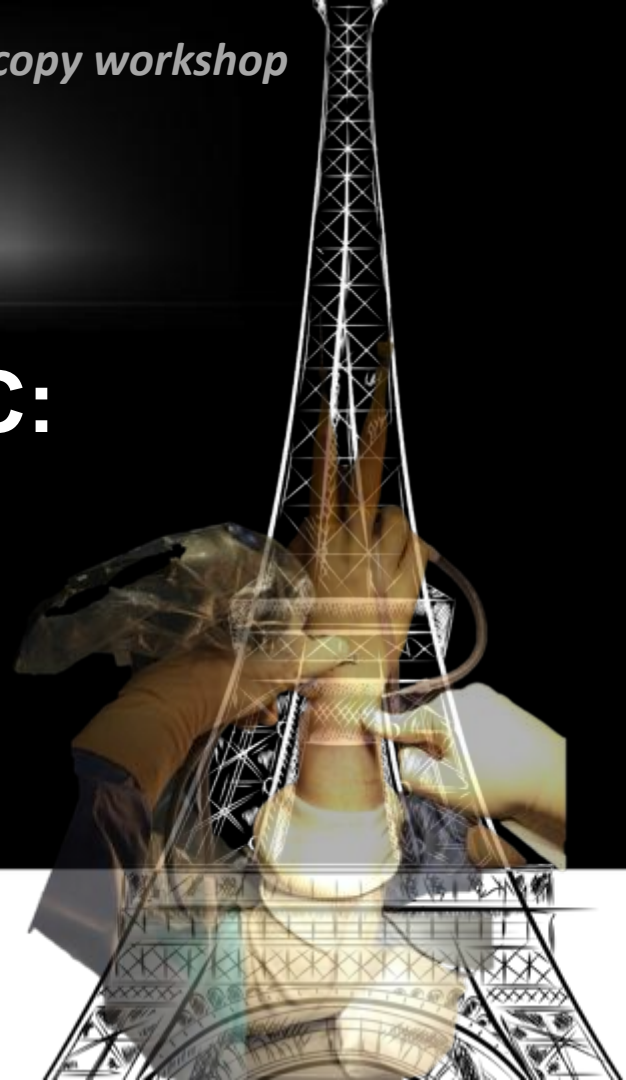


Traumatic lesions of TFCC:

*Diagnosis, XRay, Arthroscopy,
Classification, Treatment*

Didier FONTÈS, Paris - France



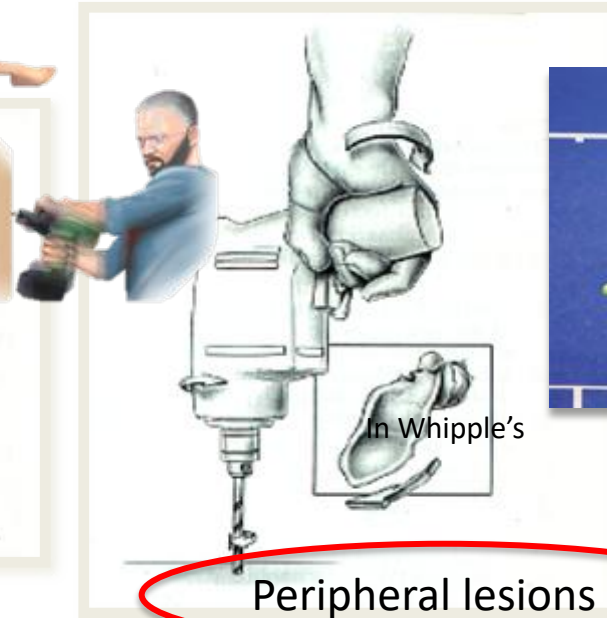
TFCC Pathology mechanism

■ **LESION** by overload or excessive twist



In Whipple's

Central lesions



In Whipple's

Peripheral lesions



TFCC pathology : overload lesions

■ Acute lesions :

- Fall down on an outstretched hand in full pronation and UD
- Direct trauma
- Association with a radius fracture



=> *Fighting and contact, fall at risk sports, high energy*

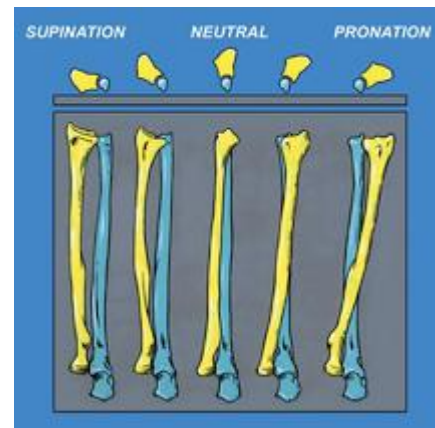
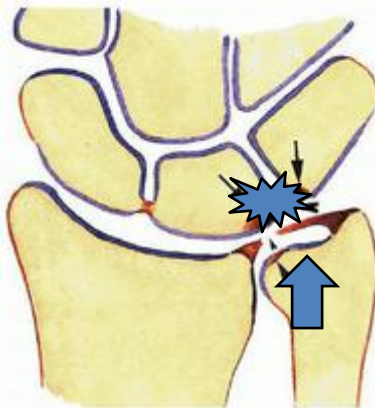
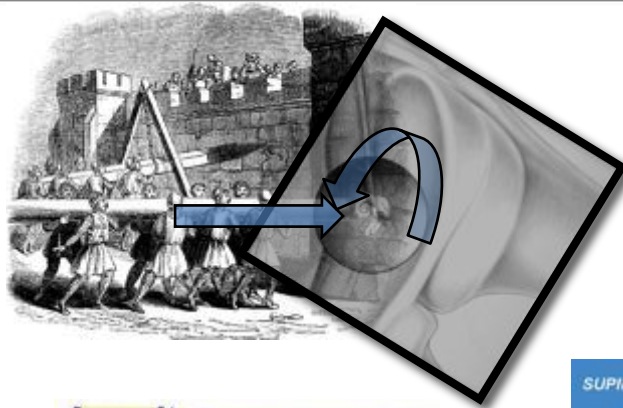


TFCC pathology : overload lesions

■ Acute lesions :

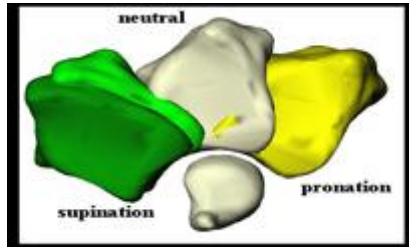
- Fall down on an outstretched hand in full pronation and UD
- Direct trauma
- Association with a radius fracture

=> *Fighting and contact, fall at risk sports, high energy*



TFCC pathology : excessive twist

- Repetitive pronation-supination
 - DRUJ over-twisted
 - Associated trauma
- => golf, tennis, martial arts, pelota ...



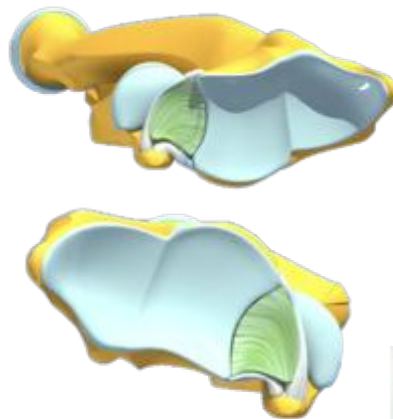
Clinical assessment of TFCC lesions

- History of a fall on pronated and hyperextended wrist or over-twist of the wrist is frequently elicited
- Possible association with radius fracture
- Ulnar-side wrist pain + clicking



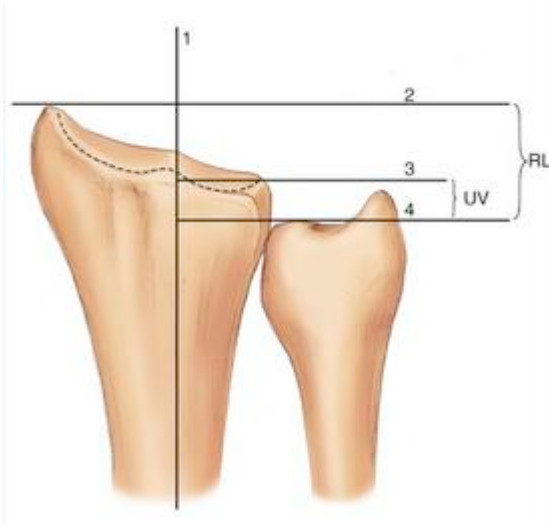
Clinical assessment of TFCC lesions

- Ulnar-side wrist pain +/- clicking
- Painful TFCC compression
- Passive full supination
- DRUJ stability must be assessed
(comparative piano key test in neutral rotation, supination and pronation)



TFCC Pathology

Xray measurement of ulnar variance



Ulnar Variance



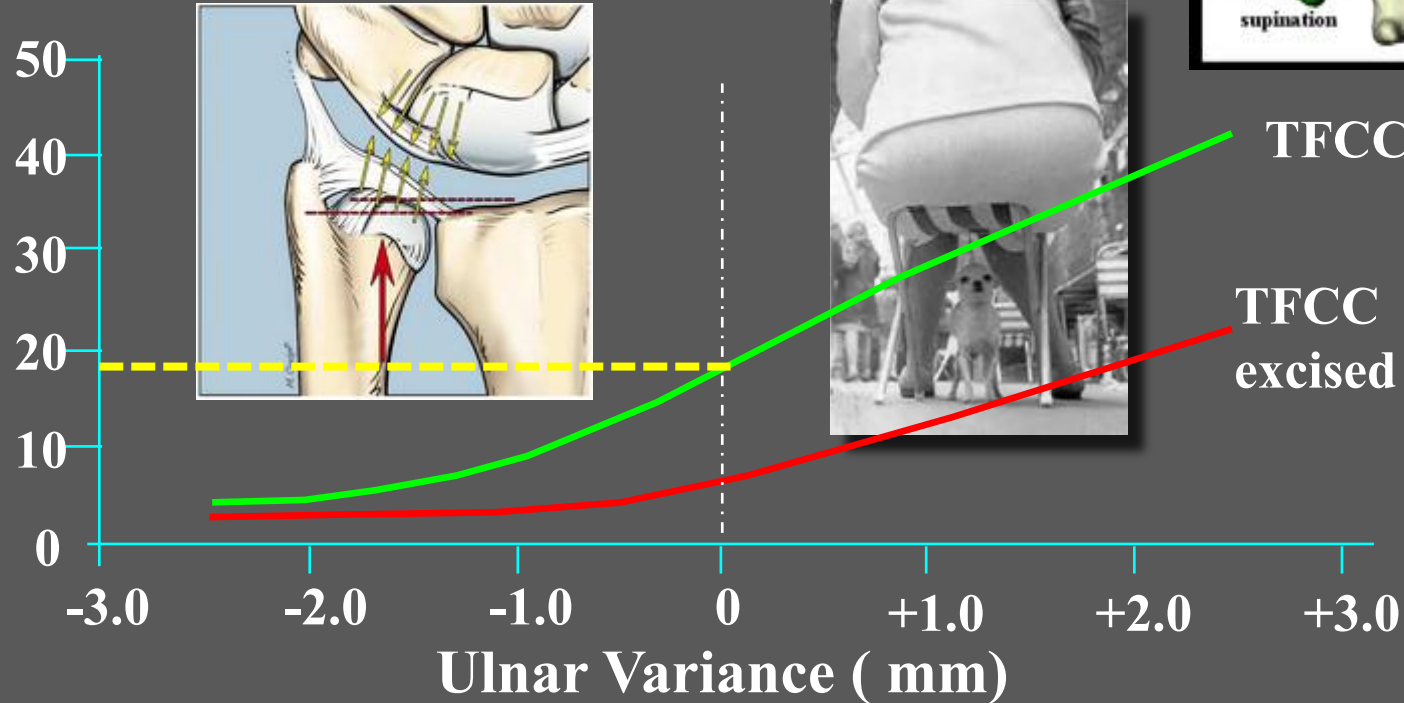
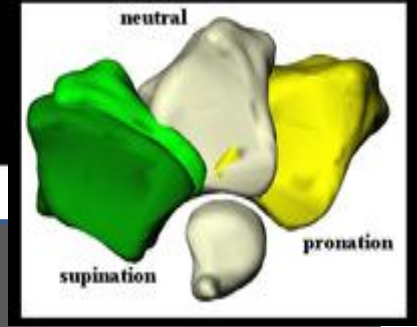
Positive

Neutral

Negative

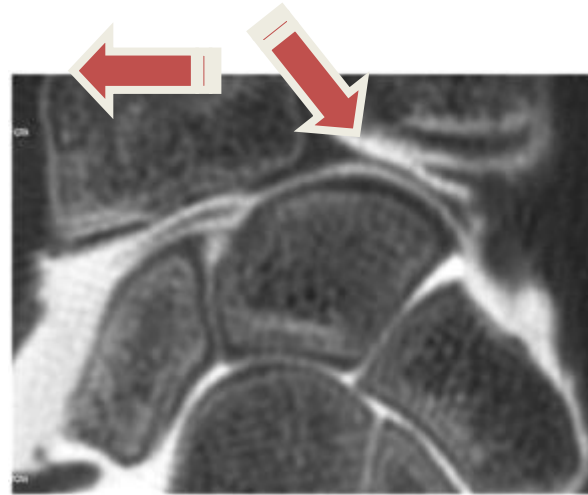
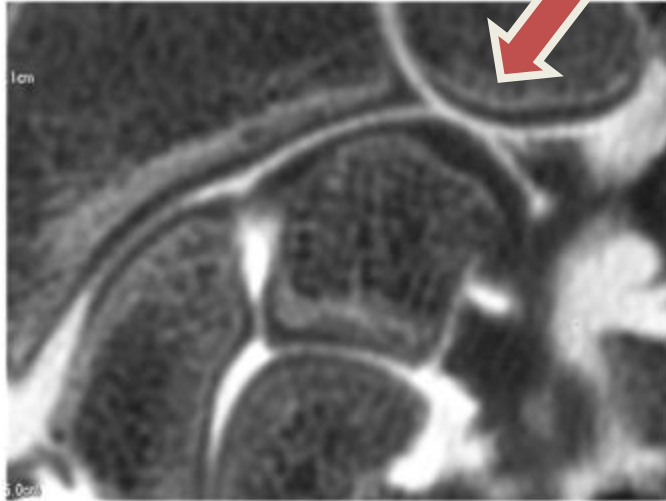
TFCC Pathology

Xray measurement of ulnar variance



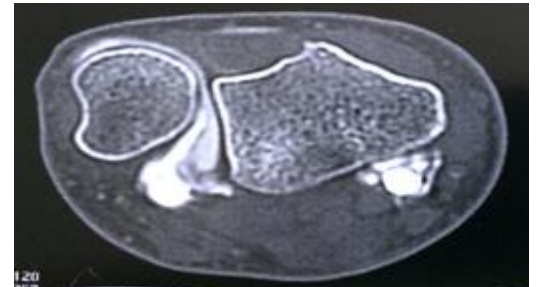
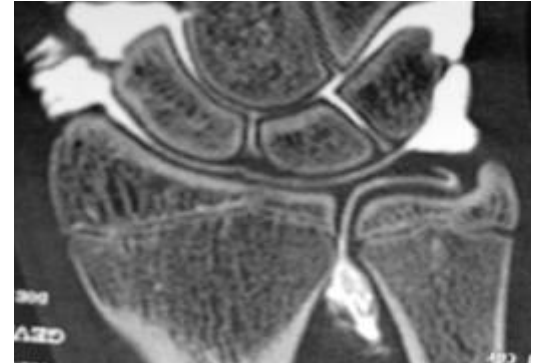
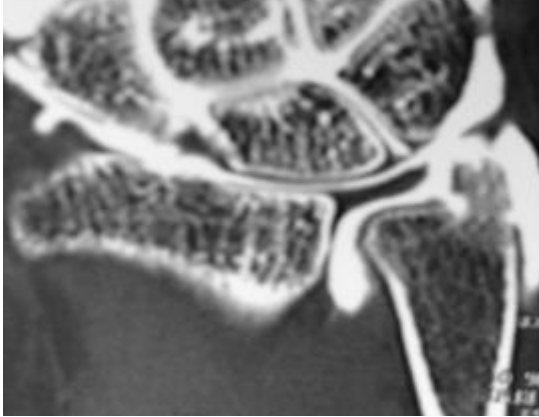
TFCC Pathology

Diagnosis confirmed by Arthro-CT scan ou MRI



TFCC Pathology

Diagnosis confirmed by Arthro-CT scan ou MRI



Arthro CT scan or MRI :

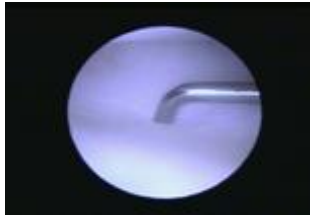
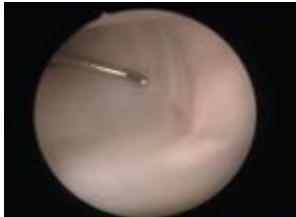
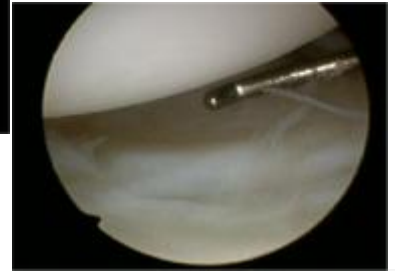
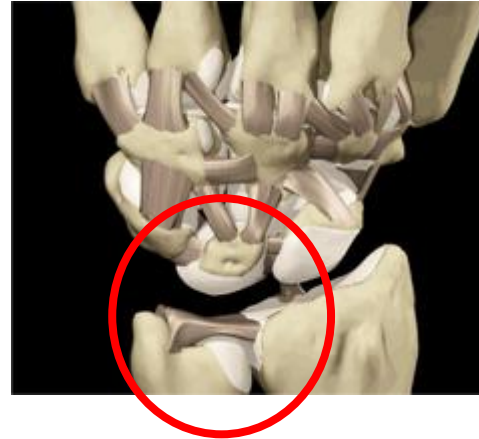
Assessment of foveal attachment, ulnar variance, DRUJ stability and extend of the lesion

Arthroscopic assessment of TFCC

□ TFCC :

- Texture +/- Hole
- Ulnocarpal ligaments
- Elasticity (trampoline effect)
- Hook test (Andrea Atzei)
- Ghost sign (Didier Fontes)

□ DRUJ exploration



Arthroscopic assessment of TFCC

Foveal lesions

- ❑ TFCC :
 - Texture +/- Hole
 - Ulna-carpal ligaments
 - Elasticity (trampoline effect)
 - Hook test (Andrea Atzei)
 - Ghost sign (Didier Fontes)
- ❑ DRUJ exploration

***TFCC can be pulled upward and radially
“wave effect”***



Hook test +
Atzei Class 2

Arthroscopic assessment of TFCC

Foveal lesions

- ❑ TFCC :
 - Texture +/- Hole
 - Ulna-carpal ligaments
 - Elasticity (trampoline effect)
 - Hook test (Andrea Atzei)
 - Ghost sign (Didier Fontès)
- ❑ DRUJ exploration

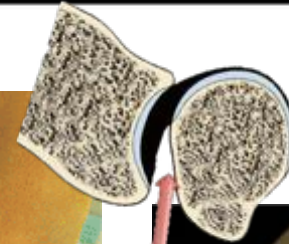
***TFCC proximal attachment can be pulled distally
and ulnarly
= reversed “trampoline sign” like a ghost waving
under his sheet***



Arthroscopic assessment of TFCC

Foveal lesions

- ❑ TFCC :
 - Texture +/- Hole
 - Ulnocarpal ligaments
 - Elasticity (trampoline effect)
 - Hook test (Andrea Atzei)
 - Ghost sign (Didier Fontès)
- ❑ DRUJ exploration



TFCC proximal attachment can be assessed

Historical Classification of A.K. Palmer TFCC lesions (1989)

Class 1 : traumatic lesions

1A



1B



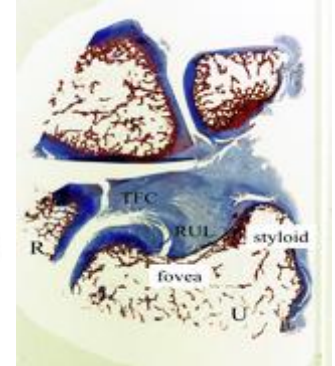
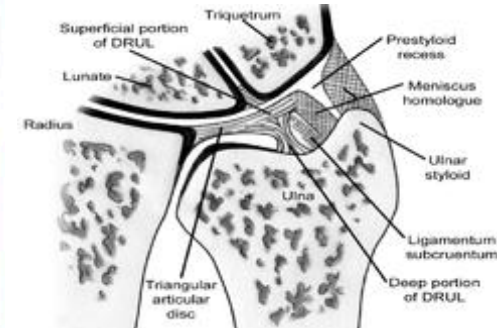
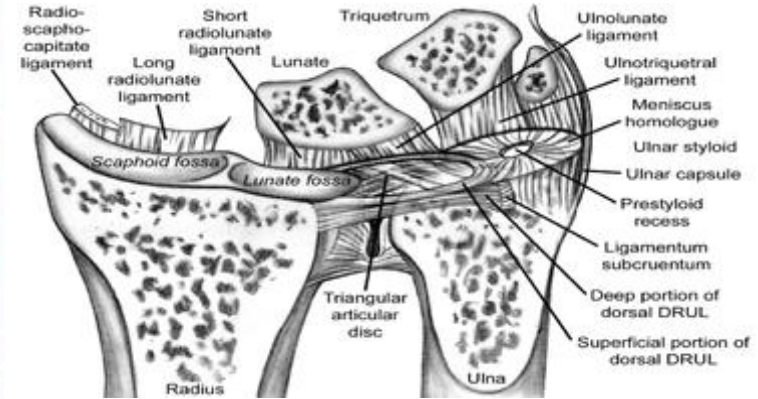
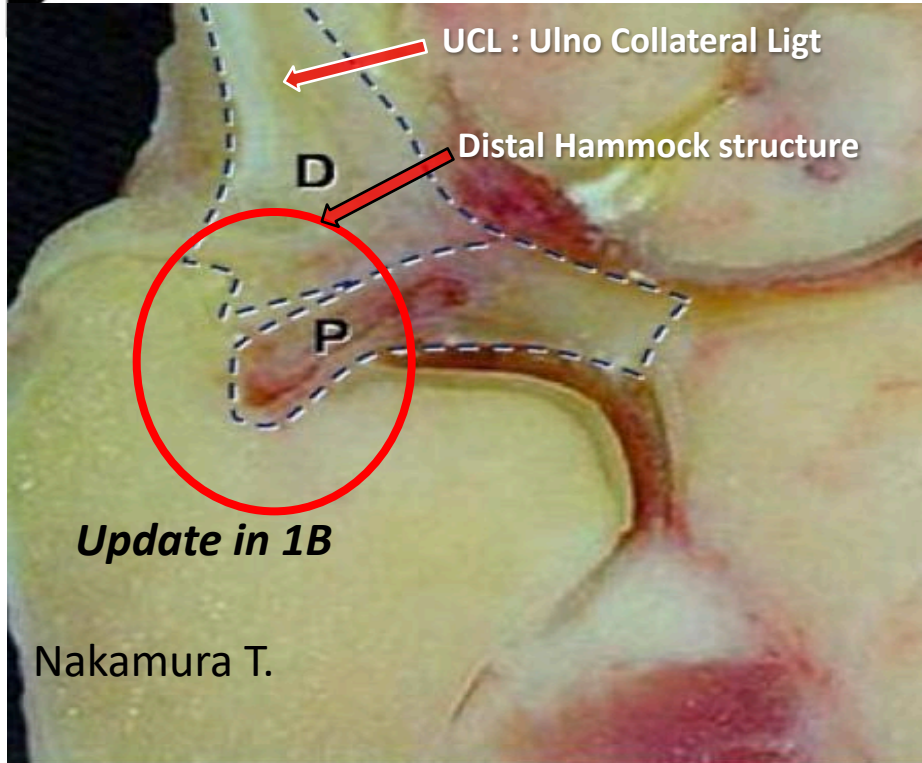
1C



1D



Anatomical 3 Dimensional description of TFCC



Updated classification of Peripheral TFCC lesions






<i>Atzei classif.</i>		CLINICAL DRUJ INSTABILITY	INVOLVED TFCC COMPONENT	
			DISTAL	PROXIMAL
Class 1 Repairable Distal Tear		None or Slight	Torn <i>Exhibits Palmer</i>	Intact
Class 2 Repairable Complete Tear		Mild or Severe	Torn	Torn
Class 3 Repairable Proximal Tear		Mild or Severe	Intact	Torn
Class 4 Non- Repairable		Severe	Torn	Torn
Class 5 Arthritic DRUJ		Mild or Severe	\$	\$

Foveal lesions

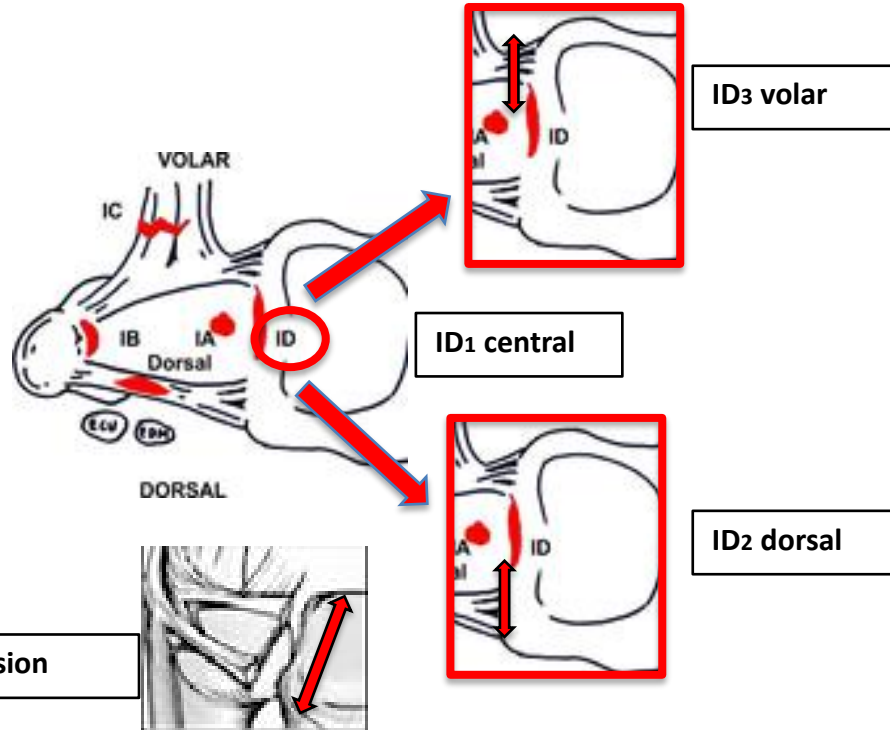
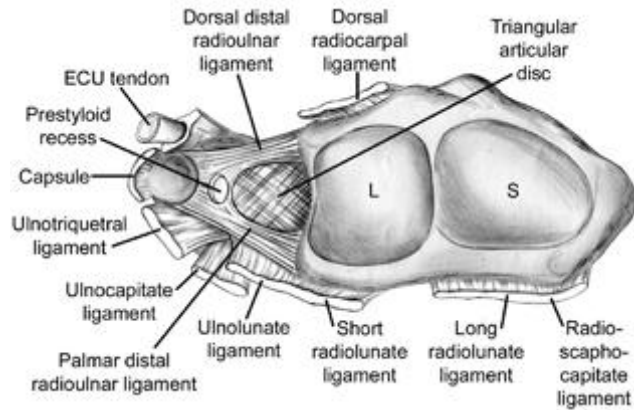
Arthroscopic specific signs

Foveal lesions

		CLINICAL DRUJ INSTABILITY	INVOLVED TFCC COMPONENT		<u>Trampo-</u> line lost	Hook Sign	Ghost Sign
			DISTAL	PROXIMAL			
Class 1 Repairable Distal Tear		None or Slight	Torn	Intact	+/-	-	-
Class 2 Repairable Complete Tear		Mild or Severe	Torn	Torn	+	+	+
Class 3 Repairable Proximal Tear		Mild or Severe	Intact	Torn	-	-	+

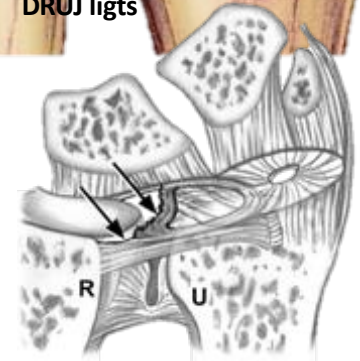
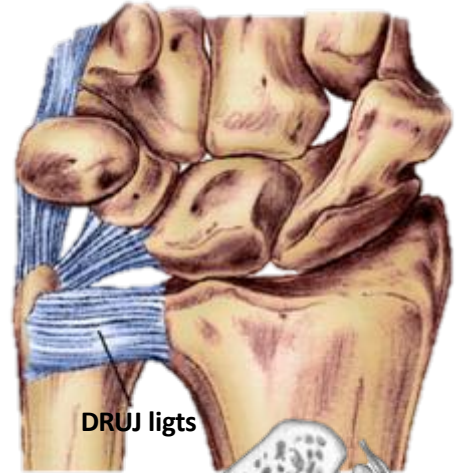
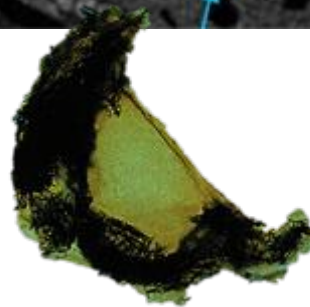
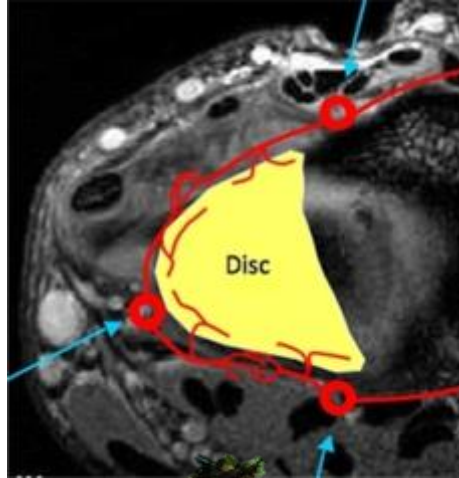


Updated classification of Radial side TFCC 1D lesions



Therapeutic strategy for TFCC lesions

- ❑ Depending on the location of the lesion (*vascularized or non-vascularized area, extend to DRUJ ligaments*)
- ❑ Associated DRUJ dislocation or at risk
- ❑ Associated radius fracture



Therapeutic attitude

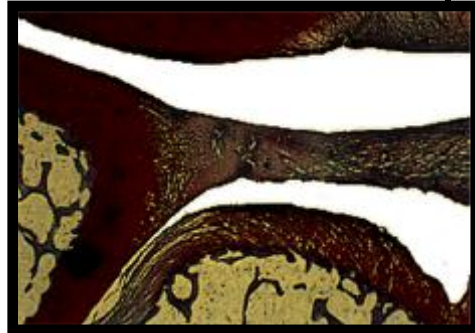
(based on histopathology)

- ❑ Radial (Palmer 1D1) or central lesions (Palmer 1A) in Non VASCULARIZED area

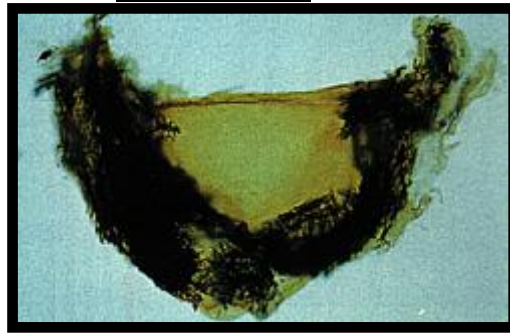
=> debridement

- ❑ Peripheral lesions in VASCULARIZED area

=> attempt of suture



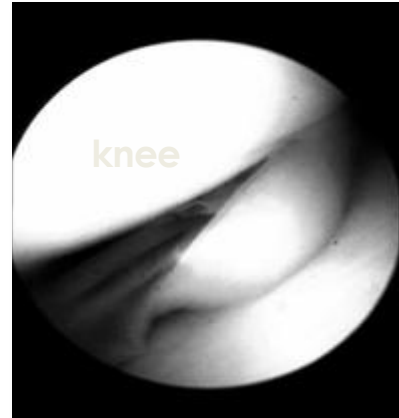
In Whipple's



In Whipple's

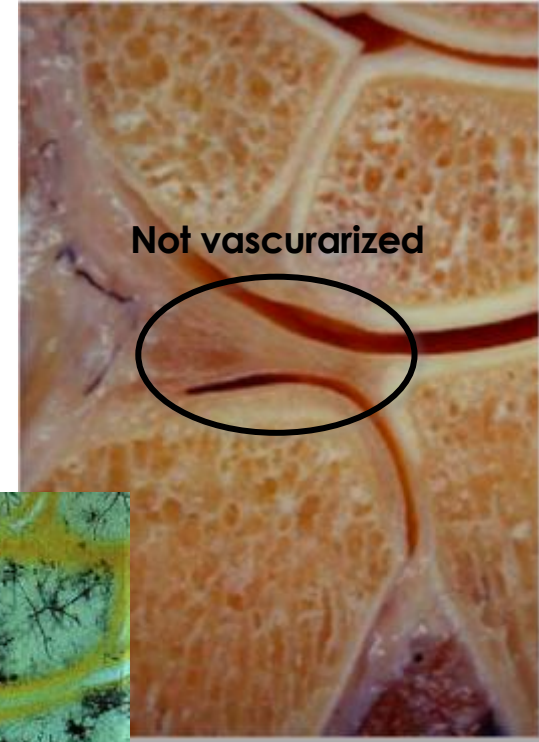
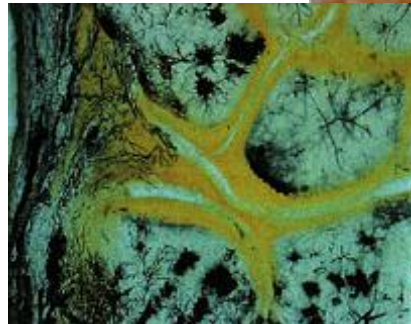
Why to debride TFCC ?

- ❑ *Clinical reasons* : « meniscus like » syndrom of the wrist as a little pebble in your shoe
- ❑ *Histologic reasons* depending on TFCC vascularization
- ❑ *Biomechanical reasons*
- ❑ Experimental healing procedures ?



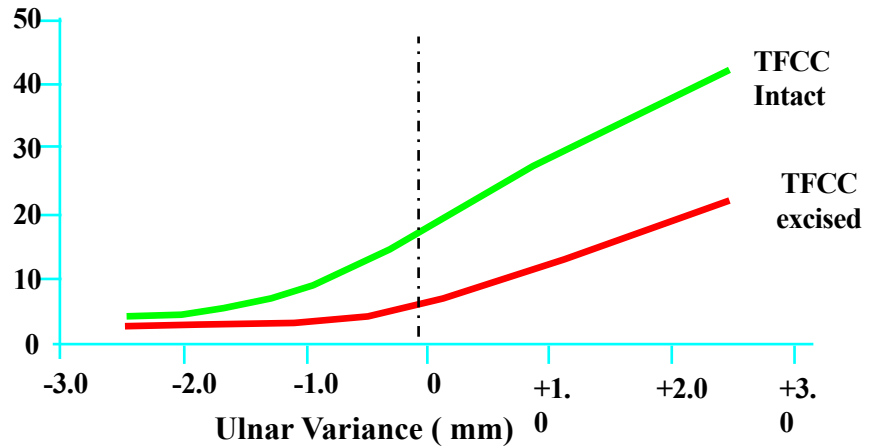
Why to debride TFCC ?

- ❑ *Clinical reasons* : « meniscus like » syndrom of the wrist as a little pebble in your shoe
- ❑ *Histologic reasons* depending on TFCC vascularization
- ❑ *Biomechanical reasons*
- ❑ Experimental healing procedures ?



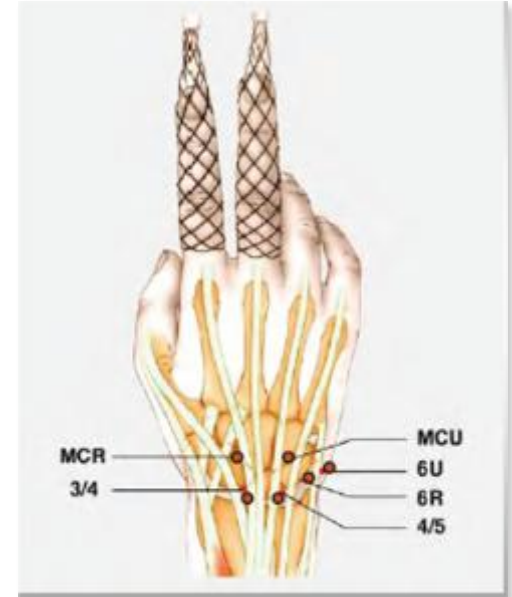
Why to debride TFCC ?

- ❑ *Clinical reasons* : « meniscus like » syndrom of the wrist as a little pebble in your shoe
- ❑ *Histologic reasons* depending on TFCC vascularization
- ❑ *Biomechanical reasons*
- ❑ Experimental healing procedures ?



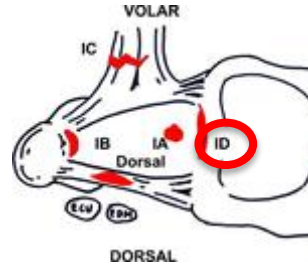
How to debride ?

- ❑ Classical installation
- ❑ Scope 3-4 portal
- ❑ Instruments 4-5 or 6R

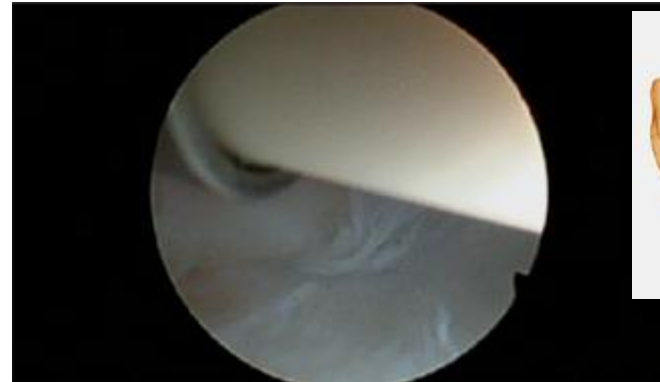


Class 1A and 1D1

- ❑ Non vascularized fibro-cartilage
- ❑ Not at risk of instability
 - => Central debridement with **radiofrequency device**

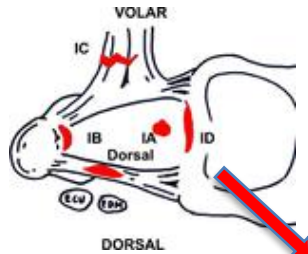


ID1 central



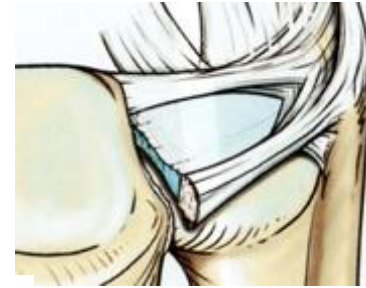
IA Palmer

Class 1D₂ dorsal

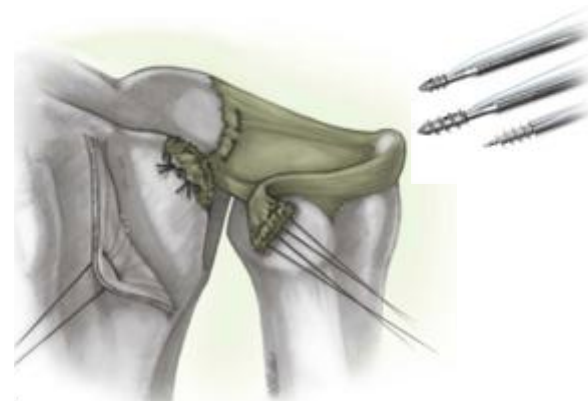
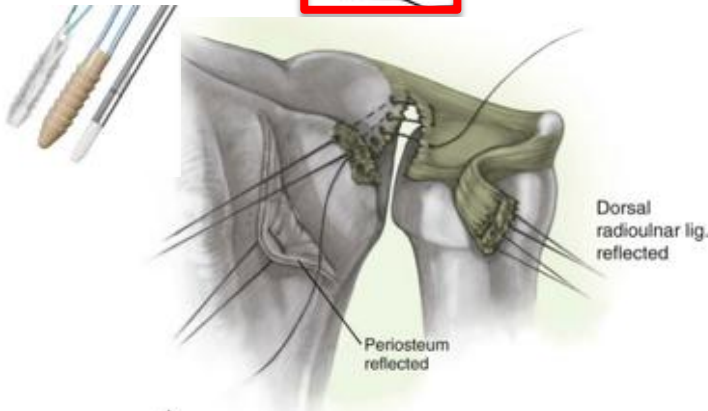


ID2 dorsal

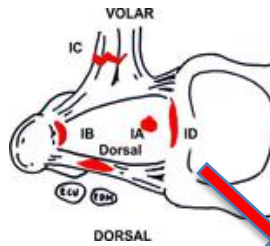
- Lesion of dorsal RUJ ligament
- At risk of instability
⇒ attempt of reattachment
(open or arthroscopic procedure)



Open procedure: suture anchors



Class 1D₂ dorsal

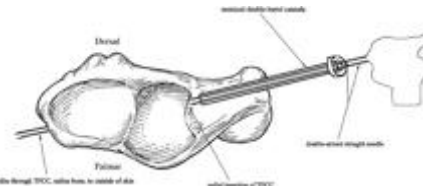
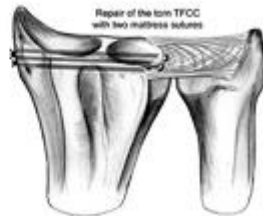
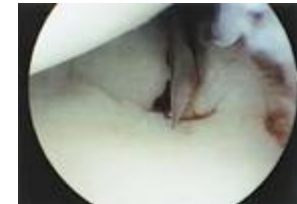
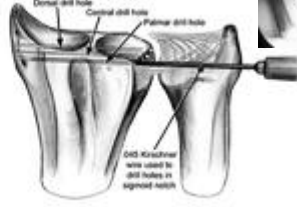
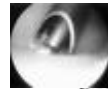


ID₂ dorsal

- Lesion of dorsal RUJ ligament
- At risk of instability
⇒ attempt of reattachment
(open or arthroscopic procedure)

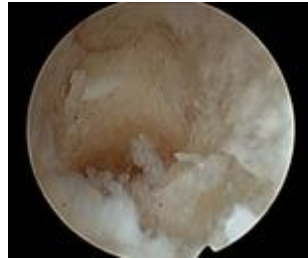
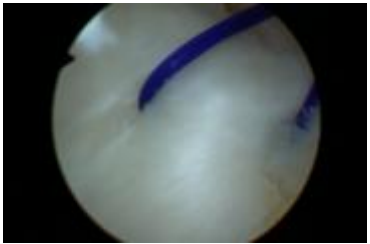
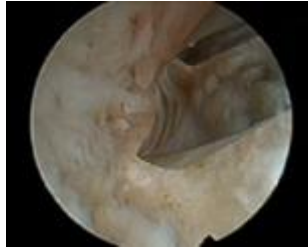


Arthroscopic procedure: trans-radial suture

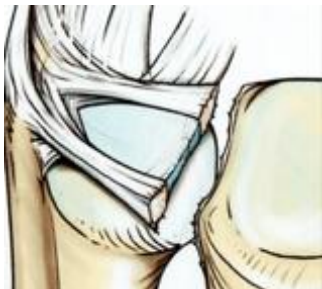


Radial side reattachment (Fontès)

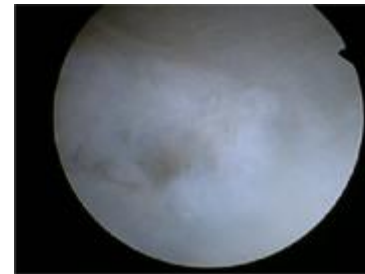
mini-pushlock knotless simplified procedure



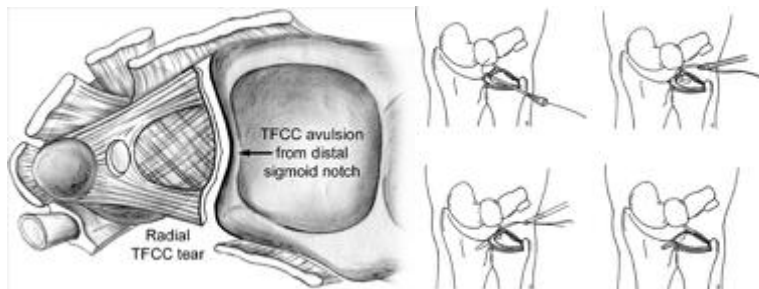
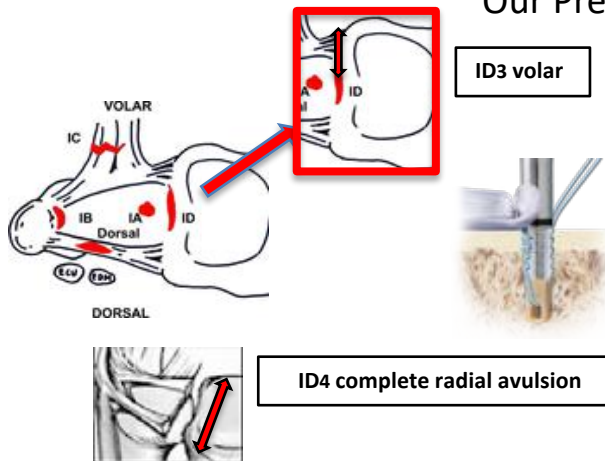
Class 1D₃ volar or 1D₄ complete



- Lesion of volar (rare) +/- volar DRUJ ligament
- At risk ++ of instability
⇒ attempt of reattachment
(open or arthroscopic procedure)



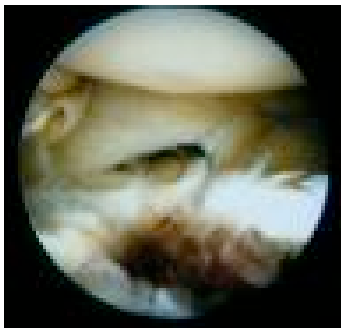
Our Preferred Arthroscopic procedure: pushlock®



Class 1D₃ volar or 1D₄ + fracture

- Lesion of volar +/- dorsal radius rim
- At risk ++ of instability
⇒ attempt of reattachment
(open or arthroscopic procedure)

Our Preferred Arthroscopic procedure: direct K wires



Foveal TFCC lesions management

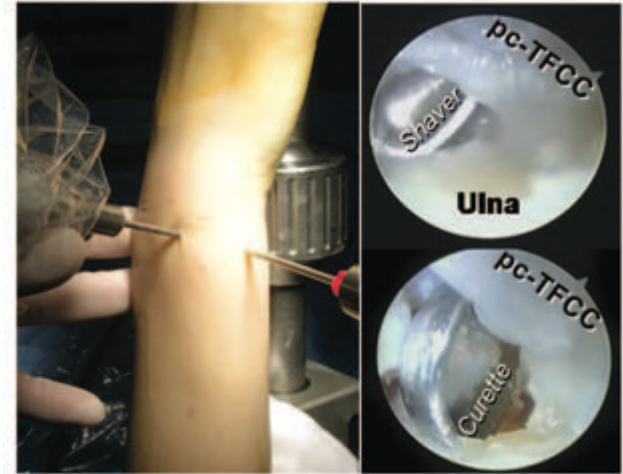
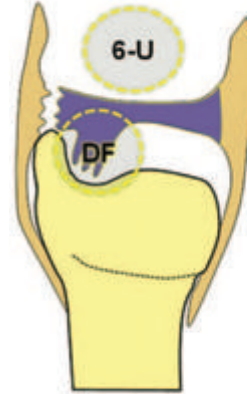
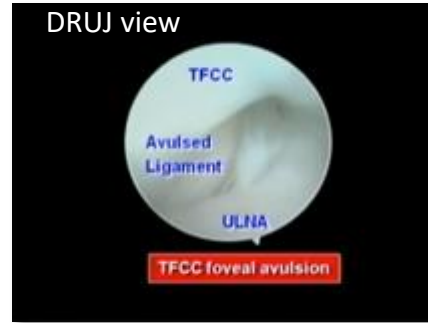
Ulnar side lesions



Atzei classif.		CLINICAL DRUJ INSTABILITY	INVOLVED TFCC COMPONENT	
			DISTAL	PROXIMAL
Class 1 Repairable Distal Tear		None or Slight	Torn <i>Ex IB de Palmer</i>	Intact
Class 2 Repairable Complete Tear		Mild or Severe	Torn	Torn
Class 3 Repairable Proximal Tear		Mild or Severe	Intact	Torn
Class 4 Non- Repairable		Severe	Torn	Torn
Class 5 Arthritic DRUJ		Mild or Severe	\$	\$

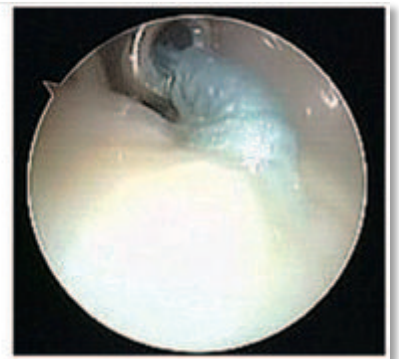
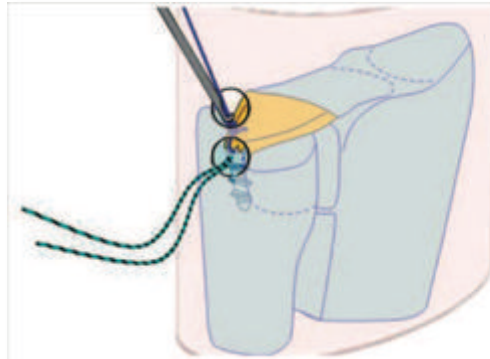
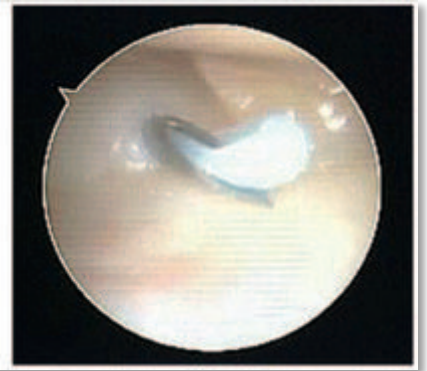
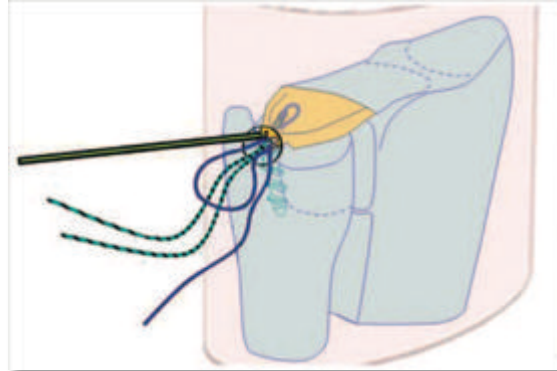
Foveal reattachment (Atzei & Luchetti)

mixed arthroscopic and mini-open procedure



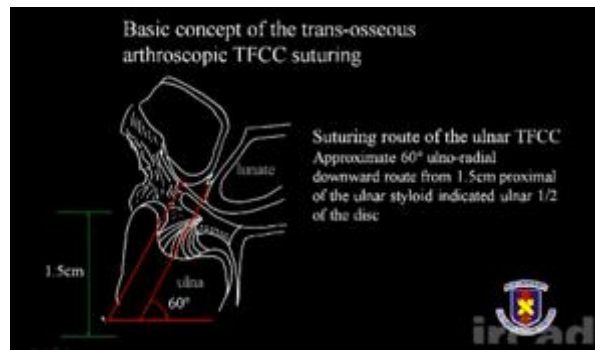
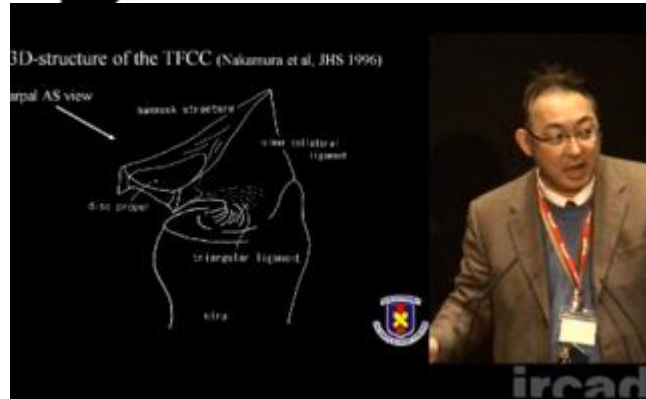
Foveal reattachment (Atzei & Luchetti)

mixed arthroscopic and mini-open procedure



Foveal reattachment (Toshi Nakamura)

trans-ulnar procedure



Foveal reattachment (Geissler) *mini-pushlock® Arthrex knotless procedure*



TFCC Instrument Kit (AR-8825CP) includes:

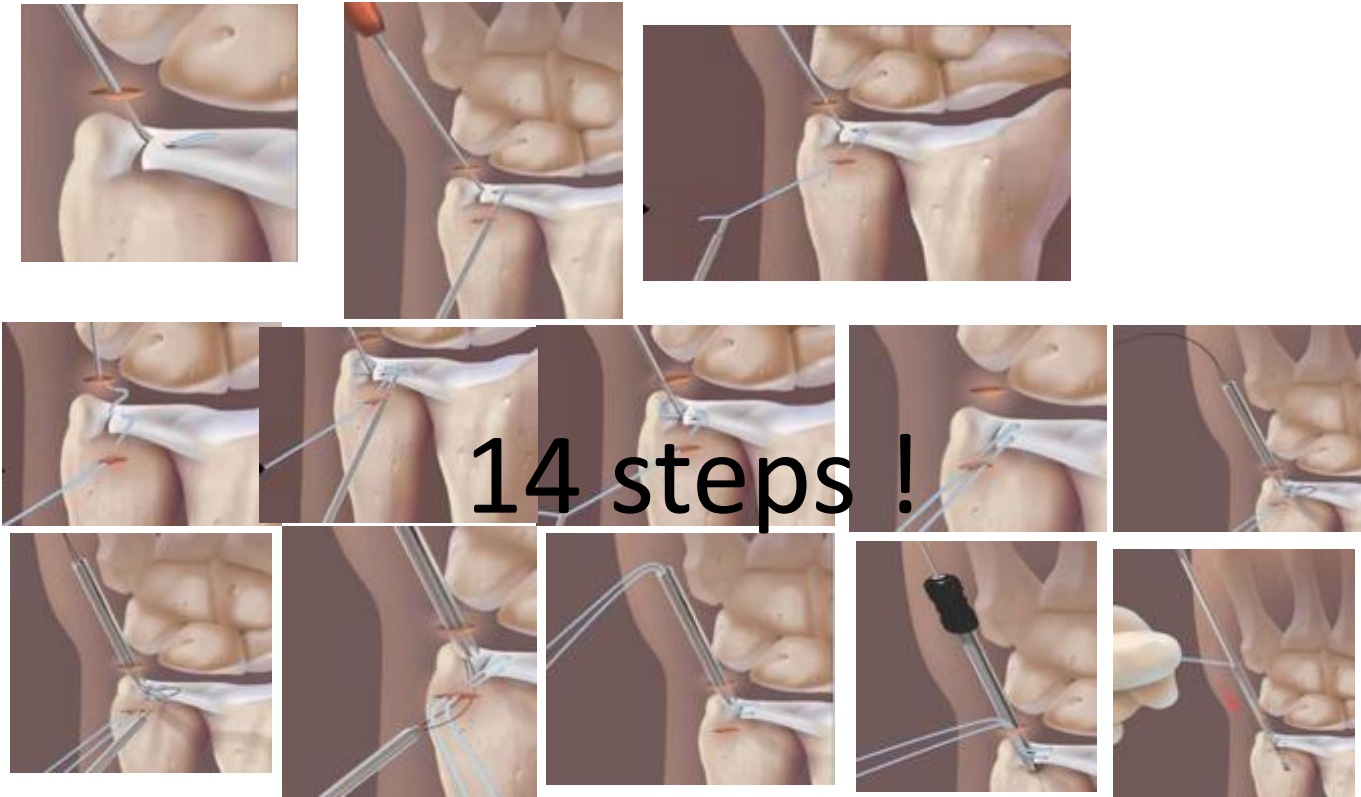
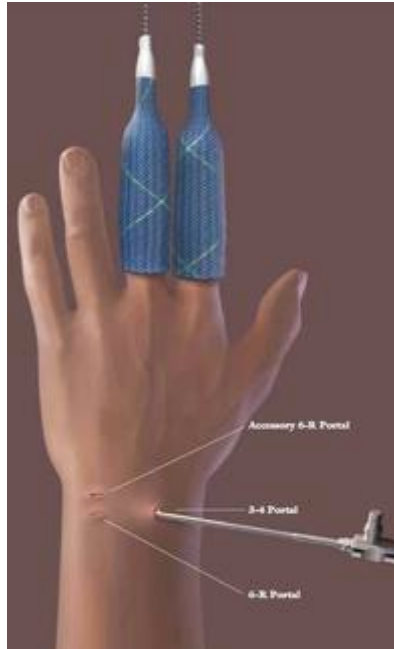
Slotted Cannula
Obturator
Guidewire, .86 mm
Cannulated Drill, 1.8 mm

Accessories:

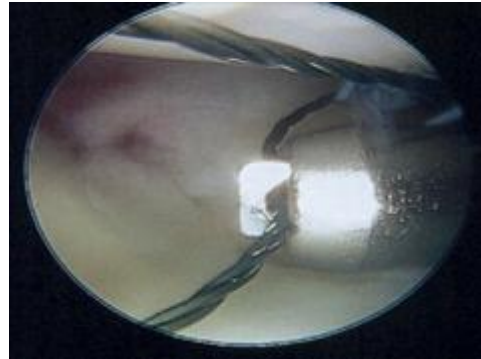
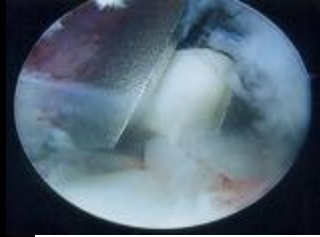
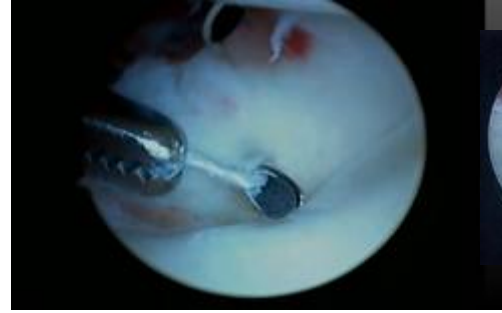
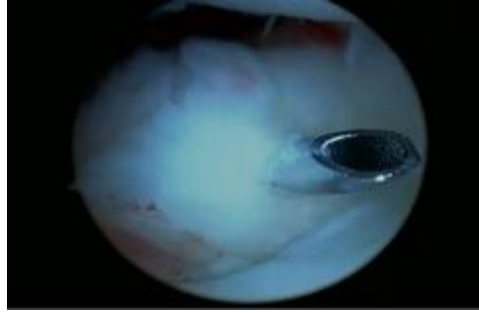
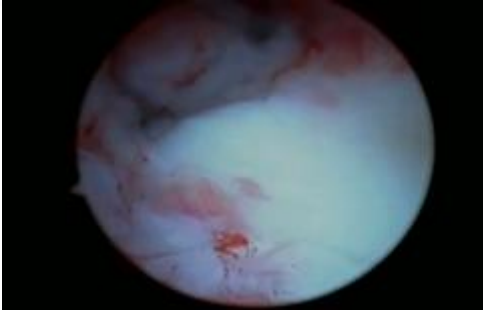
TFCC SutureLasso (with Nitinol loop) short, 70° bend	AR-8704
Mini Suture Hook	AR-8705
2-0 FiberStick (blue)	AR-7222
2-0 FiberWire (blue)	AR-7221
Bio-PushLock, 2.5 mm	AR-8825B
PEEK PushLock, 2.5 mm	AR-8825P
Wrist Traction Tower	AR-1611S



Foveal reattachment (Geissler) *mini-pushlock® Arthrex knotless procedure*

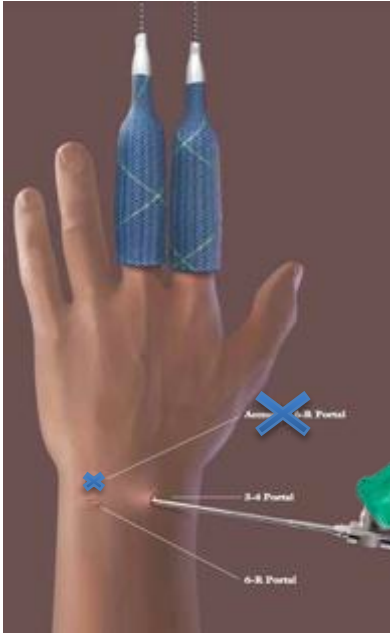


Foveal reattachment (Geissler) *mini-pushlock® Arthrex knotless procedure*



Foveal reattachment (Fontès)

mini-pushlock knotless simplified procedure



Minimum portals:

- (3-4 & 6R)

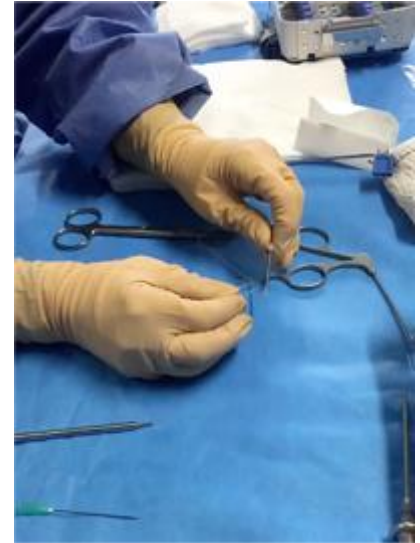
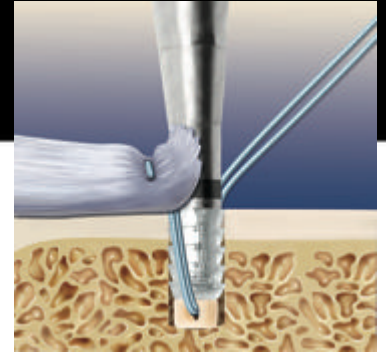
Minimum material:

- 1IM needle
- Mini Pushlock drill or awl (2 mm diam.)
- Fiberwire suture



Mini PushLock[®] device

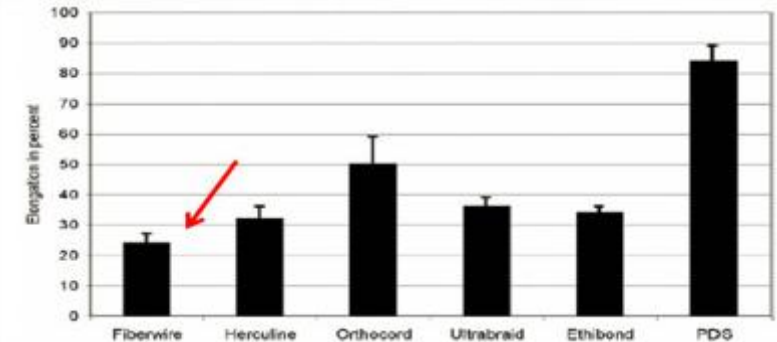
- Mini PushLock:
 - Diameter and Length: 2.5 x 8 mm
 - Suture: n/a
 - Impact design
 - Bio or PEEK material



Fiberwire[®] suture



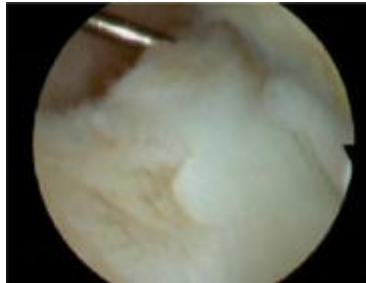
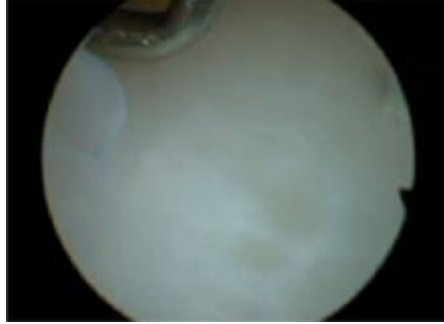
- FiberWire
 - Strongest suture on the market
 - Superior pull-out strength
 - Least elastic suture



Foveal reattachment mini-pushlock knotless simplified procedure

First step:

- Debridement of synovial tissue
- Assessment and Refreshment of TFCC foveal lesion

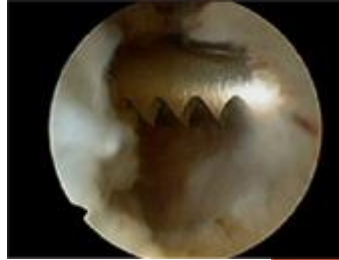


Foveal reattachment

mini-pushlock knotless simplified procedure

Second step:

- Assessment of the foveal foot print
- Refreshment of the avulsion area
- Introduction of the drill-guide
- Drilling with 2mm cannulated drill or impaction of 2mm awl

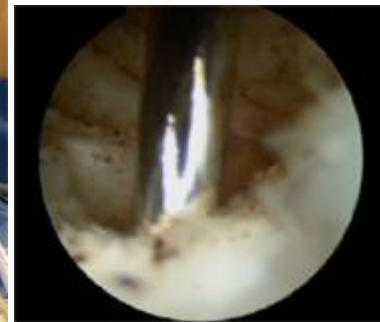
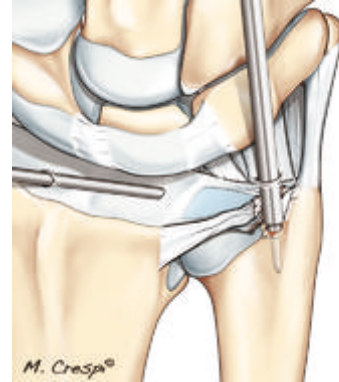
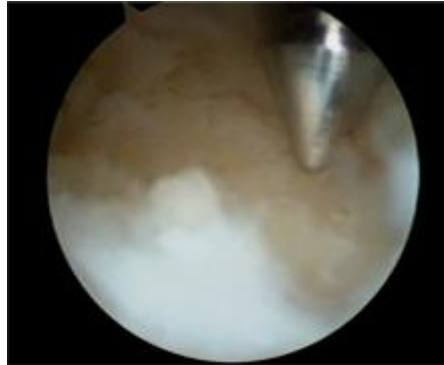


Foveal reattachment

mini-pushlock knotless simplified procedure

Second step:

- Assessment of the foveal foot print
- Refreshment of the avulsion area
- Introduction of the drill-guide
- Drilling with 2mm cannulated drill or impaction of 2mm awl

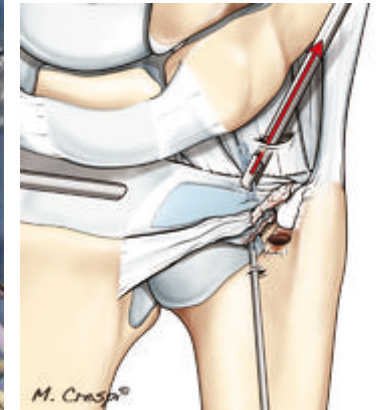
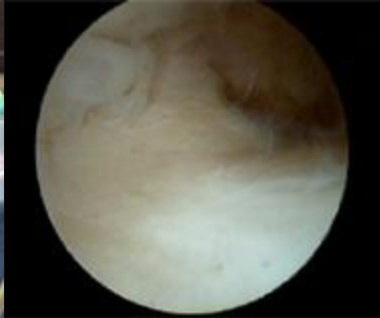
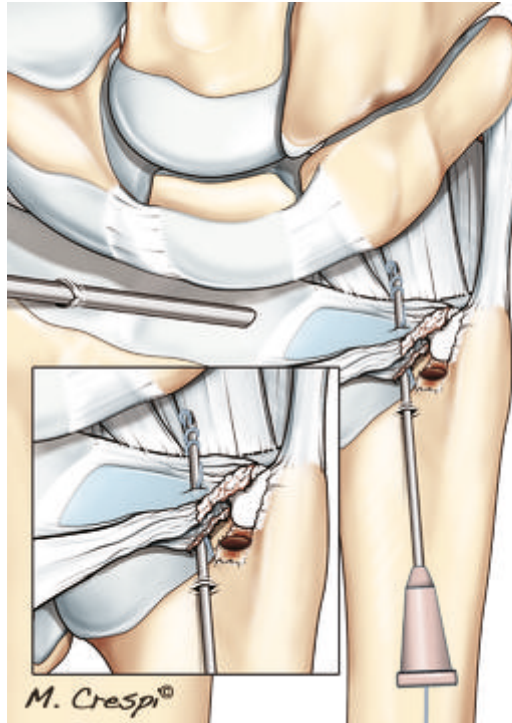


Foveal reattachment

mini-pushlock knotless simplified procedure

Third step (U knot):

- Introduction of IM needle transcutaneously
- The Fiberwire® suture is slid directly inside the joint through TFCC percutaneously and pulled out through 6R portal

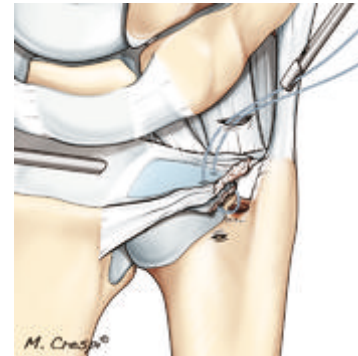
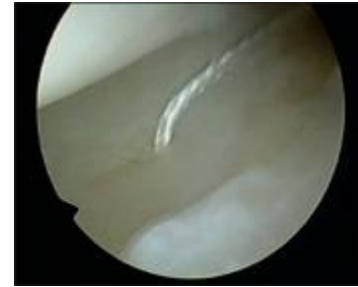
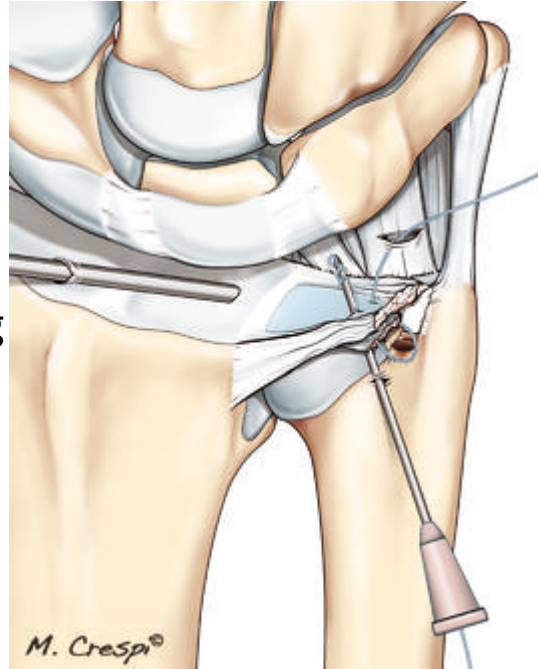


Foveal reattachment

mini-pushlock knotless simplified procedure

Third step (U knot):

- Needle + secured PDS is removed distally and pushed back in TFCC, paying attention not to cut the limb of PDS

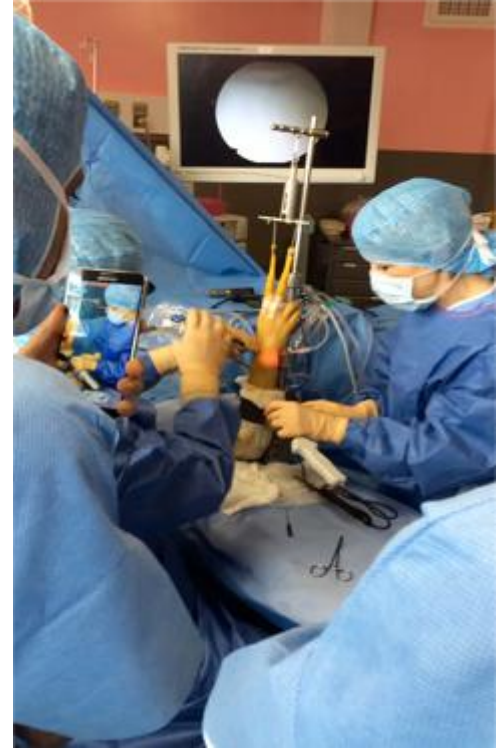
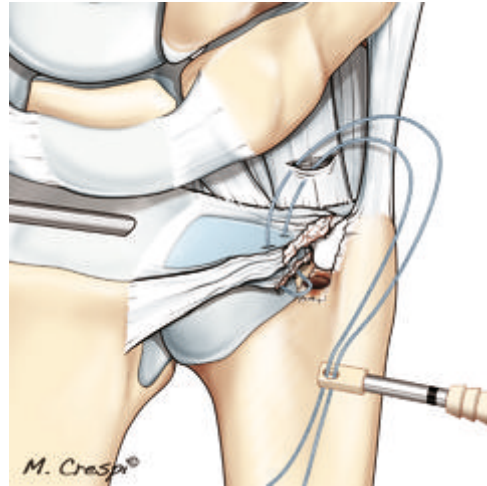
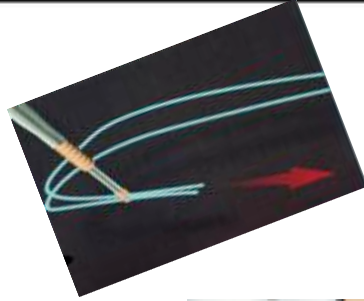


Foveal reattachment

mini-pushlock knotless simplified procedure

Last step:

- Introduction of the 2 strands of Fiberwire inside distal eyelet of Pushlock®
- Impaction of the device + traction of the strands
- Section of the stitches
- Testing of the repair

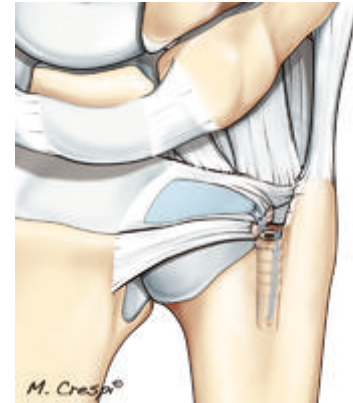
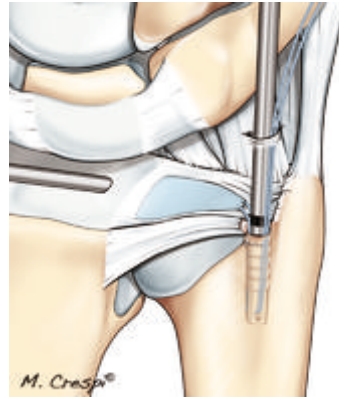
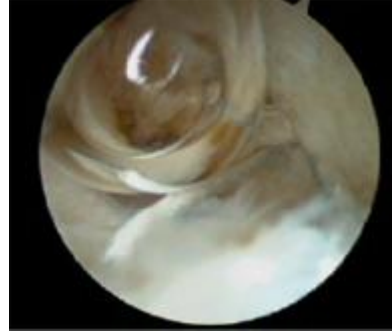


Foveal reattachment

mini-pushlock knotless simplified procedure

Last step:

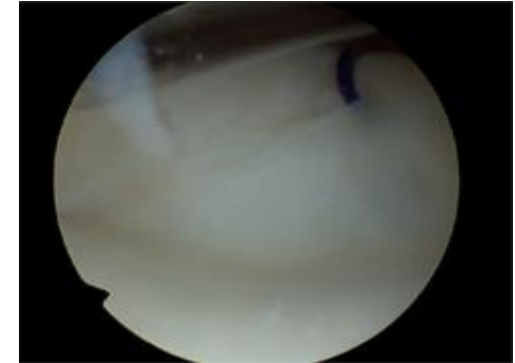
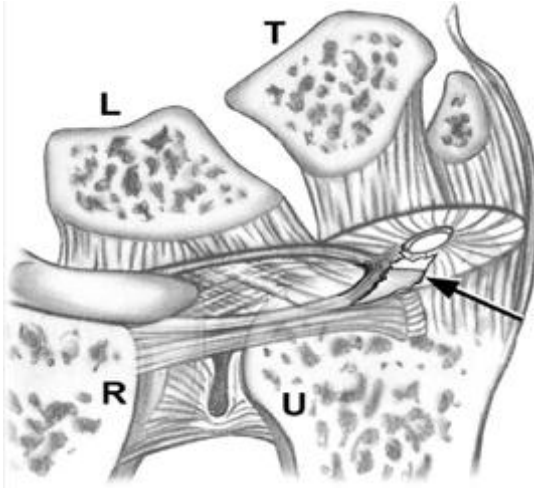
- Introduction of the 2 strands of Fiberwire inside distal eyelet of Pushlock®
- Impaction of the device + traction of the strands
- Section of the stitches
- Testing of the repair



Foveal reattachment *peripheral complementary suture*

Last step:

- Outside-in technique of **Terry Whipple** :
*In case of associated distal
TFCC class 1B lesion*



Post-op, Rehabilitation

- Long arm splint immobilization in case of suture:
 - Neutral pronosupination (or in full supination)
 - During 3 weeks
- *Short cast immobilization:*
 - During 3 weeks
 - Soft running and home trainer are authorized
 - Mobilization of the elbow
- *Rehabilitation:*
 - After 6 weeks post-op
 - Physical therapy program (range of motion, strength)
 - Anti-inflammatory local medications
- *Return to sports training:*
 - After 2 months
 - With splint protection or strapping



Conclusion

- ❑ TFCC foveal or radial lesions not so rare (sport ++)
- ❑ **All inside knotless procedure** seems to be :
 - a reproducible surgical procedure
 - accurate and rewarding
 - Short learning curve
- ❑ Clinical series are necessary to confirm the reliability of this procedure

Arthroscopic all inside procedure is undoubtedly the
gold standard

