

## Syndesmosis: How to Reduce and How Perfect?



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## The Syndesmosis

- **Indications**
  - ◆ Subluxation
  - ◆ Instability
- **Technique**
  - ◆ Fluoroscopic
  - ◆ Open



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## Instability

- **Weber B injuries**

- ◊ Incidence
- ◊ Indications for fixation

- **Weber C injuries**

- ◊ Almost all
- ◊ Posterior malleolus?



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## Weber B, SE Pattern

- **General Criteria**

- **Instability after bony fixation**

- ◊ Bimalleolar
  - Type of medial fracture
  - Cotton test
- ◊ Lateral malleolar
  - Stress test



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## Stress Examination

- **Syndesmotic instability**

- **104 / 291 (36%) ankles**

- **Bimalleolar fractures**

- ◊ 30%

- **Lateral malleolar fractures**

- ◊ 40%

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**32 Year Old Woman**



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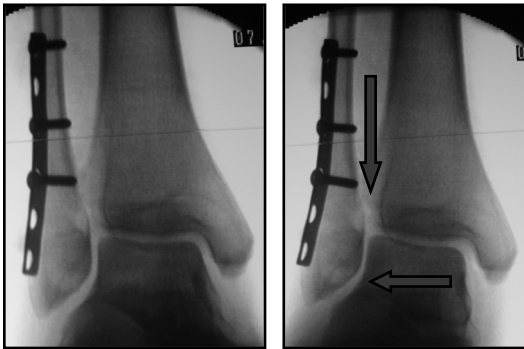
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**S/P ORIF**



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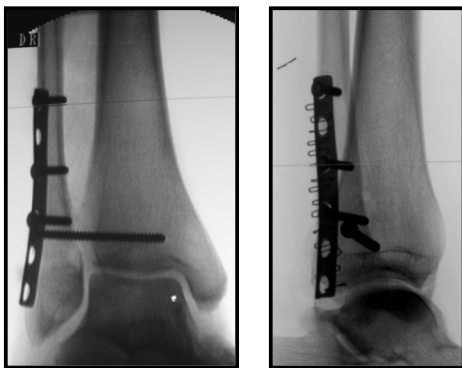
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**Post-op**



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## Weber B Injuries

- Associated with syndesmotic instability
- General criteria abandoned
- Individual evaluation of all cases intraoperatively

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## Does it Matter?

- Must we fix them?
- What happens if we don't?

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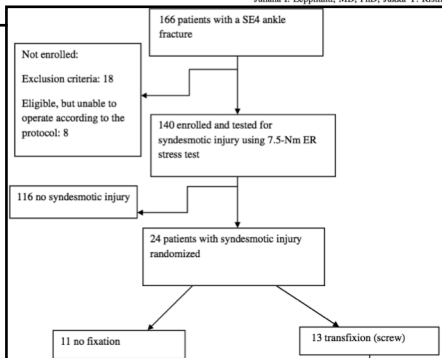
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### Syndesmotic Fixation in Supination-External Rotation Ankle Fractures: A Prospective Randomized Study

Harri J. Pakarinen, MD; Tapio E. Flinkkilä, MD, PhD; Pasi P. Ohtonen, MSc; Pekka H. Hyytiäinen, MD, PhD; Martti T. Lakovaara, MD; Juhana I. Leppilampi, MD, PhD; Jukka Y. Ristiniemi, MD, PhD  
*Oulu, Finland*



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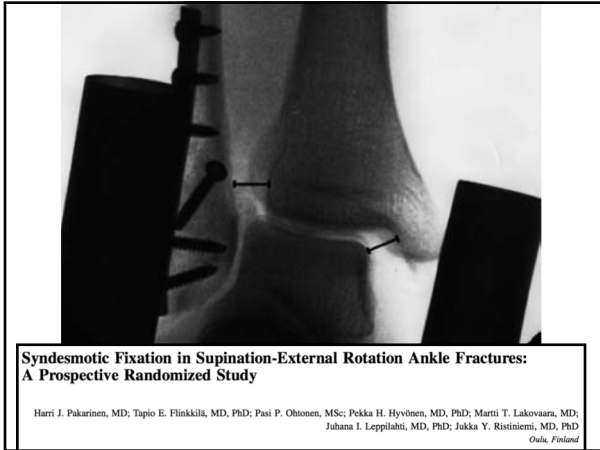
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Oulu, Finland

**Table 2: Syndesmosic Fixation and Self-Reported Disability at 1 Year.**

**NO DIFFERENCE!!**

	Lower	Upper	p	
...	4.0	-8.2	16.3	0.50
...	-14.2	-31.2	3.3	0.38
...	-7.8	-25.5	9.9	0.37
...	0.1	-0.1	0.3	0.23
...	0.2	-0.1	0.5	0.32

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**My Take** 

- **Surprised**
  - ◆ Have done many revisions when injuries are missed
  - ◆ No difference found if screws used
  - ◆ Why take the risk...
- **But...VERY interesting study**

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**Does Syndesmotom Injury Have a Negative Effect on Functional Outcome? A Multicenter Prospective Evaluation**

*Jody Litrenta, MD,\* David Saper, MD,\* Paul Tornetta III, MD,\* Laura Phieffer, MD,† Clifford B. Jones, MD,‡ Brian H. Mullis, MD,§ Kenneth Egol, MD,|| Cory Collinge, MD,¶ Ross K. Leighton, MD,\*\* William Ertl, MD,†† William M. Ricci, MD,‡‡ David Teague, MD,††† and Janos P. Ertl, MD§*

**TABLE 3. SMFA—Mixed Linear Regression**

	Syndesmotom Injury	Adjusted Mean	P
Week 6	Yes	36.49	0.76
	No	35.86	
Week 12	Yes	28.83	0.02
	No	22.68	
Week 26	Yes	15.66	0.73
	No	14.79	
Week 52	Yes	13.51	0.32
	No	10.96	
		<b>Adjusted Mean</b>	<b>P</b>
Gender			
Female		24.77	0.002
Male		19.35	

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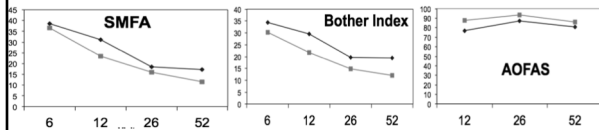
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Group	SMFA*	Bother*	AOFAS
Syndesmosis injury	17.19	19.36	80.58
No Syndesmotom injury	11.60	12.06	85.89
P Value	0.04	0.05	0.21




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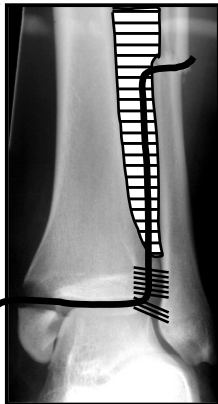
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**Weber**

- Type “C”
- Above the syndesmosis
- Assumes tib - fib dissociation




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## Operative Indications

- Instability after bony fixation

- Bimalleolar

- Type of medial fracture
- Cotton test

- Lateral malleolar

- Stress test

- In lieu of fibular fixation

- Stabilizes fibula as well



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## Fixation

- After fixation

- Instead of fibular fixation



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## Fixation

- After fixation

- Instead of fibular fixation



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## Syndesmotic Injury

- Instability is NOT just posterior
- Rest ankle, not heel on bolster
  - Avoids anterior subluxation
- Don't forget the lateral radiograph



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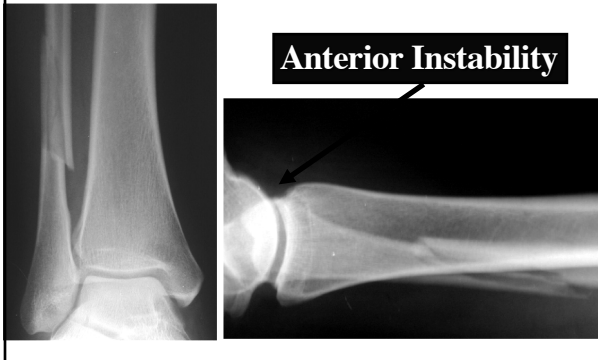
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## Weber C



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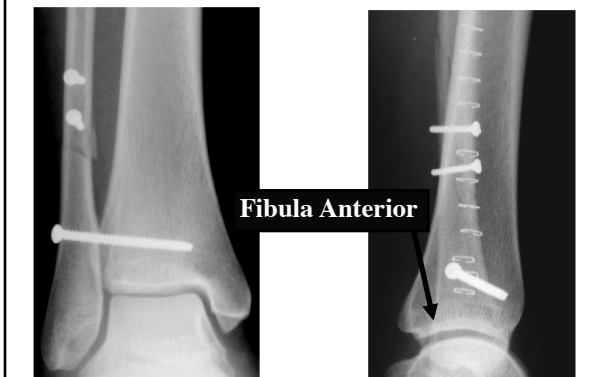
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## S/P ORIF



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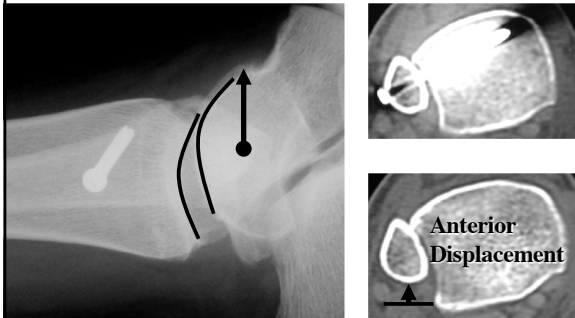
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### S/P ORIF



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### Reduction Techniques

- Fluoroscopic
- Open methods



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### Reduction

- Position of ankle
  - ◊ Dorsiflexion → lateral subluxation
- Can cause malunion



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## Ankle Position

- Dorsiflexion  $\square$  malreduction
- Dorsiflexion not necessary
- Position of the foot irrelevant
- *Make sure syndesmosis is anatomic*

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## Syndesmotic Injury



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## Fluoroscopic Method



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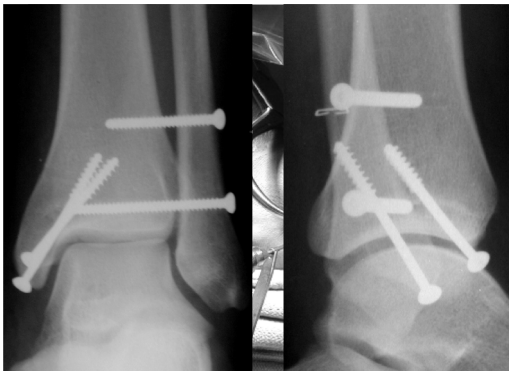
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## Syndesmotic Injury




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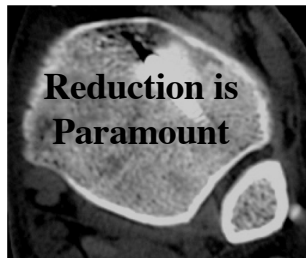
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## Syndesmotic Injury




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## How Do We Do

- Lateral radiograph
- 90% NPV for unreduced
- 4 Traumatologists
- Varied (best was 100%)

	Reduced	Anterior	Posterior	2.5mm displaced	5.0 mm displaced
PPV	70%	90%	75%	74%	92%
NPV	90%	83%	77%	78%	83%

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### Bimalleolar Weber C



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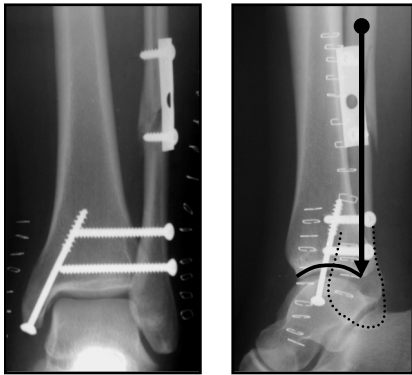
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### S/P ORIF



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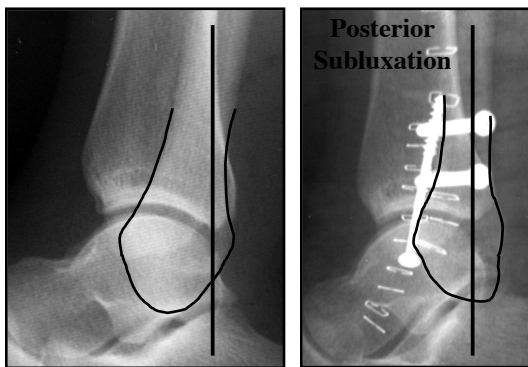
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### Perfect Laterals!



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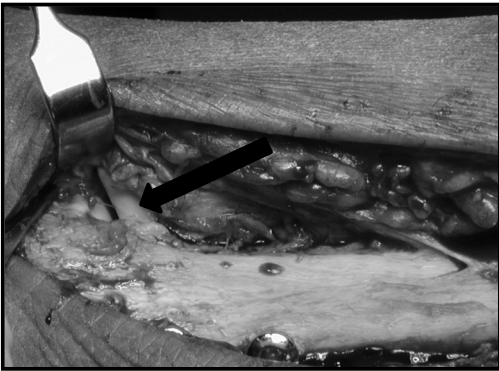
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### Malreduced



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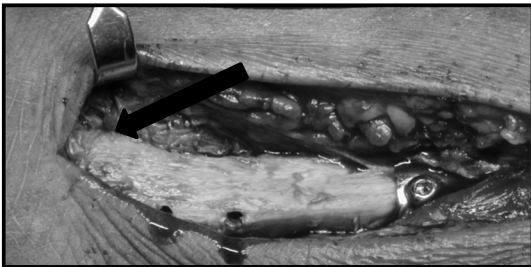
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### Reduced



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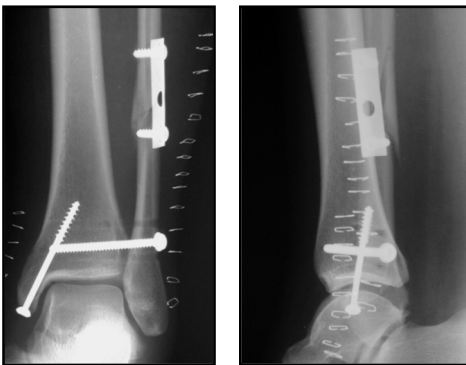
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### Postop



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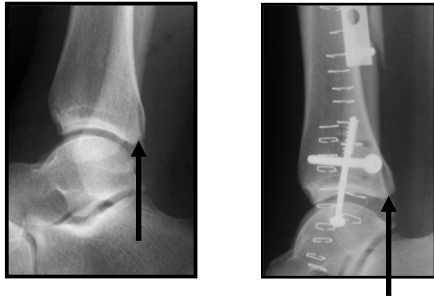
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### Postop



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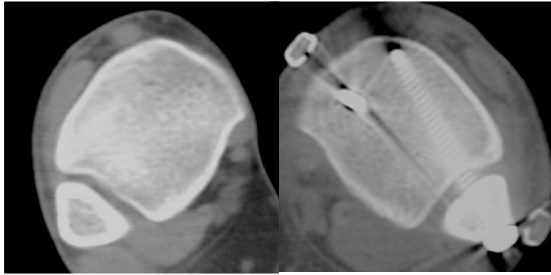
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### CT Confirmation



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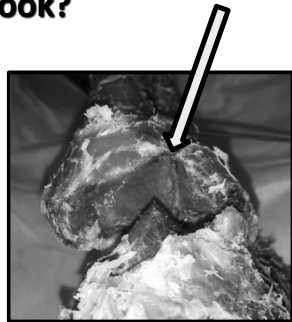
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### If Not Sure...OPEN!

- Where do you look?
- Incisura?
- Shapes vary
  - Very curved
  - Very flat
- Joint!!!



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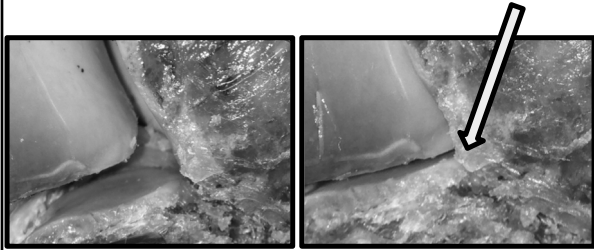
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## Joint Reduction



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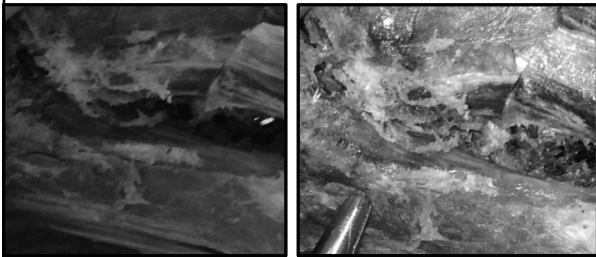
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## Incisura



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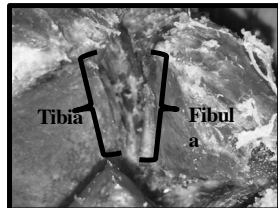
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## Where to Look?

- 10 cadaveric ankles
- AP depth
  - At Joint
  - 1cm above Joint



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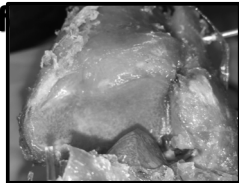
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### Answer...

- At joint corner vs incisura
- Joint better  $p = 0.0001$ 
  - ♦  $0.7 \pm 0.7$
- Fibula to incisura diff
  - ♦ 2mm at joint
  - ♦ 6mm at 1 cm



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### Case



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### Clinical View



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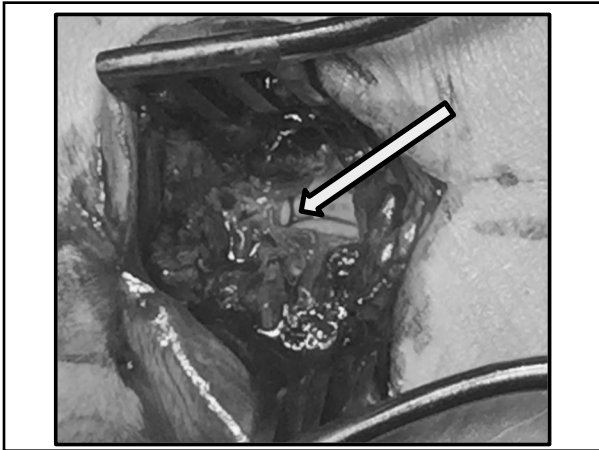
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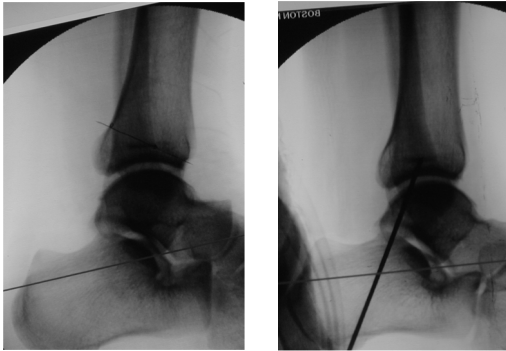
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### Laterals



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### “Flexible Fixation”

- **Not as strong**
- **Forsythe, et al '08**
  - More displacement at all loads
- **Clanton, et al '16**
  - More rotational displacement



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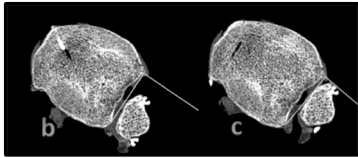
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## “Flexible Fixation”

- **Allows for error**
  - Westerman, et al '14



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## “Flexible Fixation”

- **Comparisons**
  - Laflamme '16
  - Andersen '18
- **If you reduce ... no difference**
- **Residents should not operate alone**



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## Technical Issues



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## Have Seen Failures




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## Does Perfection Matter?

The Functional Consequence of Syndesmotomic Joint Malreduction at a Minimum 2-Year Follow-Up

*H. Claude Sagi, MD, Anjan R. Shah, MD, and Roy W. Sanders, MD*

- **78 Patients**
- **CT scan at 2 yrs**
- **Functional outcomes**

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The Functional Consequence of Syndesmotomic Joint Malreduction at a Minimum 2-Year Follow-Up

*H. Claude Sagi, MD, Anjan R. Shah, MD, and Roy W. Sanders, MD*

**TABLE 2.** Outcome Scores as a Function of Quality of Reduction of Syndesmosis

	Anatomic Reduction	Malreduction	Significance
SMFA (functional)	12.0	27.0	<0.05
SMFA (bothersome)	18.3	30.8	NS
SMFA (emotional)	19.7	32.0	NS
Olerud/Molander	46.3	72.7	<0.05

SMFA, Short Form Musculoskeletal Assessment; NS, nonsignificant.

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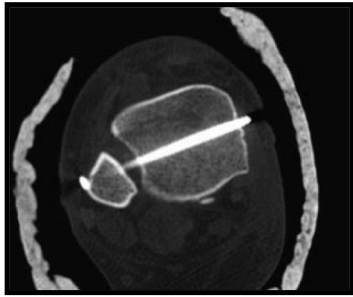
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**The Functional Consequence of Syndesmotom Joint Malreduction at a Minimum 2-Year Follow-Up**

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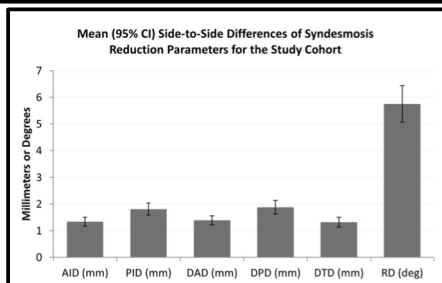
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**The Measurement and Clinical Importance of Syndesmotom Reduction After Operative Fixation of Rotational Ankle Fractures**

Stephen J. Warner, MD, PhD, Peter D. Fabricant, MD, MPH, Matthew R. Garner, MD, Patrick C. Schottel, MD, David L. Helfet, MD, and Dean G. Lorch, MD




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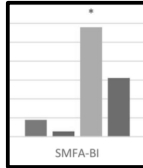
Functional Outcomes of Syndesmotic Injuries Based on Objective Reduction Accuracy at a Minimum 1-Year Follow-Up

Steven M. Cherney, MD,\* Christopher T. Cosgrove, MD,† Amanda G. Spraggs-Hughes, MA,† Christopher M. McAndrew, MD,† William M. Ricci, MD,† and Michael J. Gardner, MD‡

- 48 Patients at 1 year
- Olerud, SMFA, Bother

• No difference at:

- 1-3 mm translation
- 10° - 15° Rotation
- Power very low (5%, 10%, 45%, 71%)




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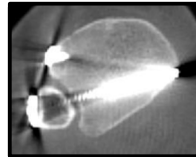
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Summary

• Reduce the syndesmosis

- Avoid clamps
- Open if need to!
- Level of the joint



• Fluoroscopy

- Beware posterior malleolus

• 2-3mm off is likely fine

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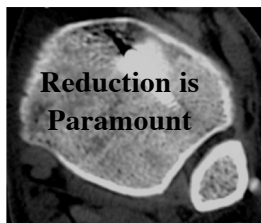
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Boston Medical Center

Thank You




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