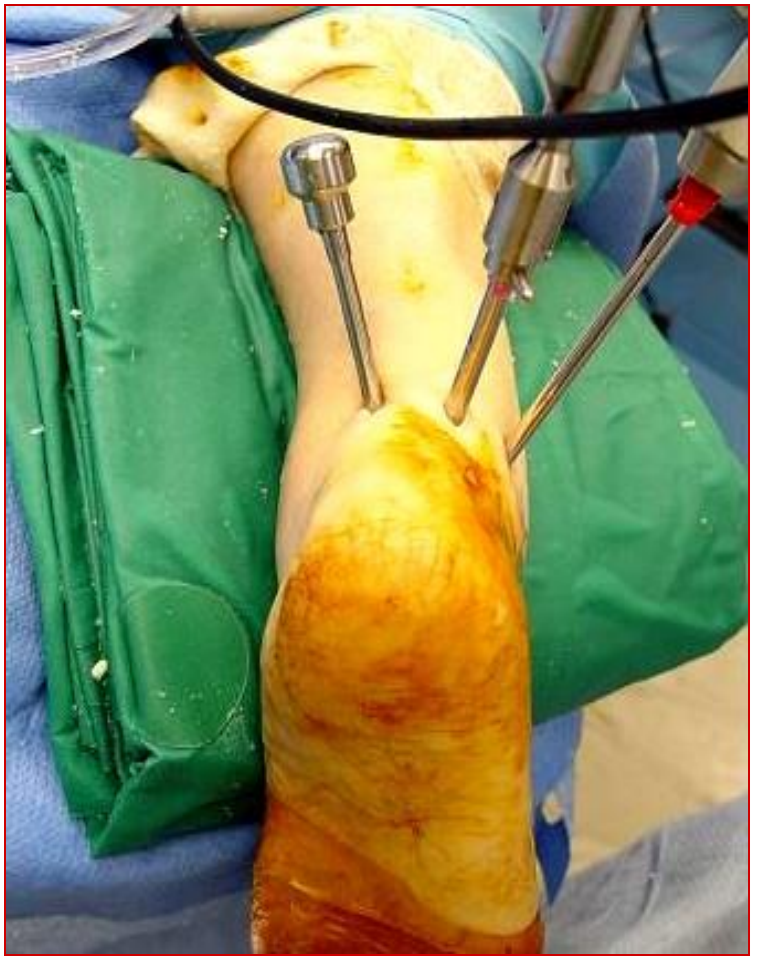
Abbreviations: AL, anterolateral; ALacc, accesory anterolateral; AOFAS, American Orthopaedic Foot & Ankle Society score; PL, posterolateral; PLacc, accesory postrolateral; PM, posteromedial.

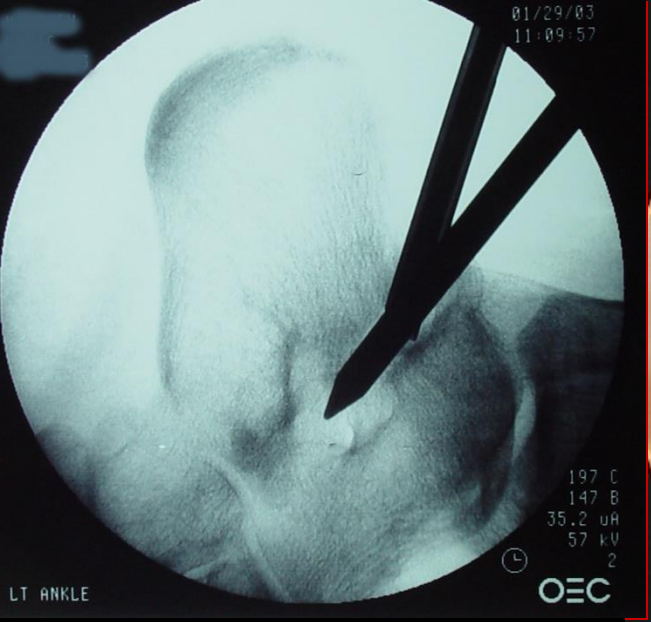
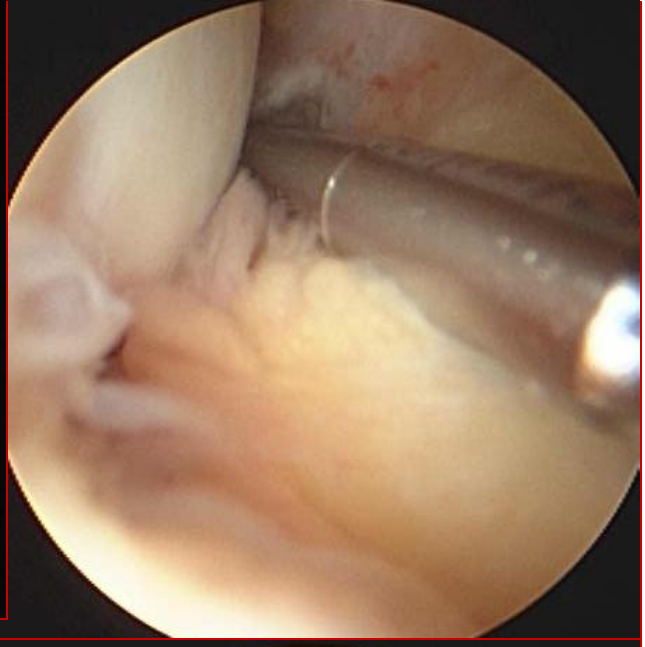
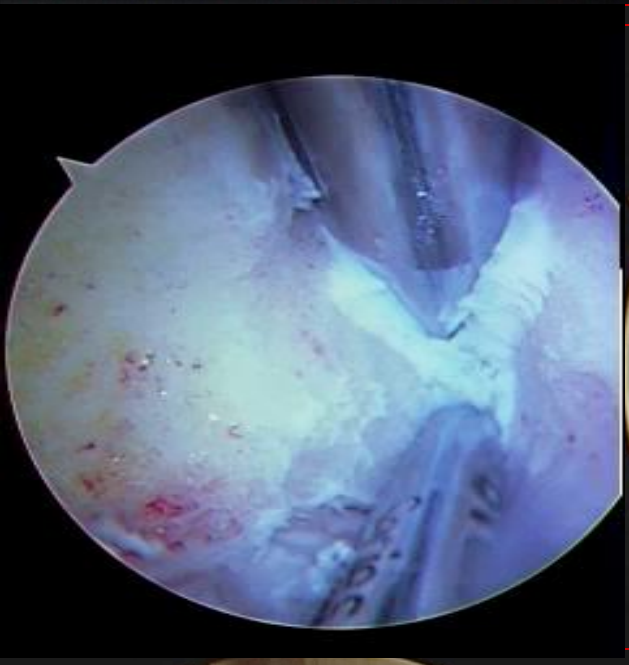
Muraro et al, review, F&A clinics 2011

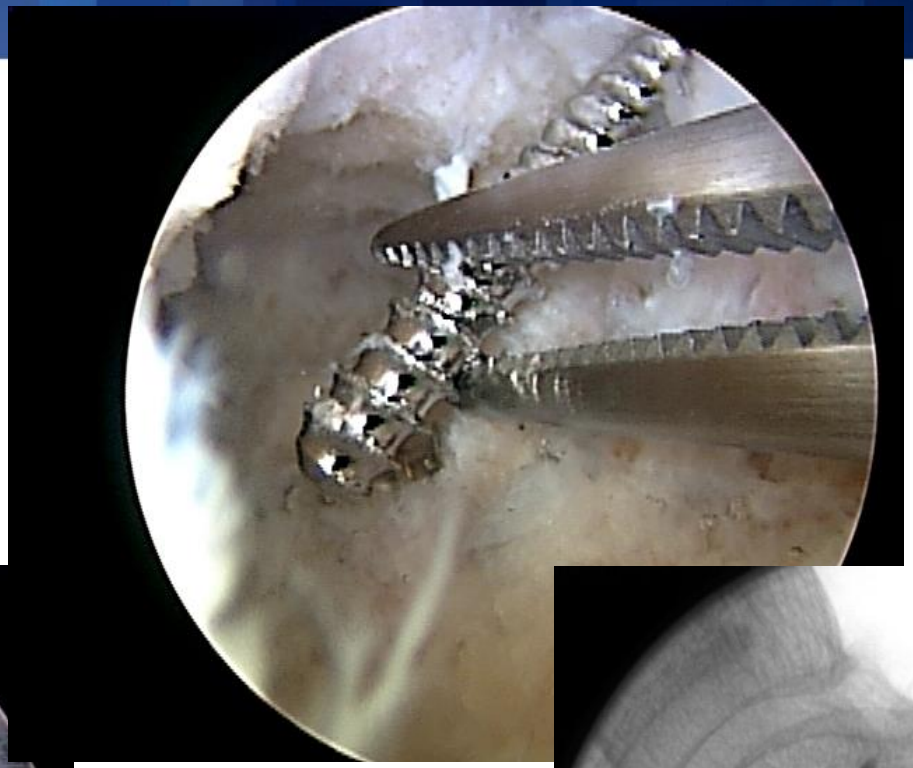
Posterior Arthroscopic SubTalar Arthrodesis (PASTA)

Amendola et al, Arthroscopic Subtalar Arthrodesis Foot and Ankle, 2007

PASTA Set Up




01/29/03
11:09:57
197 C
147 B
35.2 uA
57 kV
2
LT ANKLE
OEC



Materials and Methods:

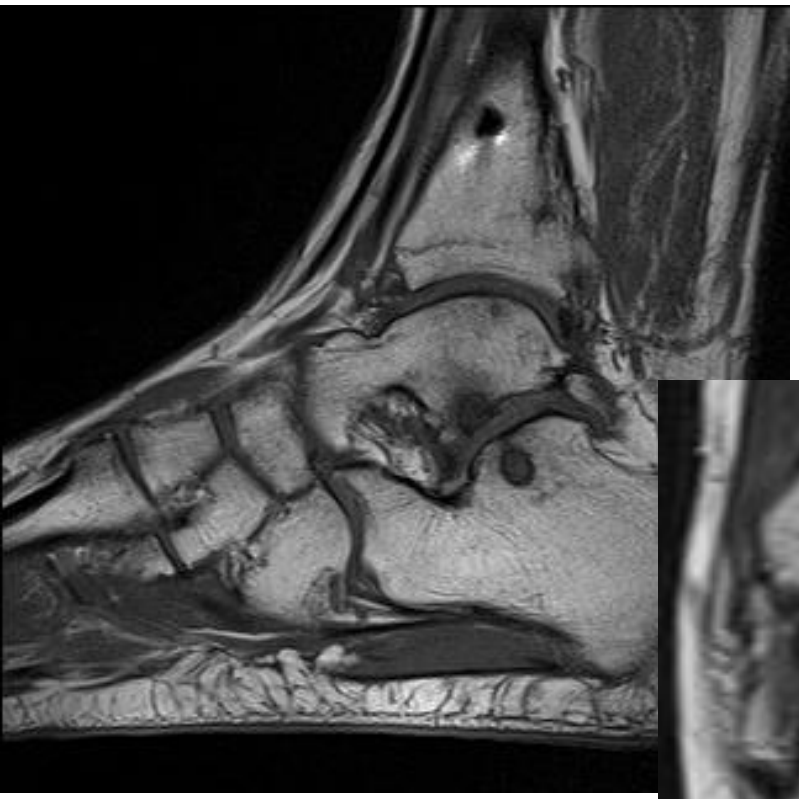
- Retrospective chart review
- between 2001 and 2012
- 52 consecutive patients (56 feet) open ST arthrodesis
- 56 consecutive patients(61 feet) PASTA

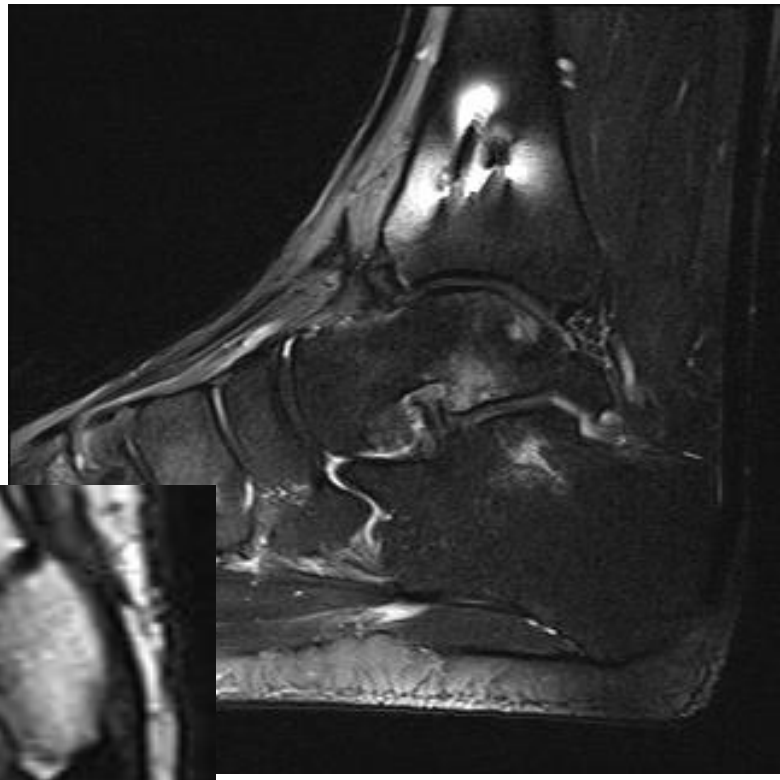
Outcomes and Complications After Open Versus Posterior Arthroscopic Subtalar Arthrodesis in 121 Patients

Rungprai, Chamnanni MD[1,2,a]; Phisitkul, Phinit MD[1]; Femino, John E. MD[1]; Martin, Kevin D. DO[3]; Saltzman, Charles L. MD[4]; Amendola, Annunziato MD[1] **Author Information**

The Journal of Bone and Joint Surgery: April 20, 2016 - Volume 98 - Issue 8 - p 636-646

Case 3 30 yo M , ST pain and stiffness following ankle resurfacing

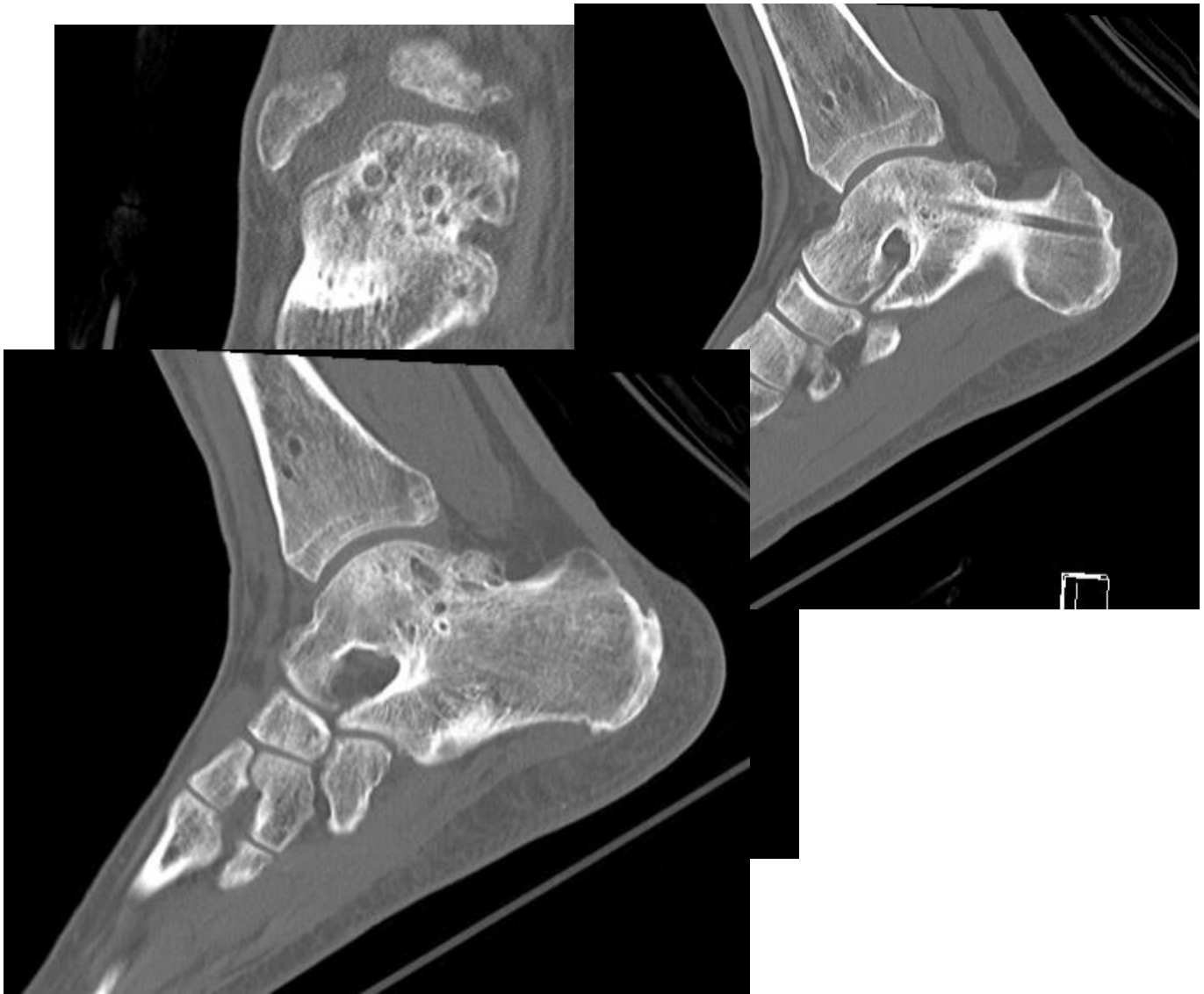




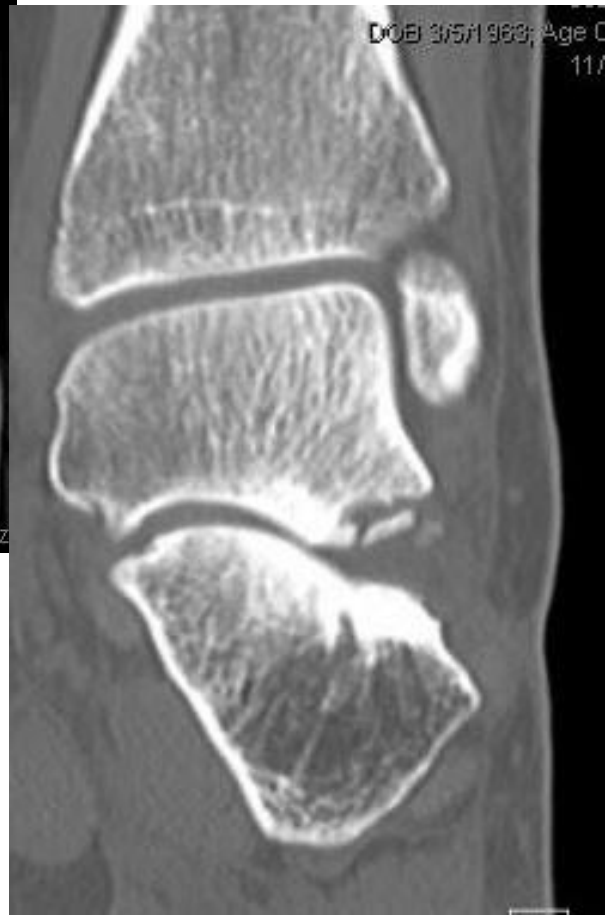
Case 3

- 6 months doing well
- Pain at heel
- Hardware removal
- CT scan

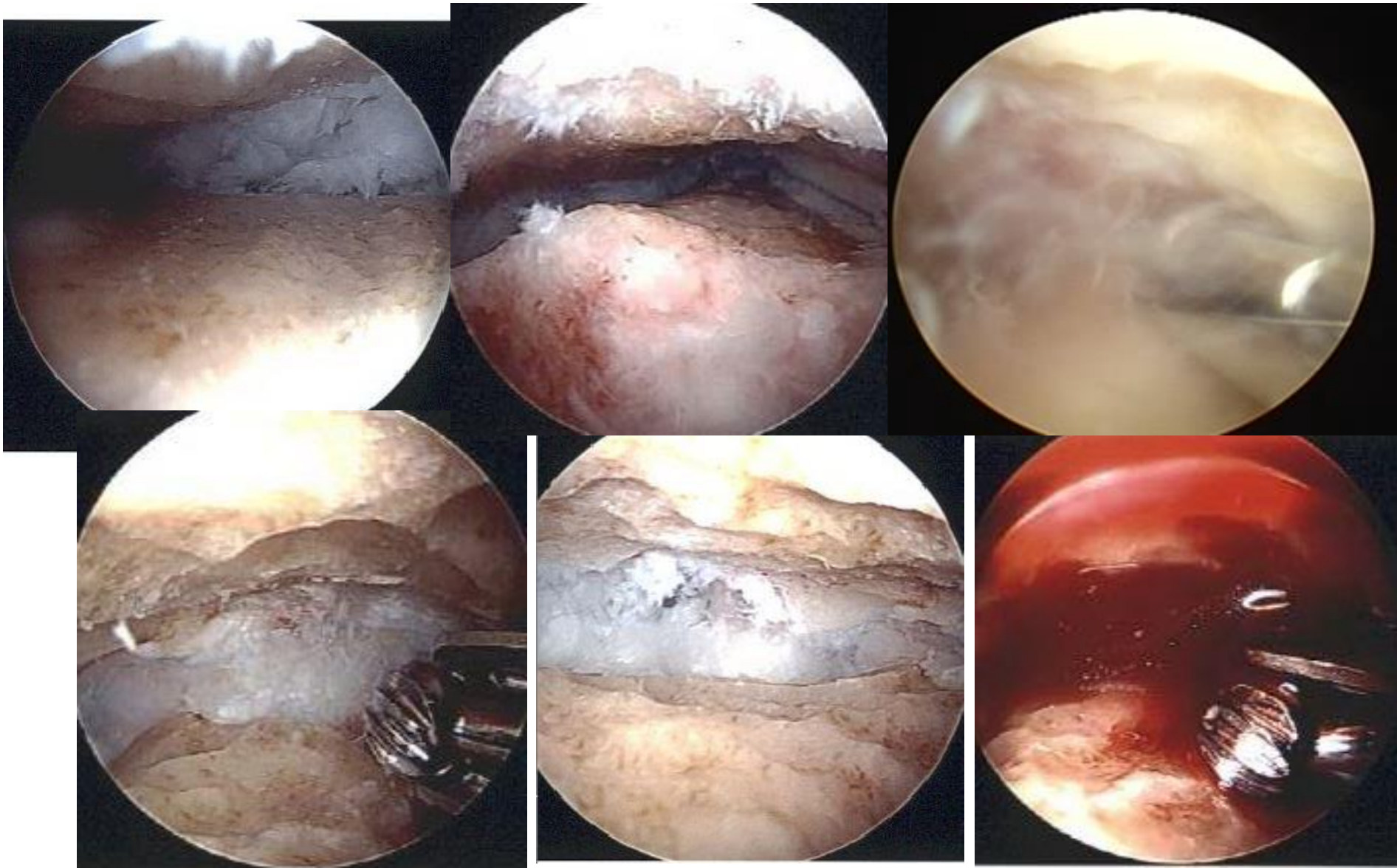
Case 3 cont



Case 1 :45 yo triathlete



Case 1 cont



- 6 weeks immobilization / TWB
- 4weeks WBAT
- 3 months walking normal
- 6 months back to running activities

Case 1 cont

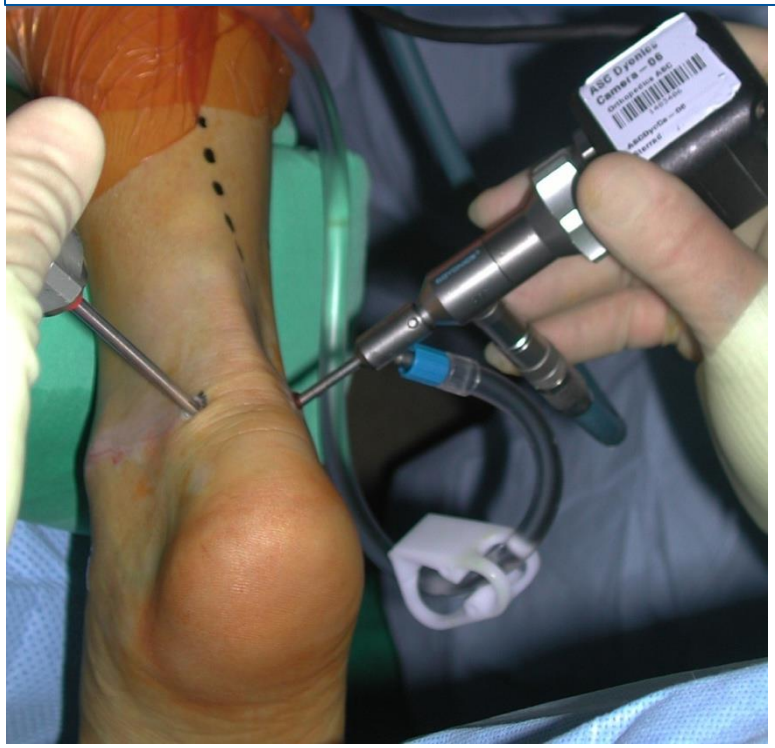
Summary

- ST arthrodesis allows patient to return to previous level of activity
- Keys to success:
  - Isolated OA
  - Neutral alignment
  - Minimal morbidity (arthroscopic)
  - Early rehabilitation

Complications

Postoperative Complications of Posterior Ankle and Hindfoot Arthroscopy

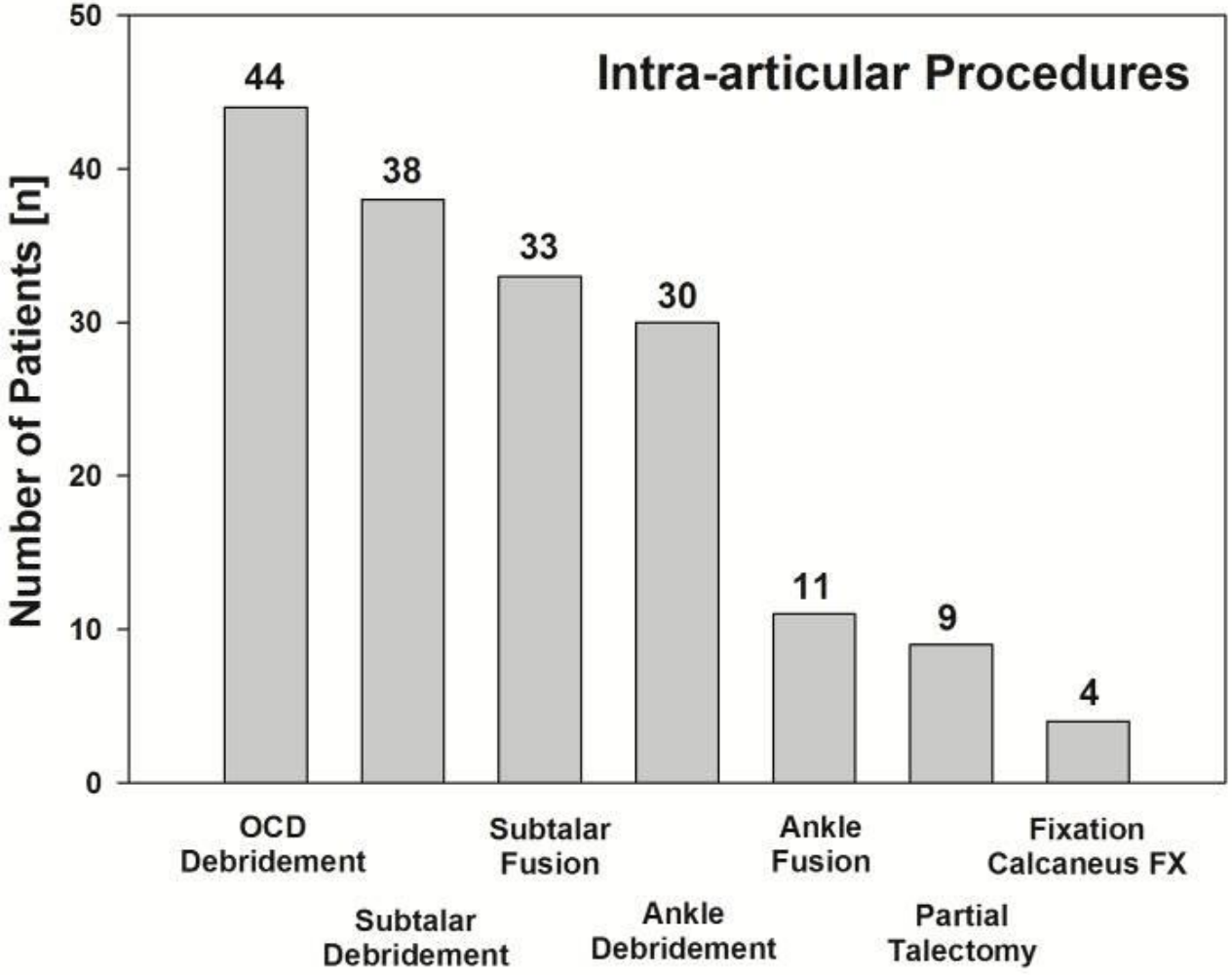
Florian Nickisch, MD, Alexej Barg, MD, Charles L. Saltzman, MD, Timothy C. Beals, MD, Davide E. Bonasia, MD, Phinit Phisitkul, MD, John E. Femino, MD, and Annunziato Amendola, MD



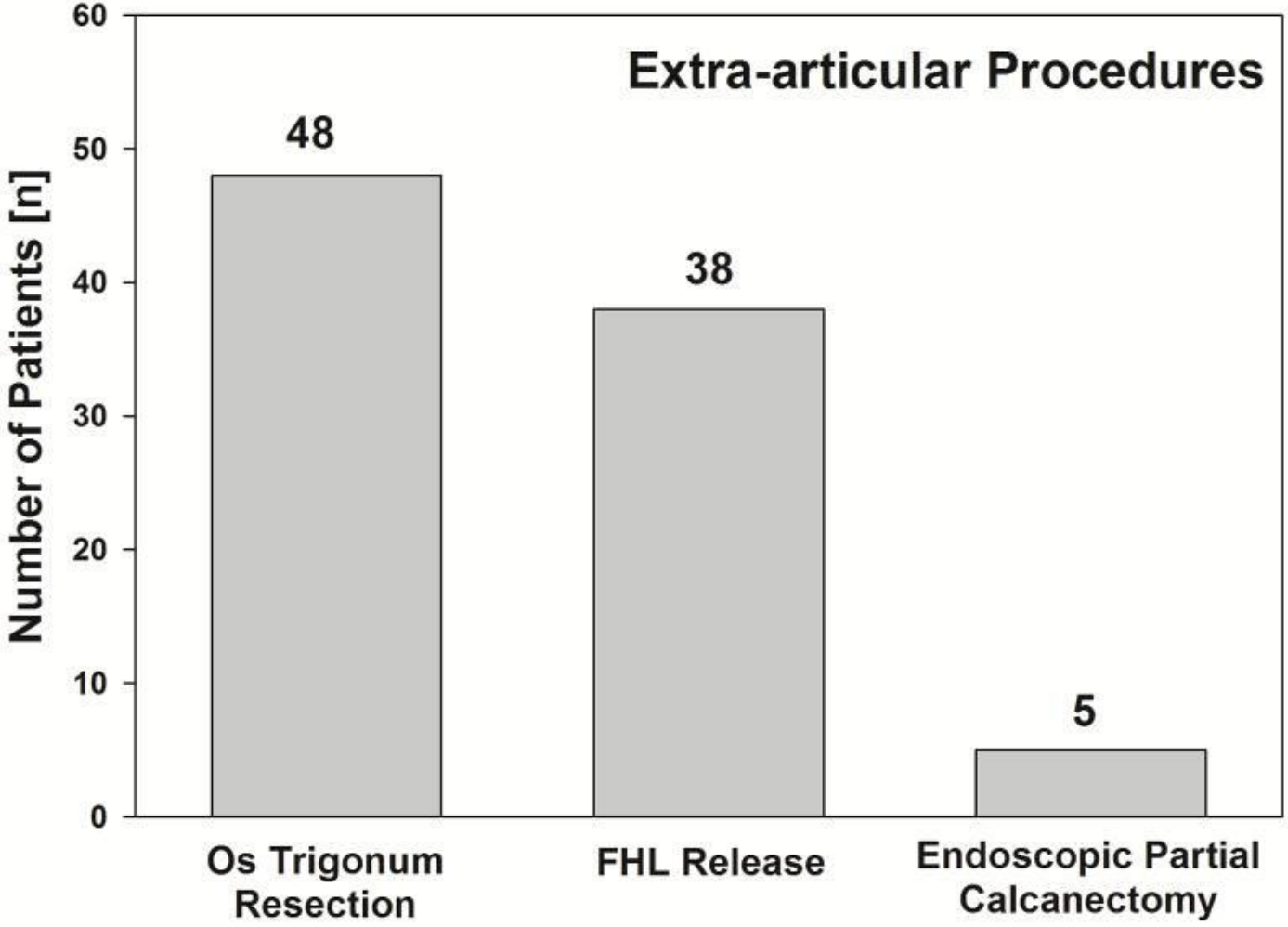
No distraction

Minimally invasive distraction

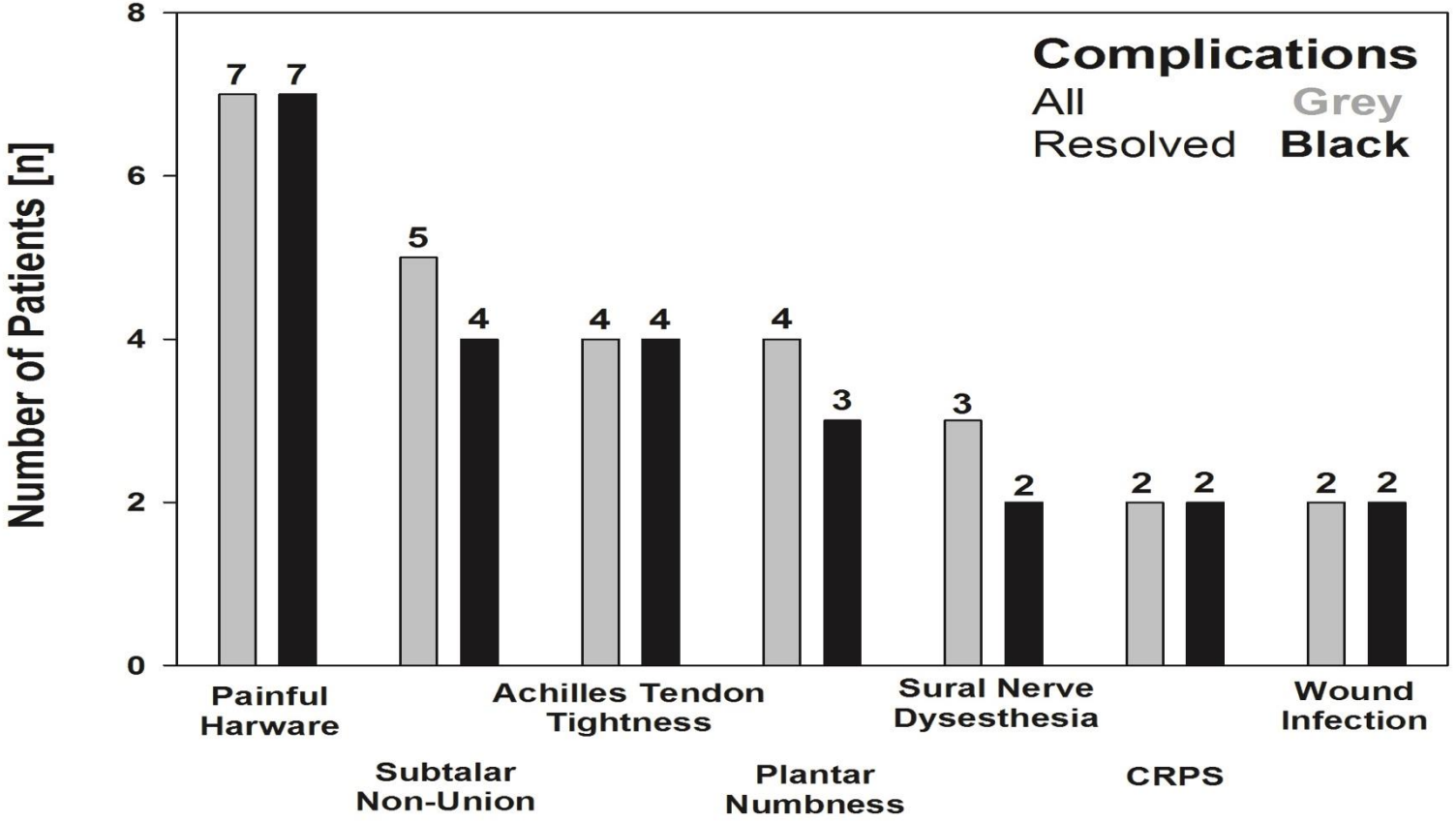
Primary Procedures



Primary Procedures



Complications



Summary

- Foot and ankle arthroscopy is evolving
- Very useful with proper indications
- Minimizes morbidity and earlier return to activity
- As with all (new) procedures , follow the patients and outcomes

Thank You!