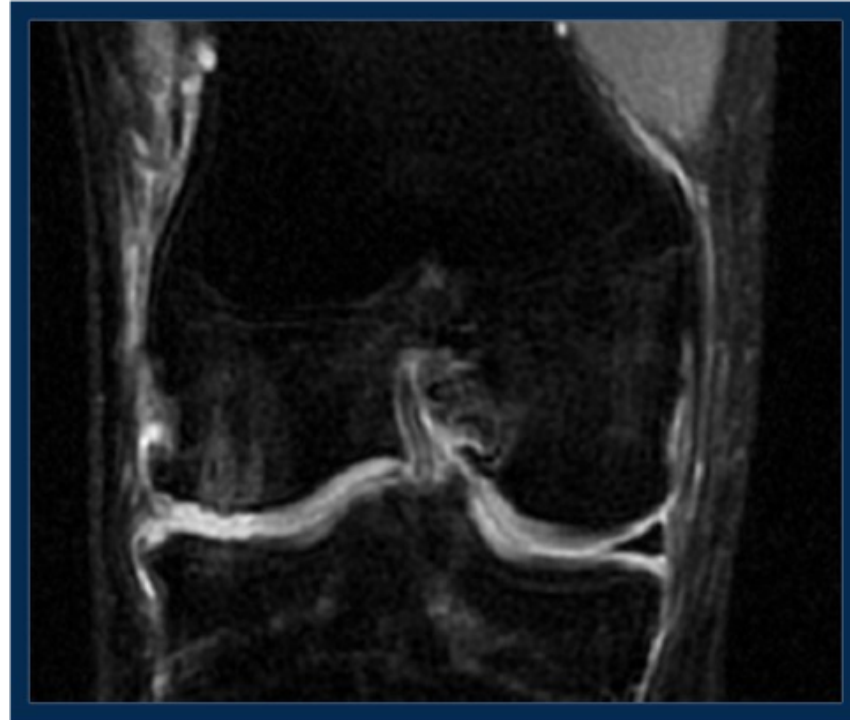


COMPLEX INJURY OF THE KNEE - MOST IMPORTANT TO SAVE THE MENISCUS: AMMR

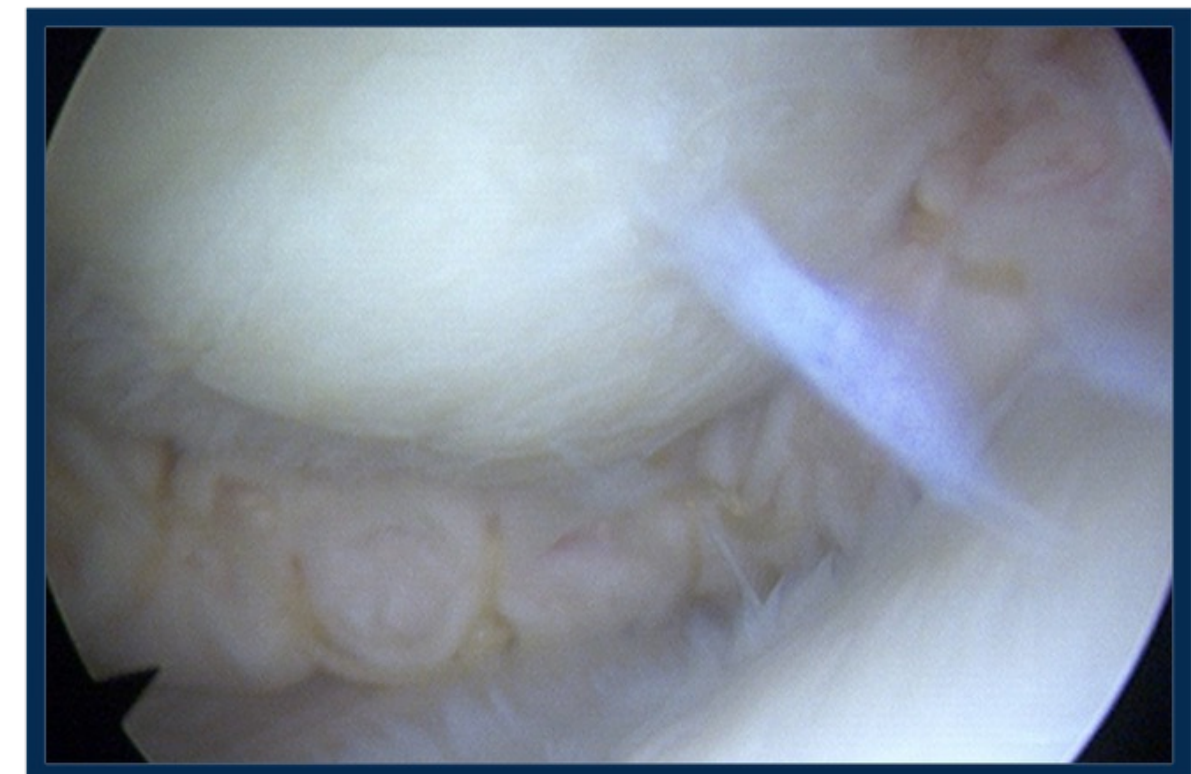
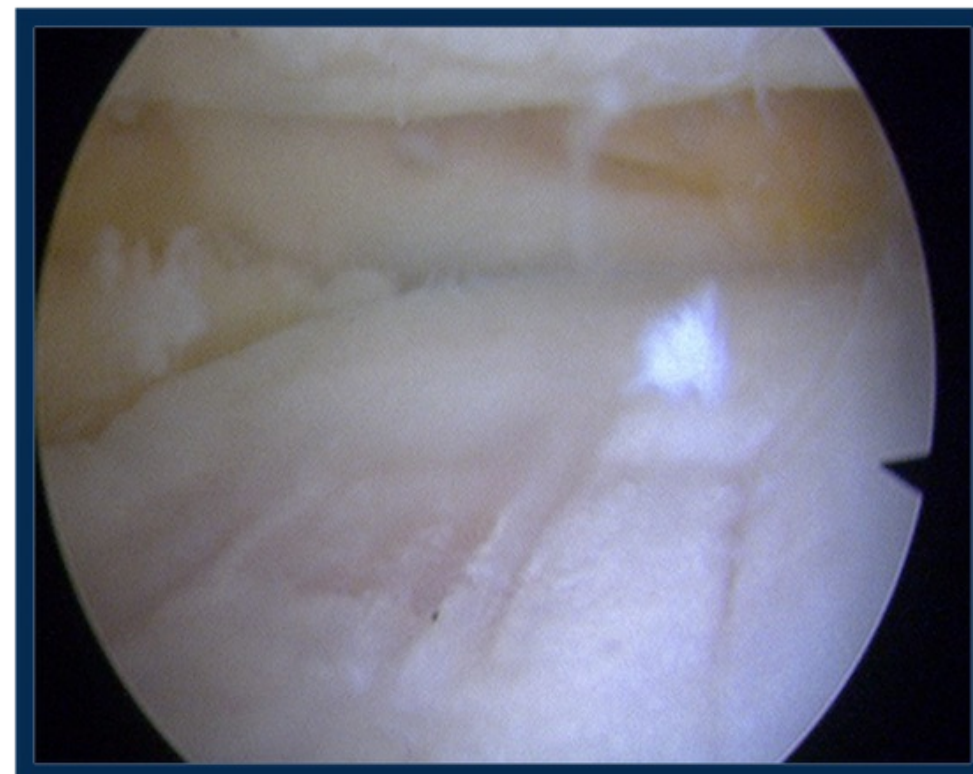
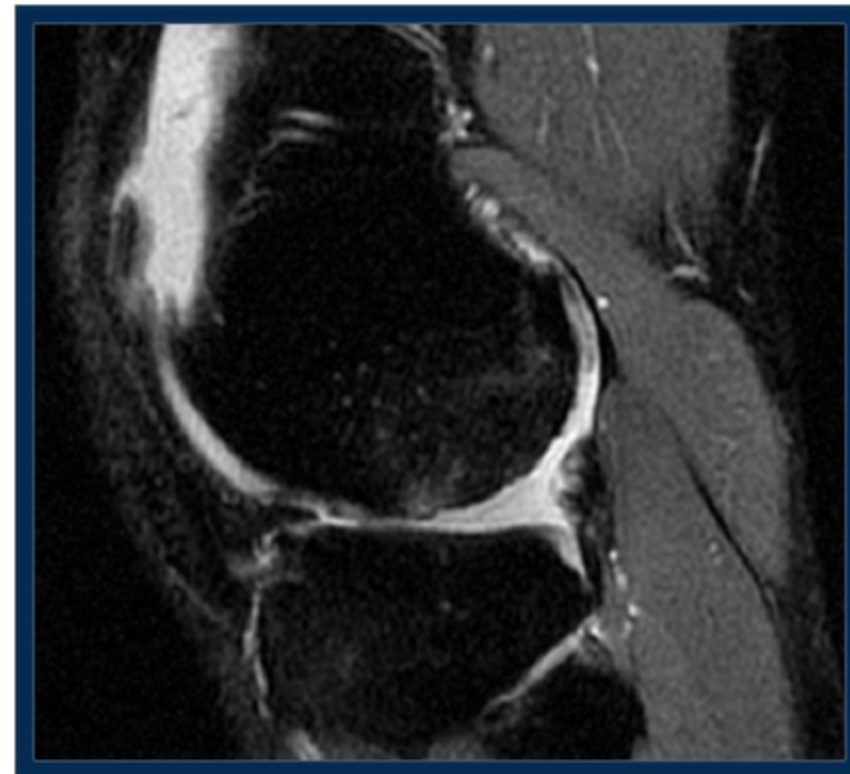
9th JOINT AEA-SEROD
CONGRESS

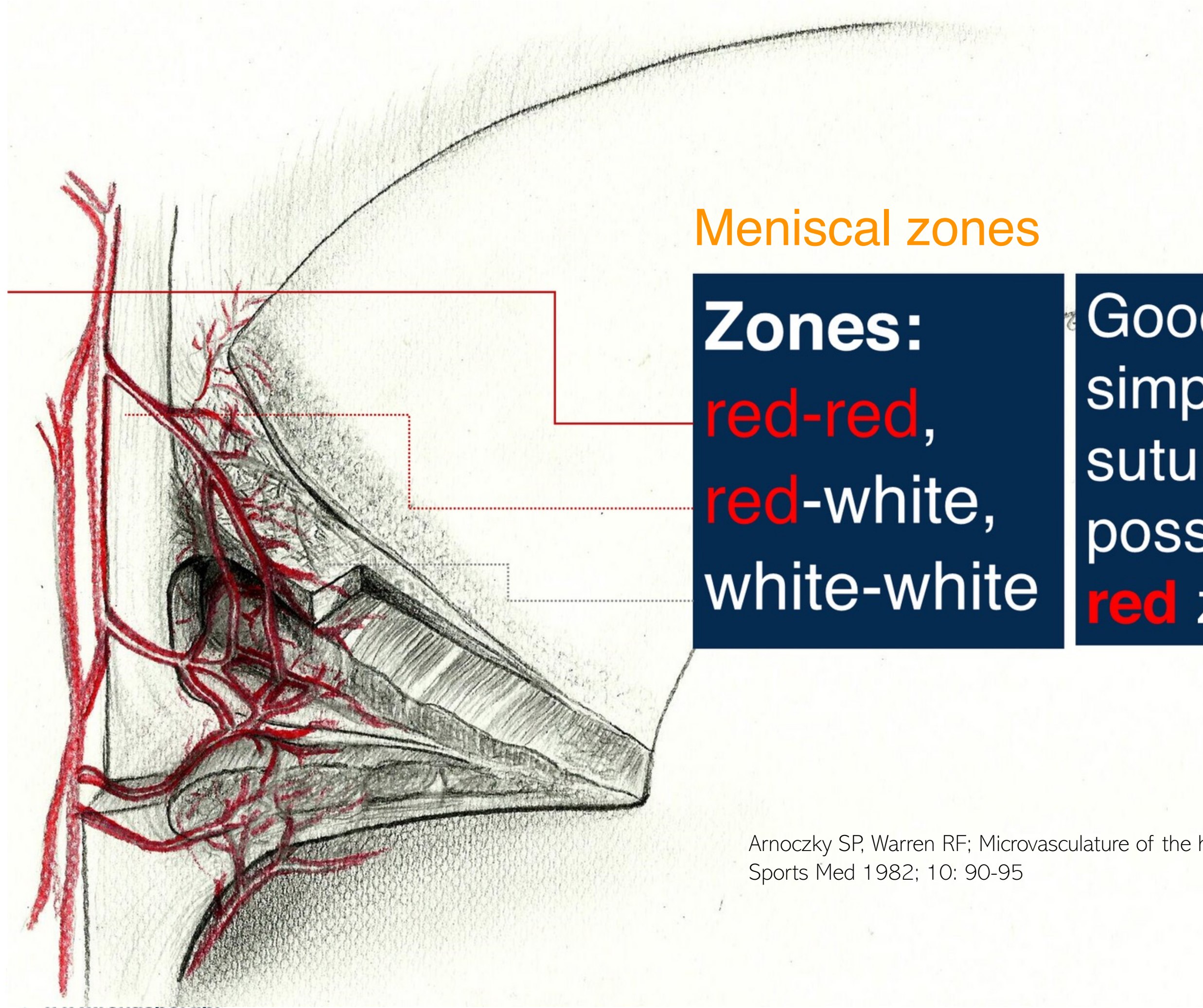
TOMASZ PIONTEK



Lateral Meniscectomy at the age of 17

9 years later (age 27)
progressive arthritic changes
in the lateral knee compartment





Meniscal zones

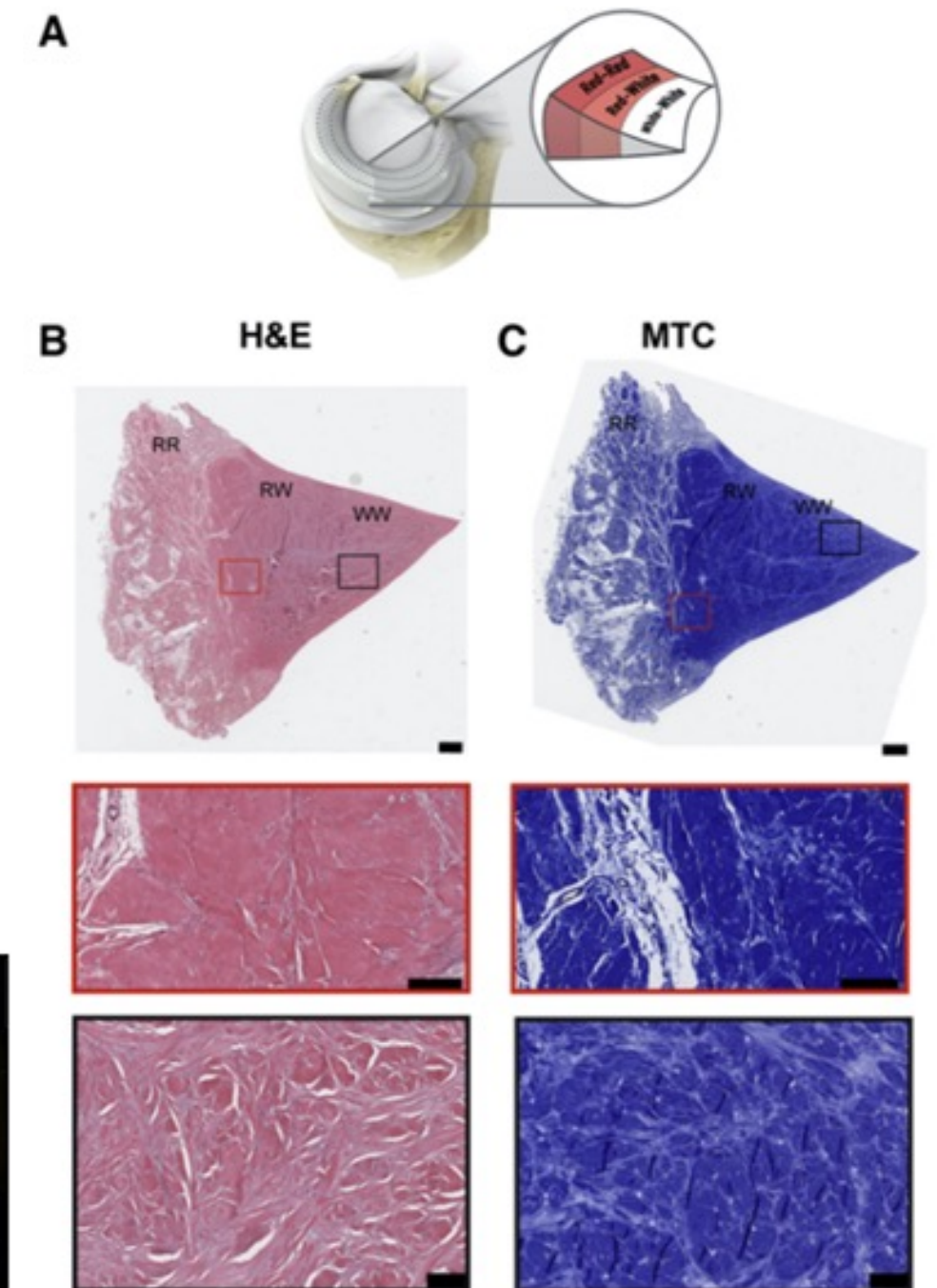
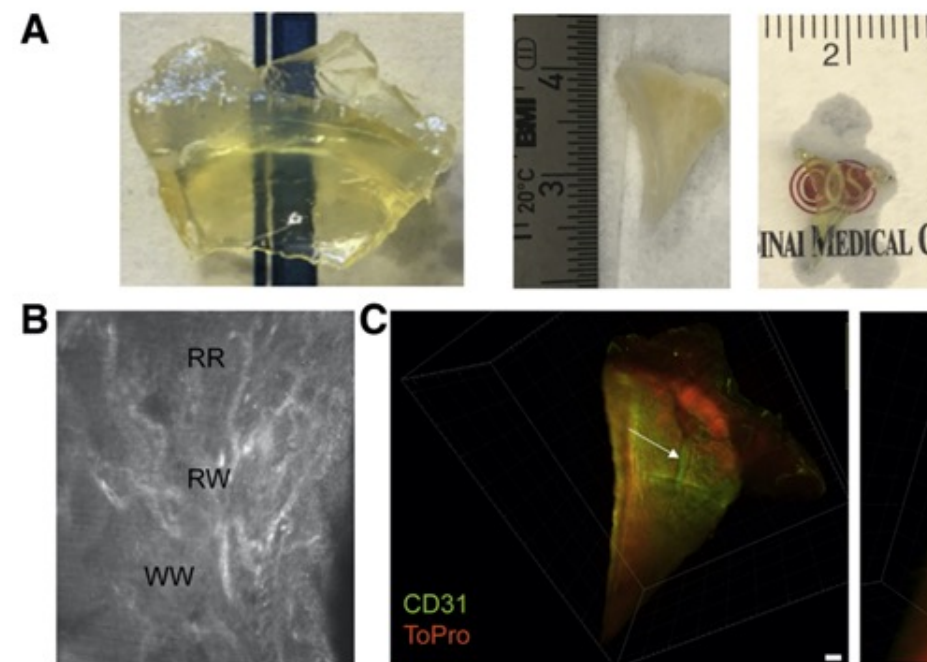
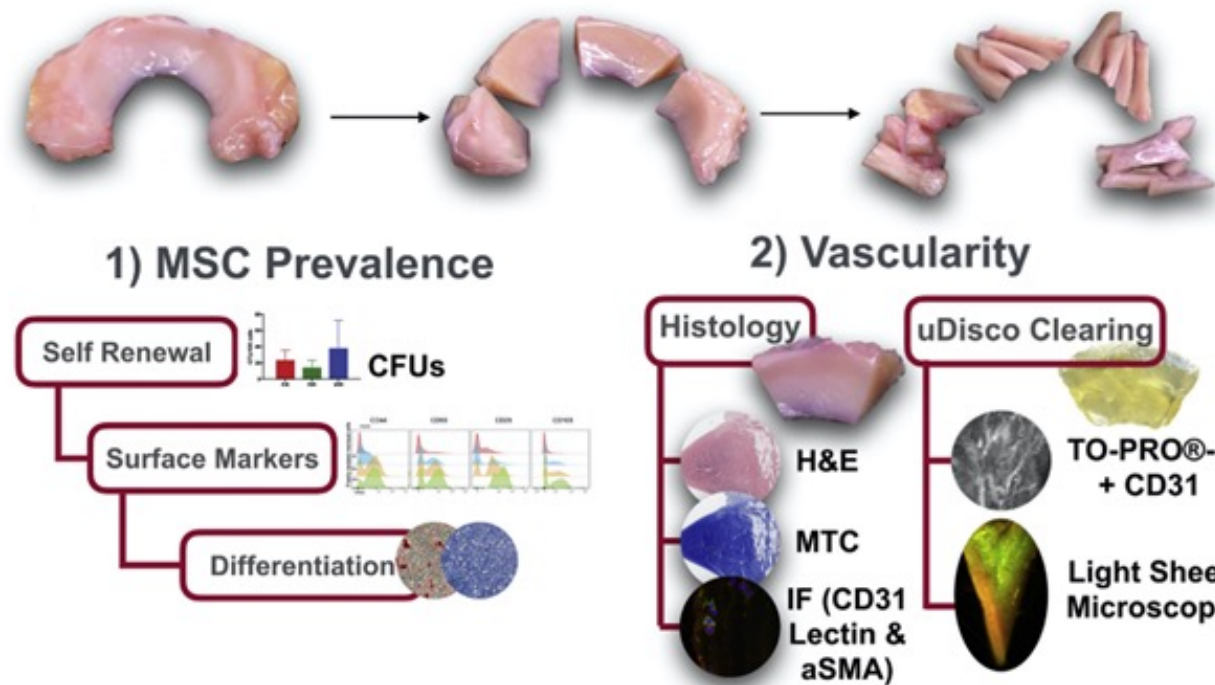
Zones:
red-red,
red-white,
white-white

Good results of simple meniscal suturing are possible in **red-red** zones.

Arnoczky SP, Warren RF; Microvasculature of the human meniscus. Am J Sports Med 1982; 10: 90-95

Assessing the Resident Progenitor Cell Population and the Vascularity of the Adult Human Meniscus

Jorge Chahla, M.D., Ph.D., Angela Papalamprou, Ph.D., Virginia Chan, B.S., Yasaman Arabi, B.S., Khosrawdad Salehi, B.S., Trevor J. Nelson, B.S., Orr Limpisvasti, M.D., Bert R. Mandelbaum, M.D., D.H.L., Wafa Tawackoli, Ph.D., Melodie F. Metzger, Ph.D., and Dmitriy Sheyn, Ph.D.



Conclusions

In conclusion, our results demonstrate the presence of resident mesenchymal progenitors in all 3 meniscal zones of healthy adult donors without injury. In addition, our results demonstrate the presence of vascularization in the WW zone.

Meniscus healing and structures

the most frequent tear patterns chronic:
vertical (16%),
discoid (14%),
bucket-handle (14%),

radial (10%), **48%**

horizontal (8%),

oblique (5%),

fray (3%), and
root detachment (2%)

complex (28%).



Biological stimulation for meniscal repair



- MSCs **Dutton**
- Synovial Cells **Jo et al.**
- “The fibrin clot seems to guide the intrinsic meniscal response to heal, as a scaffold and as a source of stimulating factors.” **Arnoczky**

Ra HJ, Ha JK, Jang HS, Kim JG. Traumatic posterior root tear of the medial meniscus in patients with severe medial instability of the knee. *Knee Surg Sports Traumatol Arthrosc.* 2015; 23:3121-3126.

Van Trommel M, Simonian P, Potter H. Arthroscopic meniscal repair with fibrin clot of complete radial tears of the lateral meniscus in the avascular zone. *Arthroscopy.* 1998;14:360- 365.



Augmentation techniques for isolated meniscal tears Samuel A. Taylor & Scott A. Rodeo *Curr Rev Musculoskelet Med* (2013) 6:95–101

The concept of meniscus wrapping

0363-5465/91/1906-0626\$02.00/0
 THE AMERICAN JOURNAL OF SPORTS MEDICINE, Vol. 19, No. 6
 © 1991 American Orthopaedic Society for Sports Medicine

Use of the fascia sheath coverage and exogenous fibrin clot in the treatment of complex meniscal tears*

CHARLES E. HENNING,†‡ MD, KIM M. YEAROUT, PT, STEVEN W. VEQUIST, PT,
 ROBERT J. STALLBAUMER, RN, AND KRISTA A. DECKER

From the Mid-America Center for Sports Medicine, Wichita, Kansas

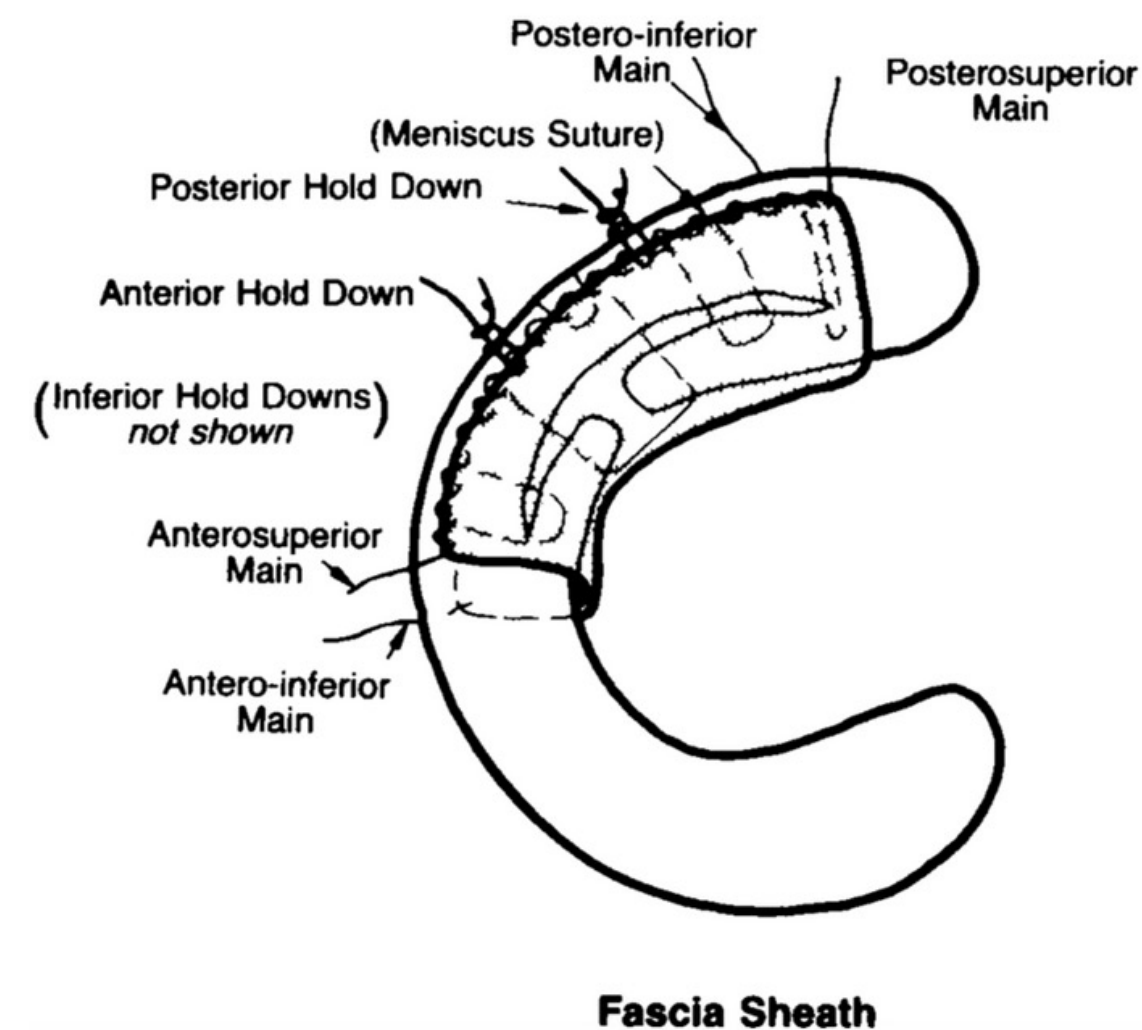
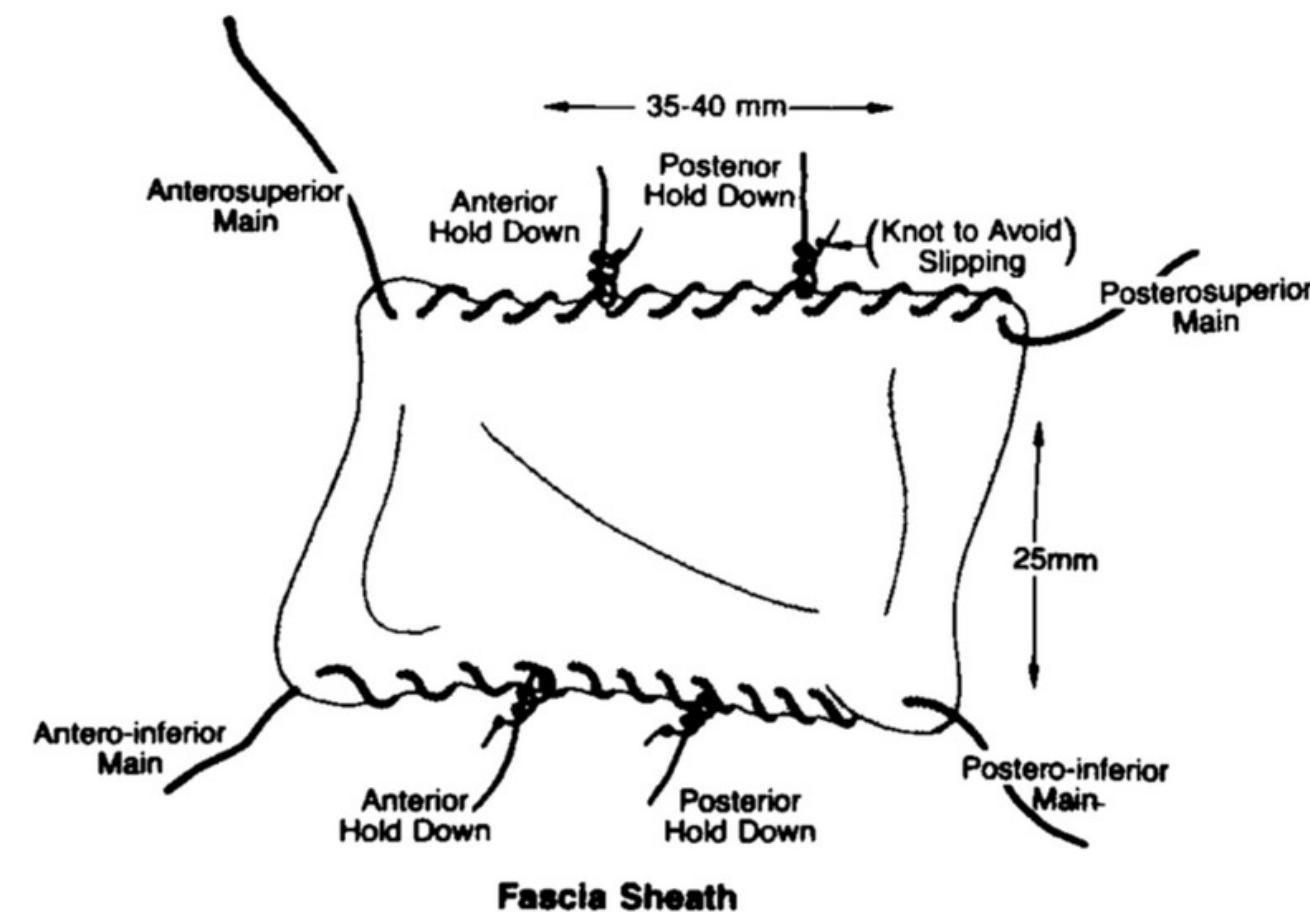
TABLE 1

Comparative healing rates, rasp peripheral rim vs. sheath when excluding tears in the middle one-third

	Complete healing		Incomplete healing		Failed	
	No.	(%)	No.	(%)	No.	(%)
Rasp rim ^a N = 58	30	(51)	14	(24)	14	(24)
Sheath ^b N = 26	10	(38)	14	(54)	2	(8)

^a Previous series.

^b Current series.



The concept of meniscus wrapping

Jacobi M, Jakob RP

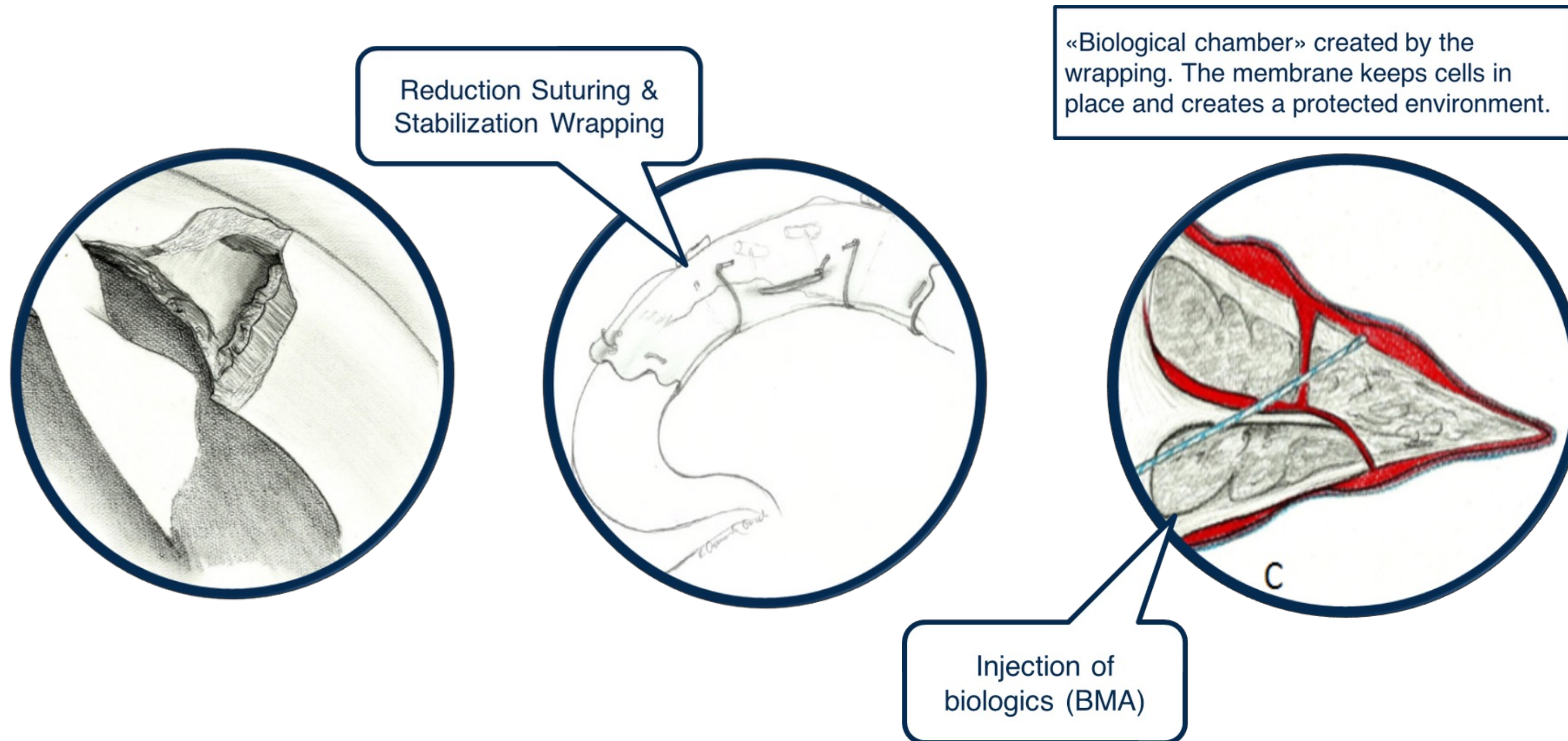
**Meniscal repair: enhancement of healing
process; the meniscus,
P. Beaufils, R. Verdonk,
The Meniscus; Springer, 2010**

HOW TO WORK IN THE ARTHROSCOPIC MODE?

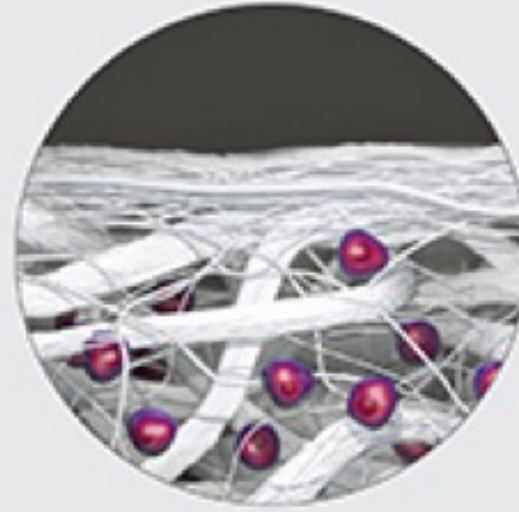


Prof. Dr. med. Roland Jakob

Arthroscopic technique of collagen Matrix-based Meniscus Repair: AMMR



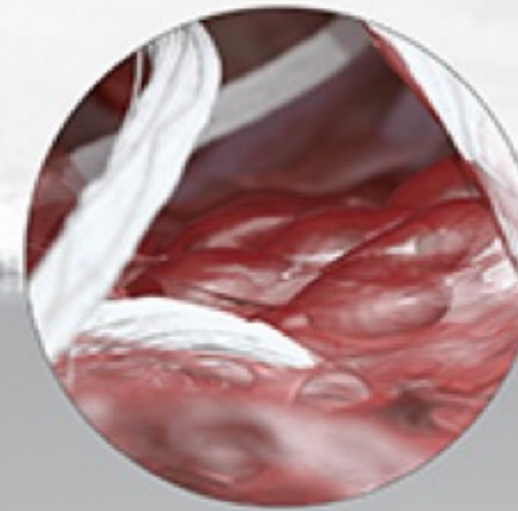
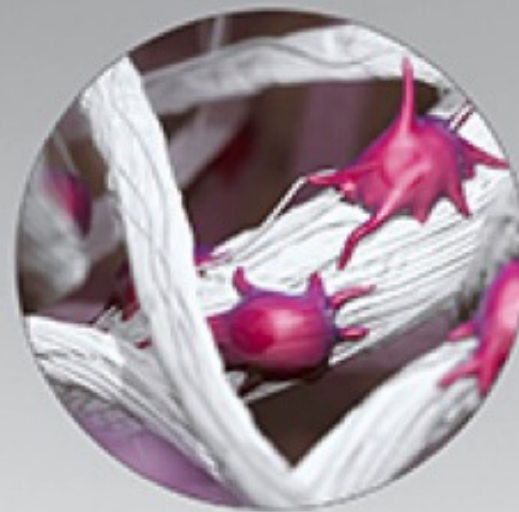
Bi-layer collagen membrane: Chondro-Gide®



A barrier to prevent cell diffusion
The smooth, compact top layer is also sturdy
enough to protect the cells and newly forming
cartilage from shear stress in the joint



Rough, porous bottom layer
Adheres to the defect, keeping
the membrane in place

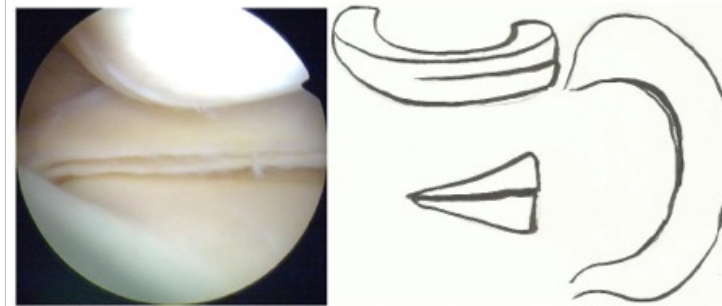


Indications for meniscus wrapping 1/3

- Augmentation of meniscal suture repair in w/w and r/w zone
- Failure of suture repair
- Complex tears – degenerative and traumatic - extending from w/w into r/w and r/r zone

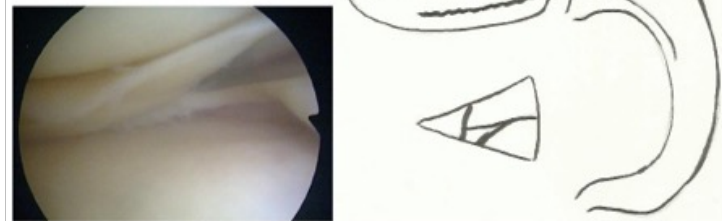
Indications for meniscus wrapping 2/2

horizontal/cleavage



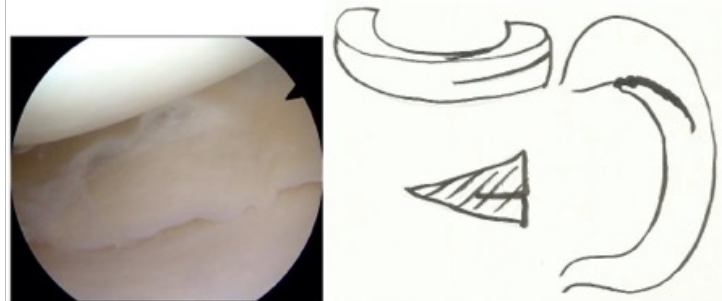
horizontal tear

horizontal



combined tear with unstable meniscus

radial/oblique



“parrot” type of tear

vertical (bucket handle)



huge bucket handle

A new device for the technique

INSTRUCTION MANUAL
Medical device manufactured at Aesculap Chfta. Before using the device, you should read this manual.

Characteristics
Handmade product made of high-quality, specialized stainless steel.

Storage
Devices should be stored in a standard condition, which provides protection from temperature/humidity extremes.

First use
Reusable device.
Before first use, device should be inspected and maintained as described in the Inspection and Maintenance section.

Inspection and maintenance
1. Inspection and function testing
Before each use it is necessary to perform careful inspection and functional test of reusable devices to confirm its proper operation. During visual inspection pay attention to any damages or wear, cracks or surface contamination.
This product has no expiry date. Repeated processing has minimal effect on these instruments. End of life is normally detected by wear and damage due to use.

2. Preliminary cleaning and disinfection
Before cleaning, remove excess soil from devices, especially in areas such as joints and crevices, by cleaning the surfaces with a plastic brush under running water for 2 minutes. Do not exceed 5 hours break between use and preliminary cleaning. Use light detergent during preliminary cleaning. H2O2 and fixative disinfectants (active substances, alcohols, aldehydes).

Manual cleaning/Disinfection
Cleaning-disinfecting agents – such as "Saniplast" – are recommended by Aesculap Chfta. If a.o. warnings should be used according to the instructions and restrictions provided by the device's manufacturer. Rinse the cleaned instrument thoroughly under running water. Use demineralized water for the final rinse. Visually inspect device for any remaining visible debris, damage or wear. If necessary, the process should be repeated.
Ultrasonic cleaning is recommended.
Immersion disinfection – 15 min.

Automatic washer-disinfecter cleaning:
Hospitalized units are recommended. Disinfectants should be used according to the instructions and restrictions provided by the original manufacturer. The automatic washer-disinfecter equipment should be operated following the manufacturer's instructions for use.
Thermal disinfection should be carried out at 90°C in a demineralized water bath without detergents for 5 minutes and dried at max 120°C.

Visually inspect devices for any remaining visible debris or wear.

WARNINGS:
Devices with long, thin ends and holes require special attention during cleaning.

3. Preparation for sterilization
All internal and external sections of the device must be accessible for ease of disinfection and penetration of sterilization agents. Lock devices should be opened in the open or manually open position in the first locking position, to prevent damage due to stress corrosion. Prior to sterilization, individual reusable devices that have moving parts should be lubricated. The use of "Shell" lubricant is recommended. Make sure that the maximum permitted sterilizer load specified by the sterilizer manufacturer is not exceeded. Heavy devices should be placed at the bottom.

4. Sterilization
Adequately prepared device should be sterilized. Recommended sterilization parameters:
- steam sterilization using a fractional vacuum procedure, temp. 132°C, pressure 2 bar, minimum exposure time to sterilizing agent 5 min.
- steam sterilization in accordance with PN-EN ISO 17665.

Warnings
General warranty conditions for reusable medical devices.
Aesculap Chfta Sp. z o.o. guarantees that Chfta products offered for sale comply with the requirements of the CE mark and workmanship. The company provides 2 years warranty for individual products, and 3 years for tools with hardened working parts. In the case of medical devices the condition of using the warranty is the use of the products as stated and proper preparation, lubrication, cleaning, disinfection, sterilization in accordance with the information contained in the content of the instruction manual. If a defect is found during the warranty period, please send the product after the decontamination process along with information about the date of defect found directly to the company by the address (Use address details in the "Manufacturer" section). Please attach a document confirming the purchase to the shipment. In the event of a defect after the warranty period, Aesculap Chfta Sp. z o.o. has the option of repairing products as part of a technical service. Contact details available in the "Authorized service" section.

The warranty does not cover:
1. Wear resulting from the normal operation (e.g. blinding of blades, wear of the working part surface, wear of fasteners and resulting joint loosening).
2. Incorrect use, contrary to the standard use.
3. Surface damage (e.g. pitting, surface discoloration) resulting from improper cleaning, disinfection and sterilization methods.
Improper handling in cleaning, disinfection and maintenance during preparation for reuse or storage by:
- reusable disinfectants and cleaning agents,
- improper use of disinfectants,
- inappropriate washing and cleaning methods,
- lack of maintenance (substitution) of fasteners or use of inappropriate maintenance products,
- insufficient quality of sterilizing steam or also incorrect parameters of the sterilization process.

4. Unauthorized service repairs
It is the responsibility of the user to verify that the device is suitable for given procedure. Aesculap Chfta Sp. z o.o. is not responsible for any damages resulting from the use of repaired devices, which were units for use, or which were returned to any modifications and improvements made by the user without the knowledge of the manufacturer.

Authorized service
After each cleaning and disinfection instruments should be inspected to ensure safety and proper functioning. It is recommended that during both in-house and technical service every 6 to 10 months. All questions regarding repairs and maintenance should be directed to the manufacturer's authorized service center.

ATS Aesculap Technical Service
tel. +48 61 44 20 300
ata.aesc@reha.com
www.chfta.com.pl/ats

Warnings
Particular attention should be paid to patient safety and use the product in accordance with its intended purpose and the information contained in the attached instructions manual.
Devices should not be subjected to:
- contamination by the manufacturer's mechanical, electrochemical or laser surface marking,
- long term chemical exposure.
Particular attention should be paid to patient safety and use the product in accordance with its intended purpose and the information contained in the attached instructions manual.
Devices should not be subjected to:
- contamination by the manufacturer's mechanical, electrochemical or laser surface marking,
- long term chemical exposure.
dedicated for medical use. Do not use the household cleaner for antiseptic H2O2 and/or formalin disinfection (Vielstoffe, Alkohole, Aldehyde).
long term chemical exposure.
dedicated for medical use. Do not use the household cleaner for antiseptic H2O2 and/or formalin disinfection (Vielstoffe, Alkohole, Aldehyde).
long term chemical exposure.

Manual cleaning/Disinfection:
The combination of Rinse and Disinfection should be used according to the instructions and restrictions provided by the device's manufacturer. Rinse the cleaned instrument thoroughly under running water. Use demineralized water for the final rinse. Visually inspect device for any remaining visible debris, damage or wear. If necessary, the process should be repeated.
Ultrasonic cleaning is recommended.
Immersion disinfection – 15 min.

Automatic washer-disinfecter cleaning:
Hospitalized units are recommended. Disinfectants should be used according to the instructions and restrictions provided by the original manufacturer. The automatic washer-disinfecter equipment should be operated following the manufacturer's instructions for use.
Thermal disinfection should be carried out at 90°C in a demineralized water bath without detergents for 5 minutes and dried at max 120°C.

Visually inspect devices for any remaining visible debris or wear.

WARNINGS:
Devices with long, thin ends and holes require special attention during cleaning.

GEBRAUCHSANWEISUNG
Wiederverwendbare medizinische Instrumente. Bevor Sie die Werkzeuge benutzen, ist es wichtig, dass Sie diese Gebrauchsanweisung lesen.

Charakteristika
Von Hand gefertigtes Produkt aus hochwertigem Spezialstahl.

Lagerbedingungen
Legen Sie unter Standardbedingungen ohne jegliche Exposition gegenüber feuchte Änderungen von Temperatur und Feuchtigkeit.

Erste Verwendung
Wiederverwendbares Produkt. Vor der ersten Verwendung sollte das Werkzeug überprüft und Dekontamination in Übereinstimmung mit dem unter Überprüfung und Wartung.

Inspektion und Wartung
1. Überprüfung der Bedienung und Funktionalität
Vor jeder Verwendung ist es wichtig, Folgendes zu überprüfen:
- Funktionsfähigkeit der Instrumente.
- Verschleiß der Instrumente.
- Sichtbare oder Verformungen, aufreißende, rauhende Oberflächen. Das Produkt hat kein Verfallsdatum und ist unabhängig von der Anzahl der Zubehörsätze. Das Instrument wird begrenzt durch normale Verschleiß und Schäden, die durch die Verwendung des Werkzeugs entstehen.

2. Vorreinigung und Desinfektion
Oberflächenkontaminationen/Verunreinigungen/Waschprozess sollten werden durch Spülen des Werkzeugs unter fließendem Wasser für eine Minute mit warmer Seifenlauge. Besonders oberflächennah sollte folgende Punkte beachtet werden: wendliche Stellen (Risse und Fugen) (die sollte es nicht 5 überprüfbar). Prüfen Sie die Funktion des Werkzeugs (z.B. durch Temperaturerhöhung während der Antiseptik H2O2 und/oder Formalin Desinfektion (Vielstoffe, Alkohole, Aldehyde)).

Manuelle Reinigung/Desinfektion:
Die Kombination von Rinse und Desinfektion sollte verwendet werden, wie in den Anweisungen und Einschränkungen des Herstellers angegeben. Spülen Sie das gereinigte Instrument gründlich unter fließendem Wasser. Verwenden Sie demineralisiertes Wasser für das Endspülen. Visuell prüfen Sie das Instrument auf verbleibende sichtbare Schmutz, Beschädigung oder Verschleiß. Wenn erforderlich, sollte der Prozess wiederholt werden.
Ultraschallreinigung ist empfohlen.
Immersion Desinfektion – 15 Minuten.

Automatische Waschanlage/Desinfektion:
Krankenhaus-Einheiten sind empfohlen. Desinfektionsmittel sollten gemäß den Anweisungen und Einschränkungen des Herstellers verwendet werden. Die automatische Waschanlage sollte gemäß den Anweisungen des Herstellers für den Betrieb verwendet werden.
Thermische Desinfektion sollte bei 90°C in einem demineralisierten Wasserbad ohne Reinigungsmittel für 5 Minuten durchgeführt werden und bei max 120°C getrocknet werden.

Visuell prüfen Sie die Instrumente auf verbleibende sichtbare Schmutz, Beschädigung oder Verschleiß.

WARNUNGEN:
Werkzeuge mit langen und dünnen Enden und Löchern erfordern besondere Aufmerksamkeit bei der Reinigung.

3. Vorbereitung für die Sterilisation
Der Zugang zum Sterilisationsmedium muss für alle Oberflächen des Instruments sichergestellt sein. Vor der Sterilisation sollte das Instrument mit einem nicht abrasiven Desinfiziermittel gereinigt werden. Es sollte sichergestellt werden, dass die maximale zulässige Beladung des Sterilisations nach Angaben des Herstellers nicht überschritten. Schwere Werkzeuge sollten platziert werden unter:

4. Sterilisation
Ein richtig vorbereitetes Werkzeug sollte dem Prozess übergeben werden. Sterilisation. Die empfohlene Methode ist:
- Dampfsterilisation mit reduzierter Vakuum.
- Temperatur 132°C, Druck 2 bar, minimale Expositionszeit 5 Minuten.
- Dampfsterilisation nach PN-EN ISO 17665.

Garantie
Allgemeine Garantiebedingungen für medizinische Instrumente/Produkte:
Aesculap Chfta Sp. z o.o. garantiert, dass Produkte der Marke Chfta von unseren Unternehmen angeboten werden, sind frei von jeglichen mangelhaften und Verformungen. Das Unternehmen bietet 2 Jahre für gewerbliche Produkte. Garantie beträgt 3 Jahre für Werkzeuge mit gehärteten Arbeitsflächen. Die Kombination der Bedingungen ist die Bedingung für die Verwendung von Produkten.
bestimmte Garantie besteht darin, das Produkt bestimmungsgemäß zu verwenden und ordnungsgemäße Vorbereitung, Reinigung, Wartung, Anweisungen sind Anweisungen und Einschränkungen des Herstellers. Wenn während der Garantiezeit ein Defekt gefunden wird, sollte das Produkt nach dem Dekontaminationsprozess gereinigt und inspektionell zu verwenden sein, solange das Instrument die Funktion erfüllt. Prüfen Sie die Funktion des Werkzeugs (z.B. durch Temperaturerhöhung während der Antiseptik H2O2 und/oder Formalin Desinfektion (Vielstoffe, Alkohole, Aldehyde)).

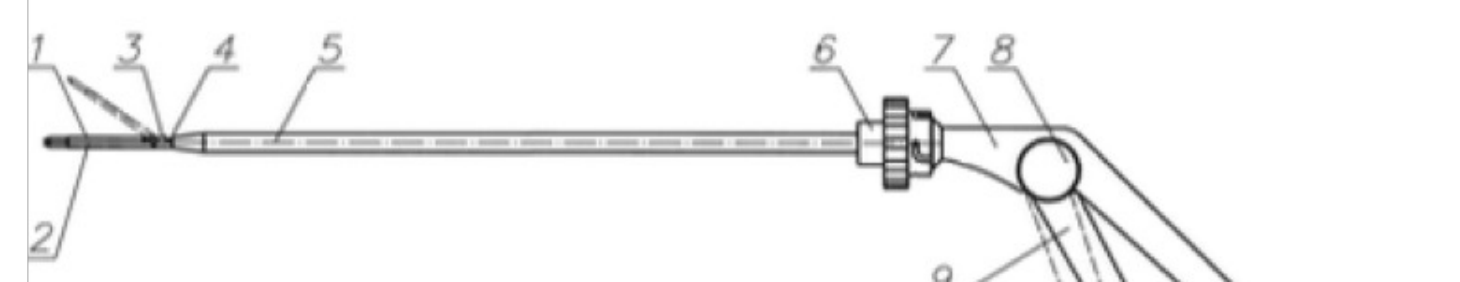
Die Garantie deckt nicht ab:
1. Verschleiß durch normalen Betrieb (z.B. Abnutzung der Arbeitsfläche, Verschleiß der Arbeitsfläche und des durch resultierende übermäßige Spülen).
2. Unsachgemäßer Gebrauch, unsachgemäßer Gebrauch.
3. Oberflächenbeschädigung (z.B. durch Oberflächenbeschädigung durch unzureichende Reinigung, Desinfektion und Sterilisation).

Unsachgemäße Handhabung während des Wasch- und Reinigungsprozesses, Sterilisation und Wartung bei der Vorbereitung zur Wiederverwendung/Verwendung oder zur Speicherung durch:
- ungeeignete Desinfektions- und Reinigungsagentien,
- ungeeignete Verwendung von Desinfektionsmitteln.

5. Allgemeine Garantiebedingungen für medizinische Instrumente/Produkte:
Aesculap Chfta Sp. z o.o. garantiert, dass Produkte der Marke Chfta von unseren Unternehmen angeboten werden, sind frei von jeglichen mangelhaften und Verformungen. Das Unternehmen bietet 2 Jahre für gewerbliche Produkte. Garantie beträgt 3 Jahre für Werkzeuge mit gehärteten Arbeitsflächen. Die Kombination der Bedingungen ist die Bedingung für die Verwendung von Produkten.
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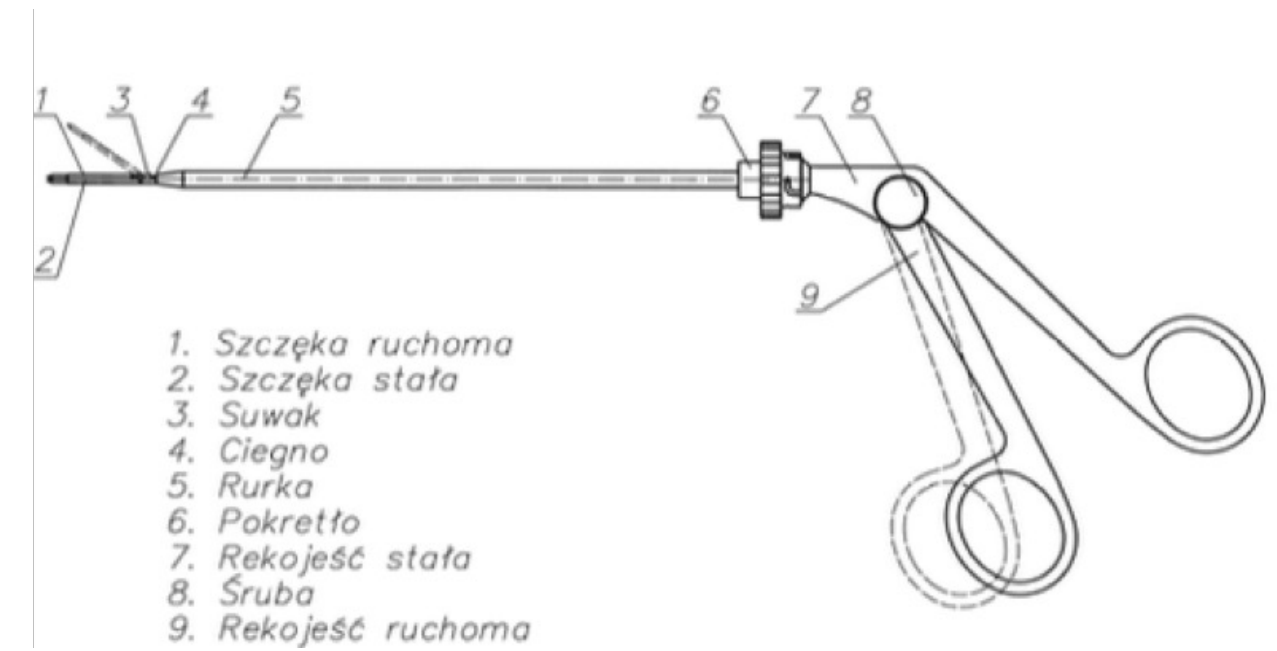
Unsachgemäße Handhabung während des Wasch- und Reinigungsprozesses, Sterilisation und Wartung bei der Vorbereitung zur Wiederverwendung/Verwendung oder zur Speicherung durch:
- ungeeignete Desinfektions- und Reinigungsagentien,
- ungeeignete Verwendung von Desinfektionsmitteln.



- 1. Szczęka ruchoma
- 2. Szczęka stała
- 3. Suwak
- 4. Ciegno
- 5. Rurka
- 6. Pokretło
- 7. Rekojeść stała
- 8. Śruba
- 9. Rekojeść ruchoma



A new device for the technique



Case Presentation: 40 years old man with a radial tear of the MM

- Non-contact, twisting injury to the left knee
- Symptoms: pain, swelling, inability to bear weight on the L knee
- Locking, unable to fully straighten or flex the knee



Physical Examination

- Painful ROM: 110°- 120°
- Pain at terminal flexion
- McMurray test positive
- Patellar apprehension test: negative
- Lachman test negative



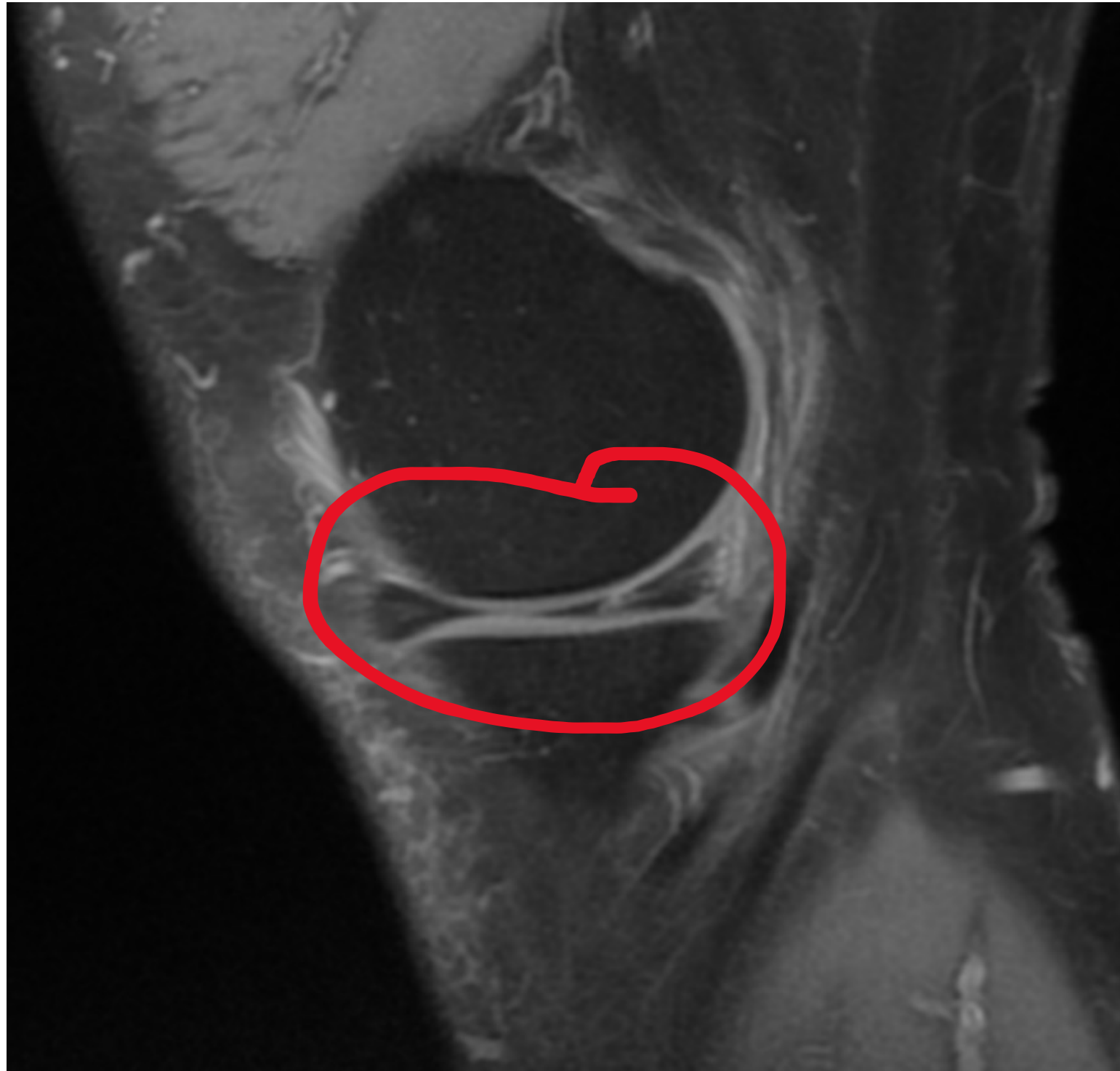
Imaging Studies

- Radiographs normal
- Frontal plane alignment: normal
- Posterior tibial slope: normal

MRI

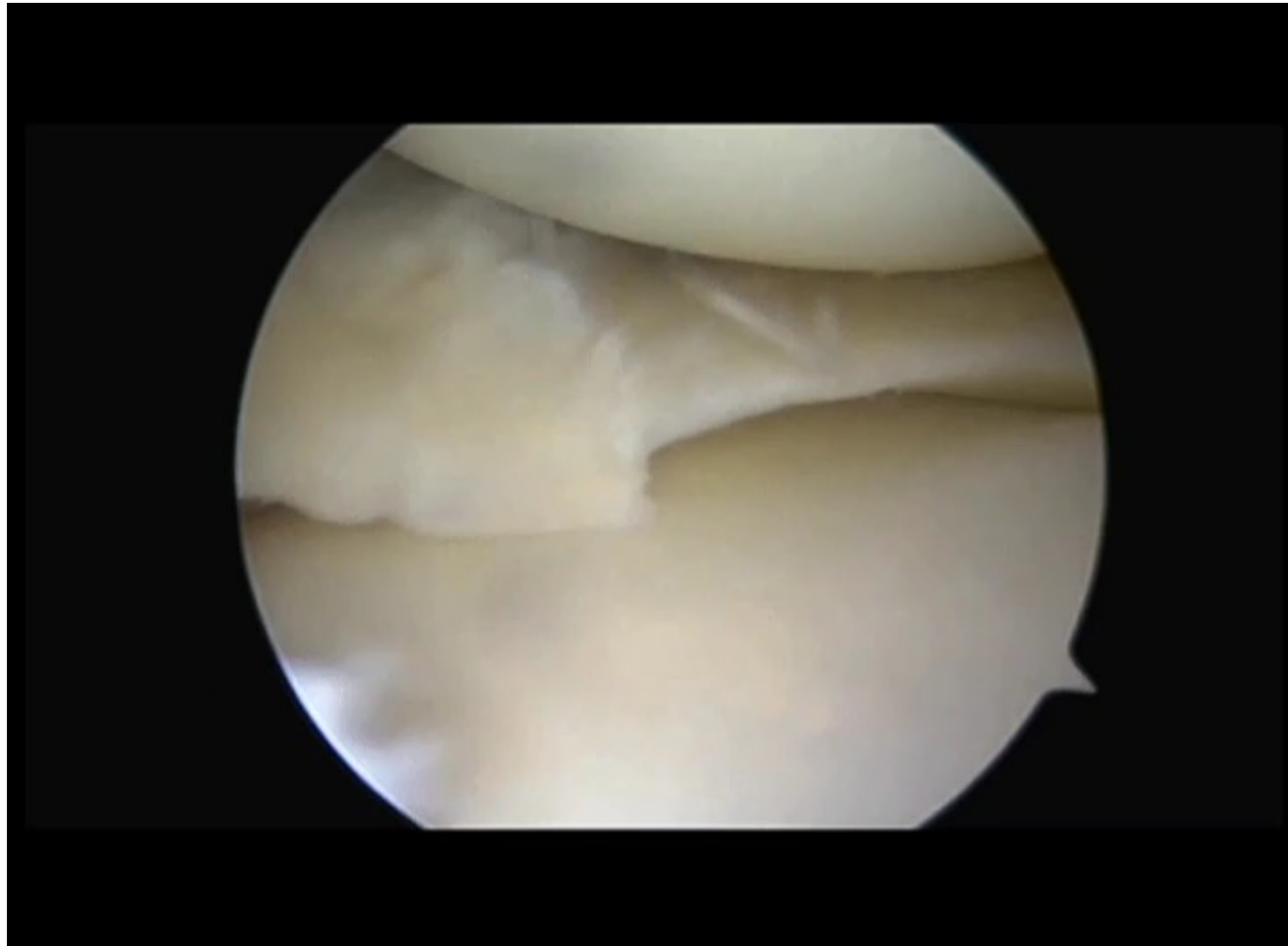


MRI





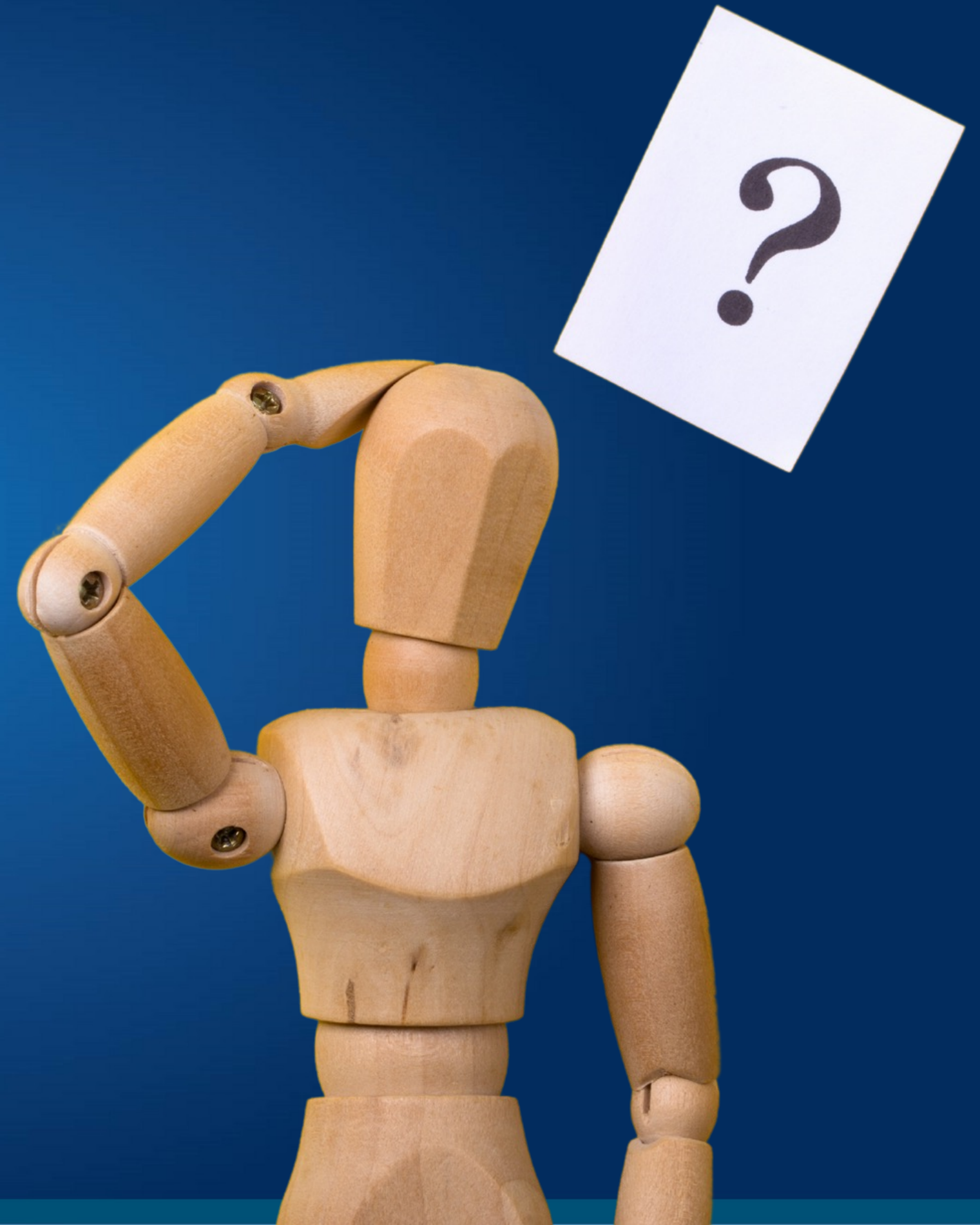
Findings at Arthroscopy



Question

How would you treat this tear?

- Nonoperative treatment
- Partial meniscectomy
- Meniscus repair



Question

If you repaired this meniscus tear, what surgical technique would you use?

- Outside-in
- All-inside
- Inside-out
- Other



Would you perform any biological augmentation techniques? If so, what techniques?



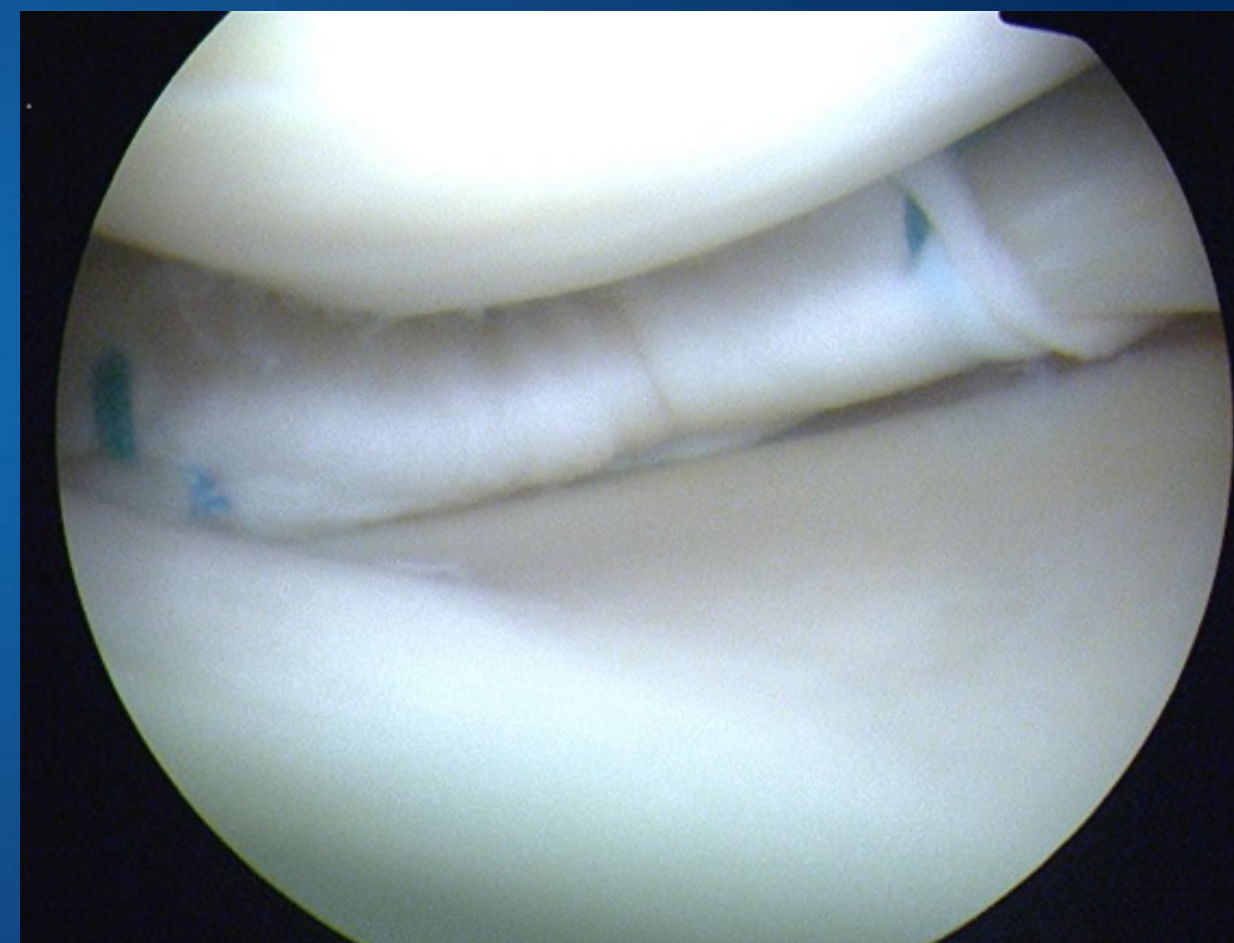
PRP



BMAC

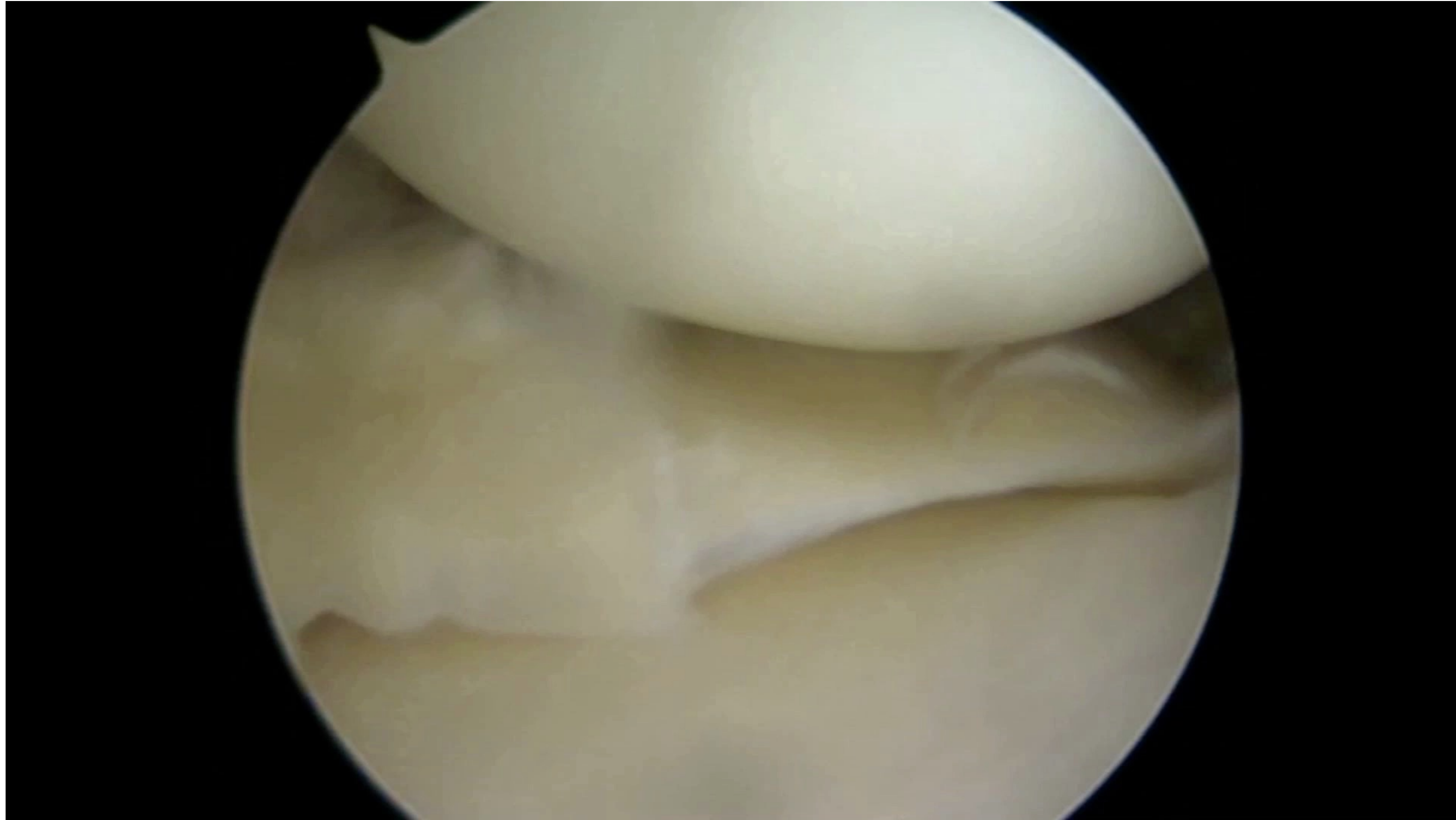


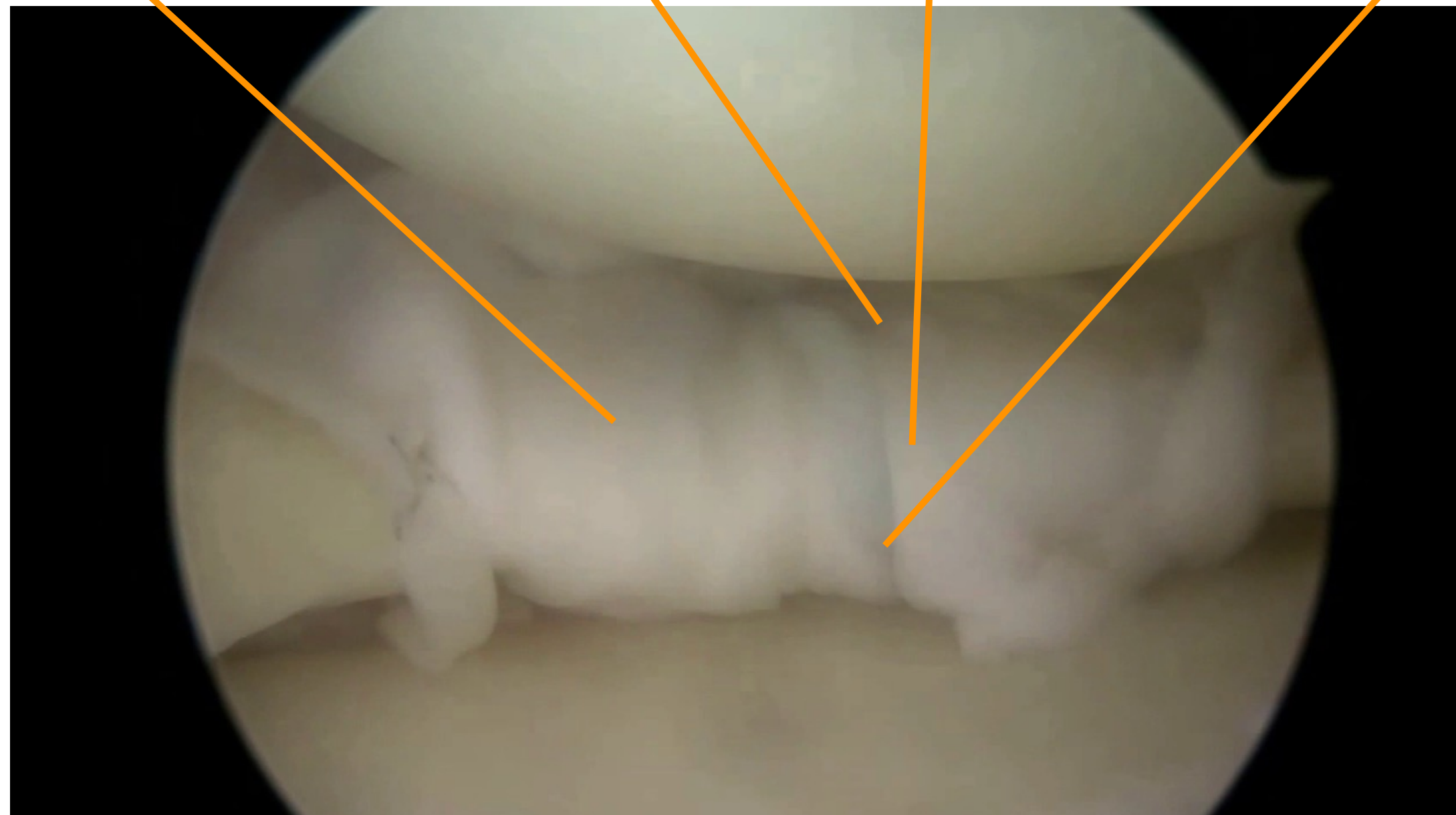
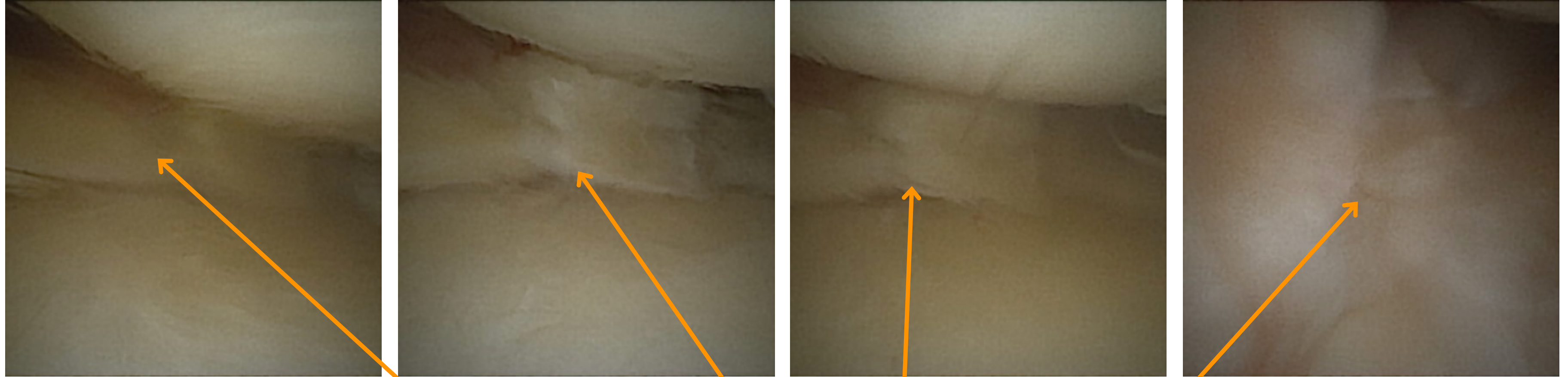
**Exogenous
fibrin clots**



Wrapping

What I did?





What
I did?

Wrapping in algorithm of AAOS

Augmentation Techniques for Meniscus Repair

Leili Ghazi zadeh, MSc¹ Anik Chevrier, PhD² Jack Farr, MD³ Scott A. Rodeo, MD⁴
 Michael D. Buschmann, PhD²

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² Department of Chemical Engineering, Ecole Polytechnique de Montreal, Montreal, Quebec, Canada
³ Cartilage Restoration Center, OrthoIndy, Greenwood, Indiana
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J Knee Surg

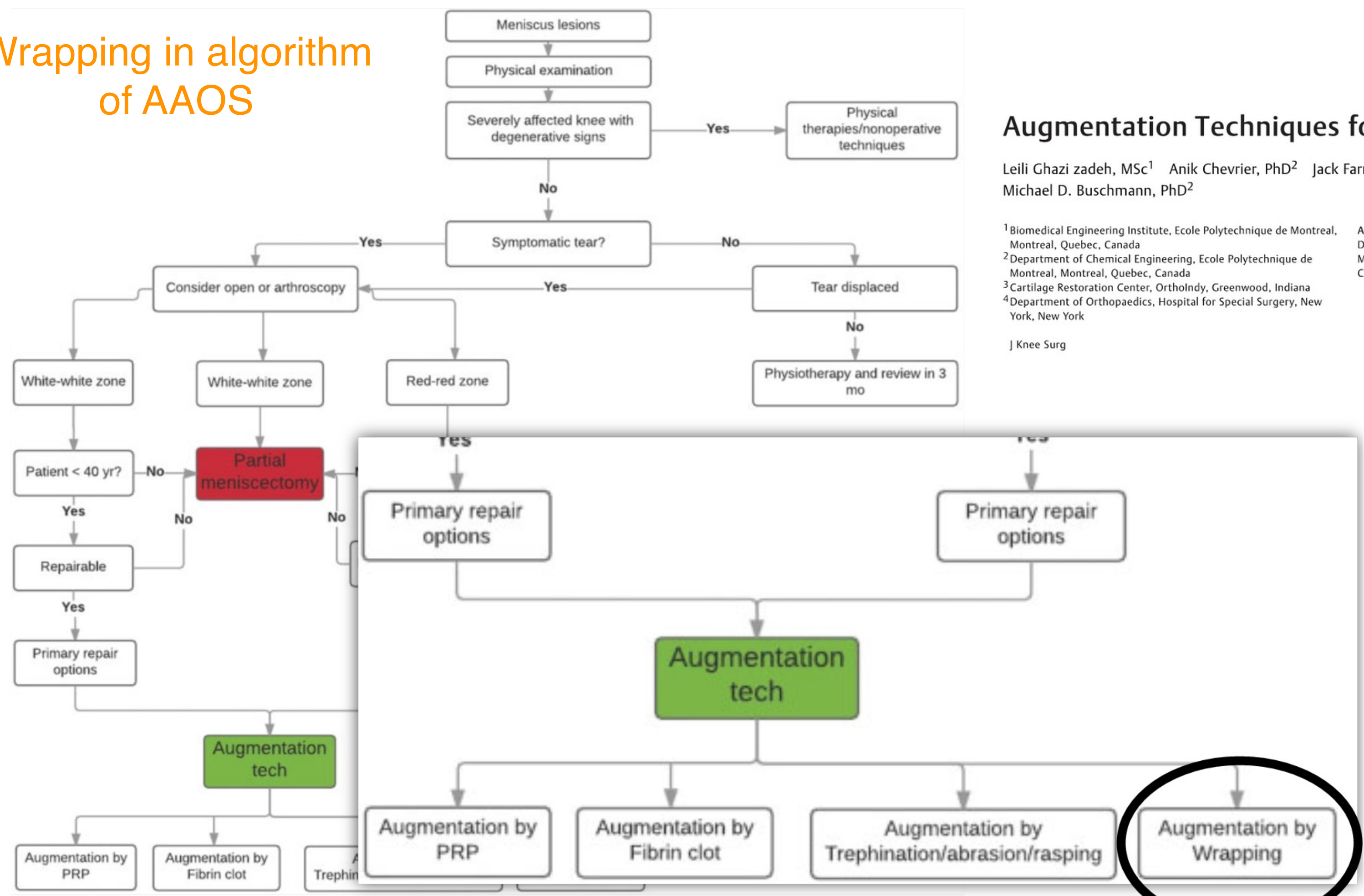
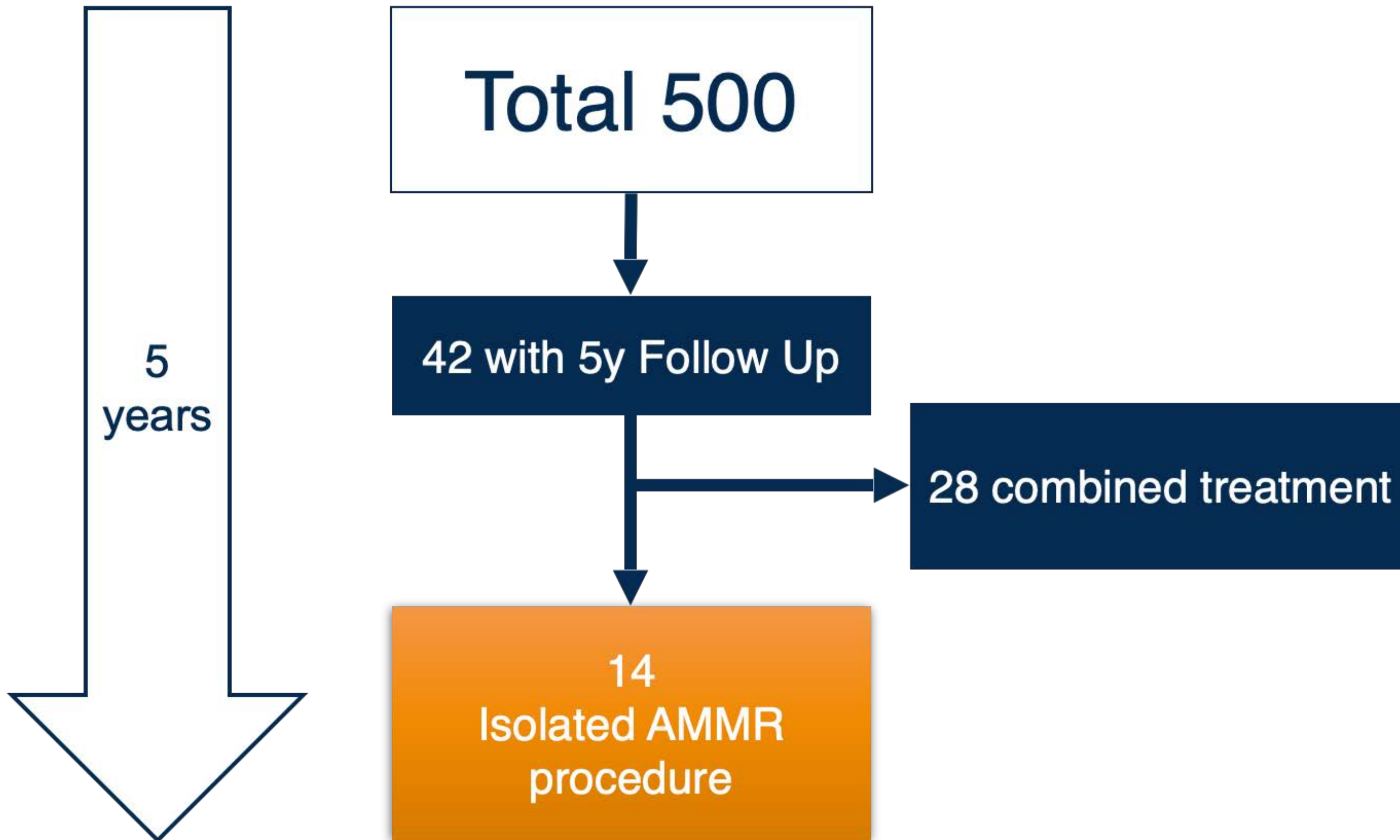


Fig. 1 Treatment algorithm of meniscus lesions. (Adapted from Mordecai et al, 2014.¹¹⁰)

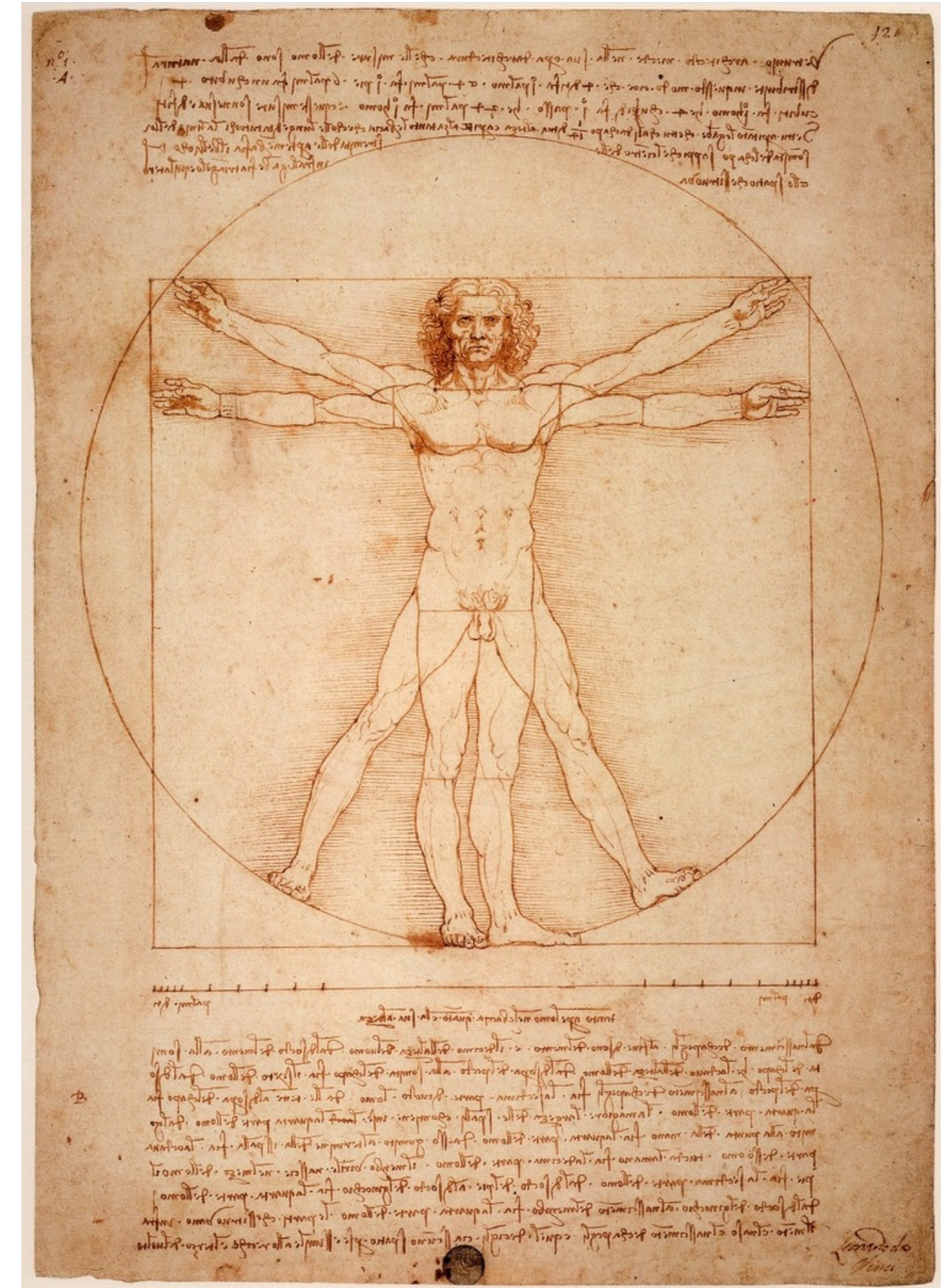
Results



Results

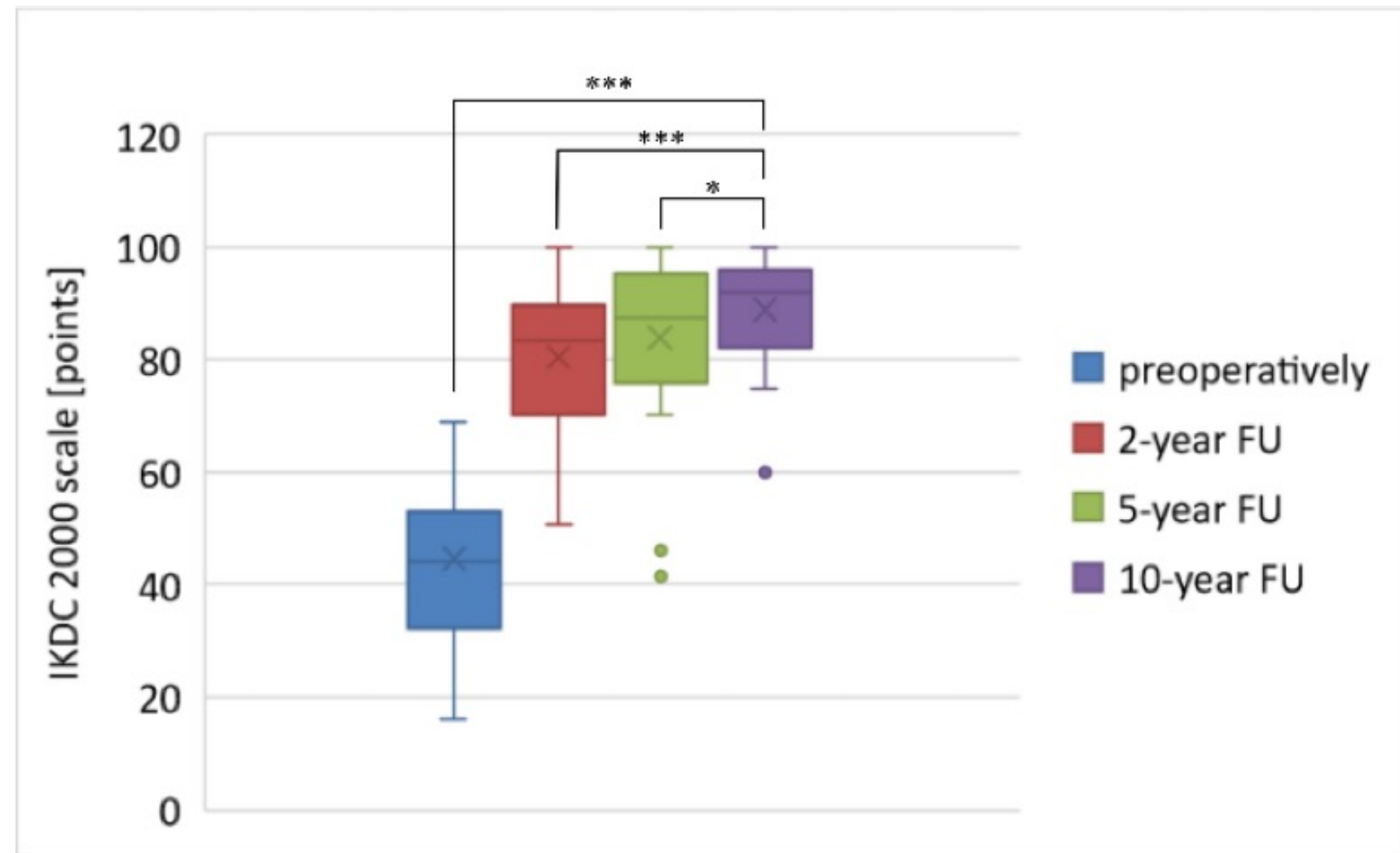
- Demographic data of 14 patients, who only had the AMMR procedure
- 10 M/4F
- Knee 6L/8R

	Average values (SD)
Age (years)	39.5 (58-19)
Weight (kg)	80.9 (100-74)
Height (m)	1.8 (1.8- 1.7)
BMI	27 (30-22)
Length of tear (mm)	31 (35-30)
Months to surgery	26 (50-7)

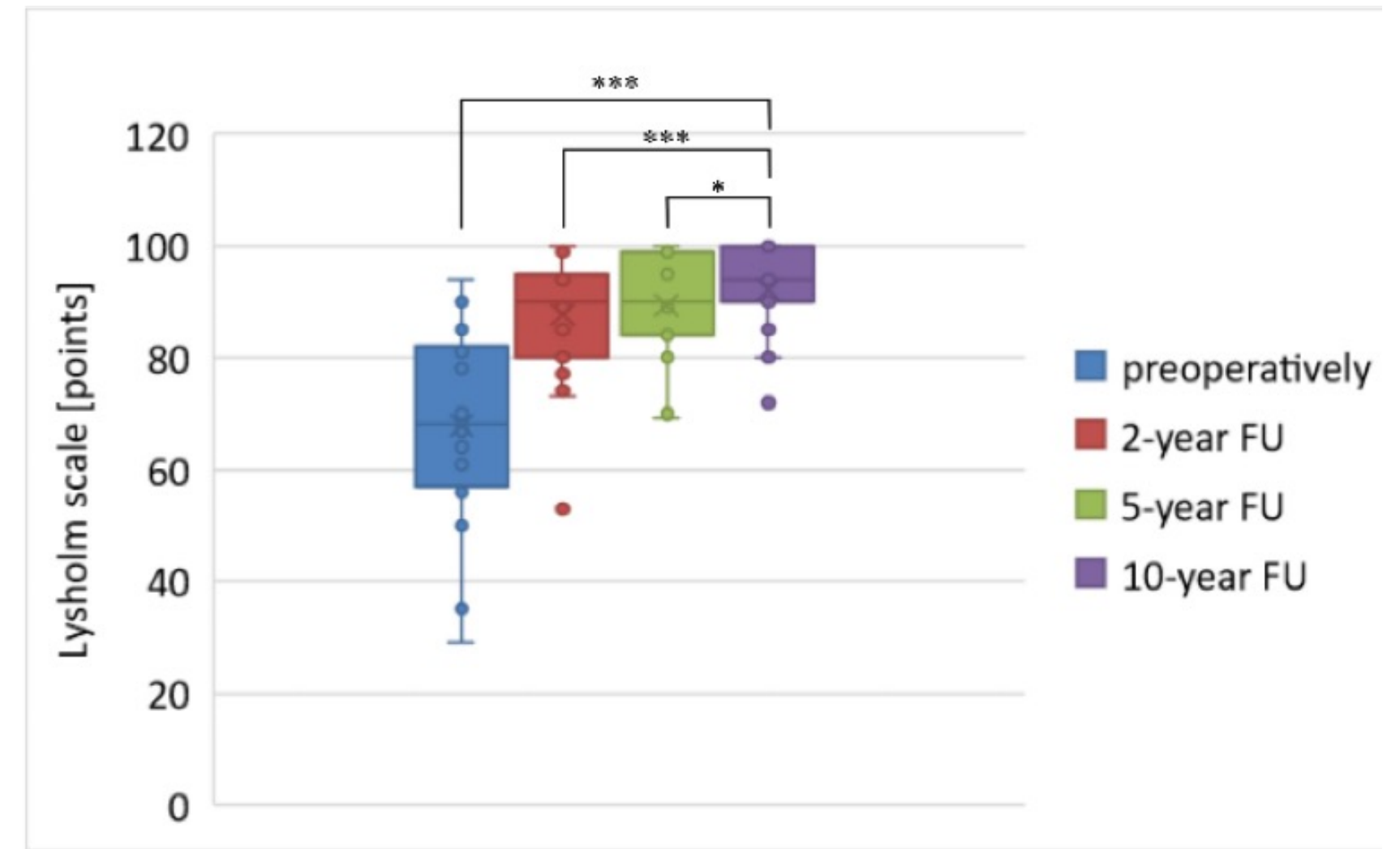


Results 10 years

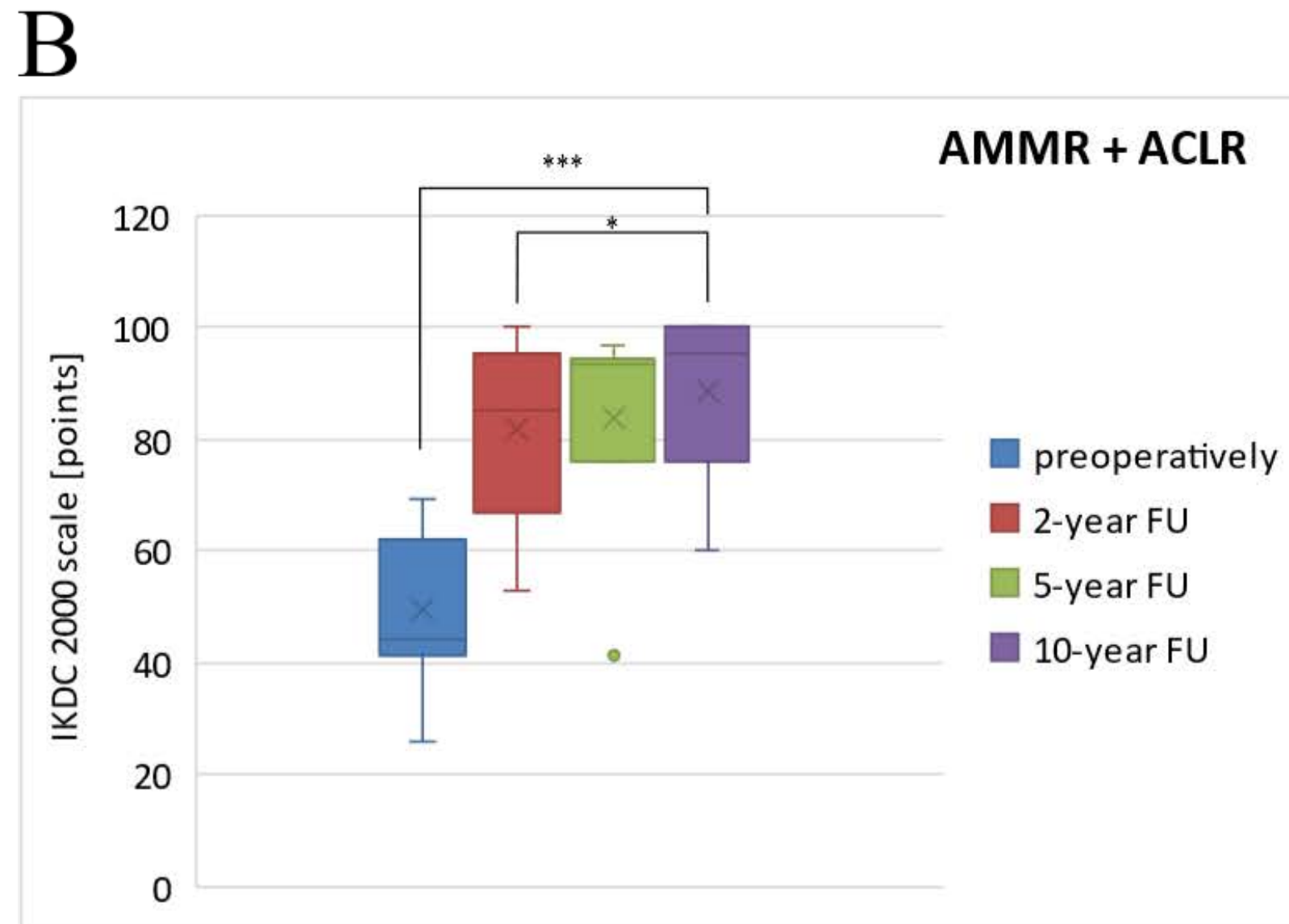
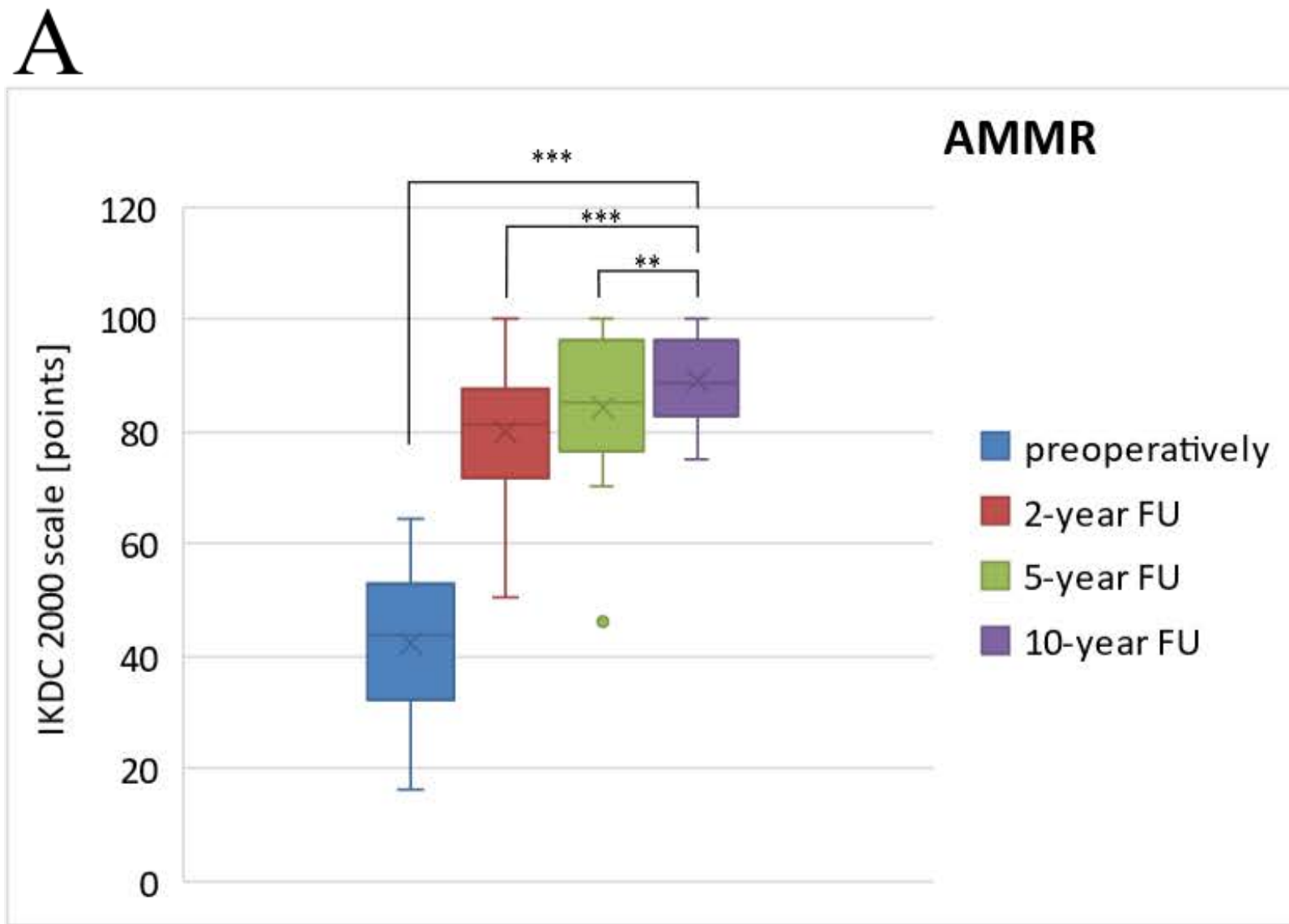
A



B

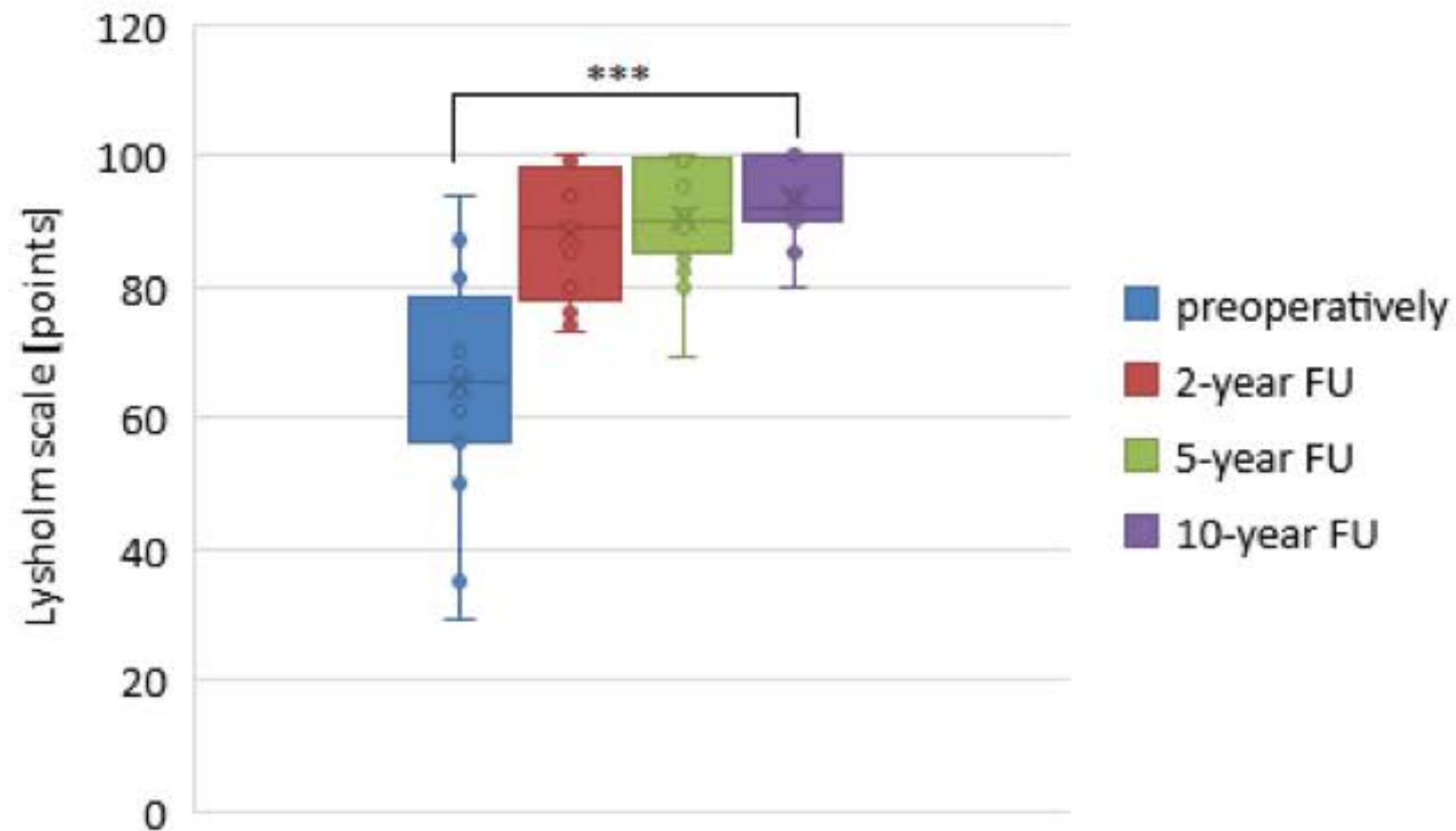


Results 10 years

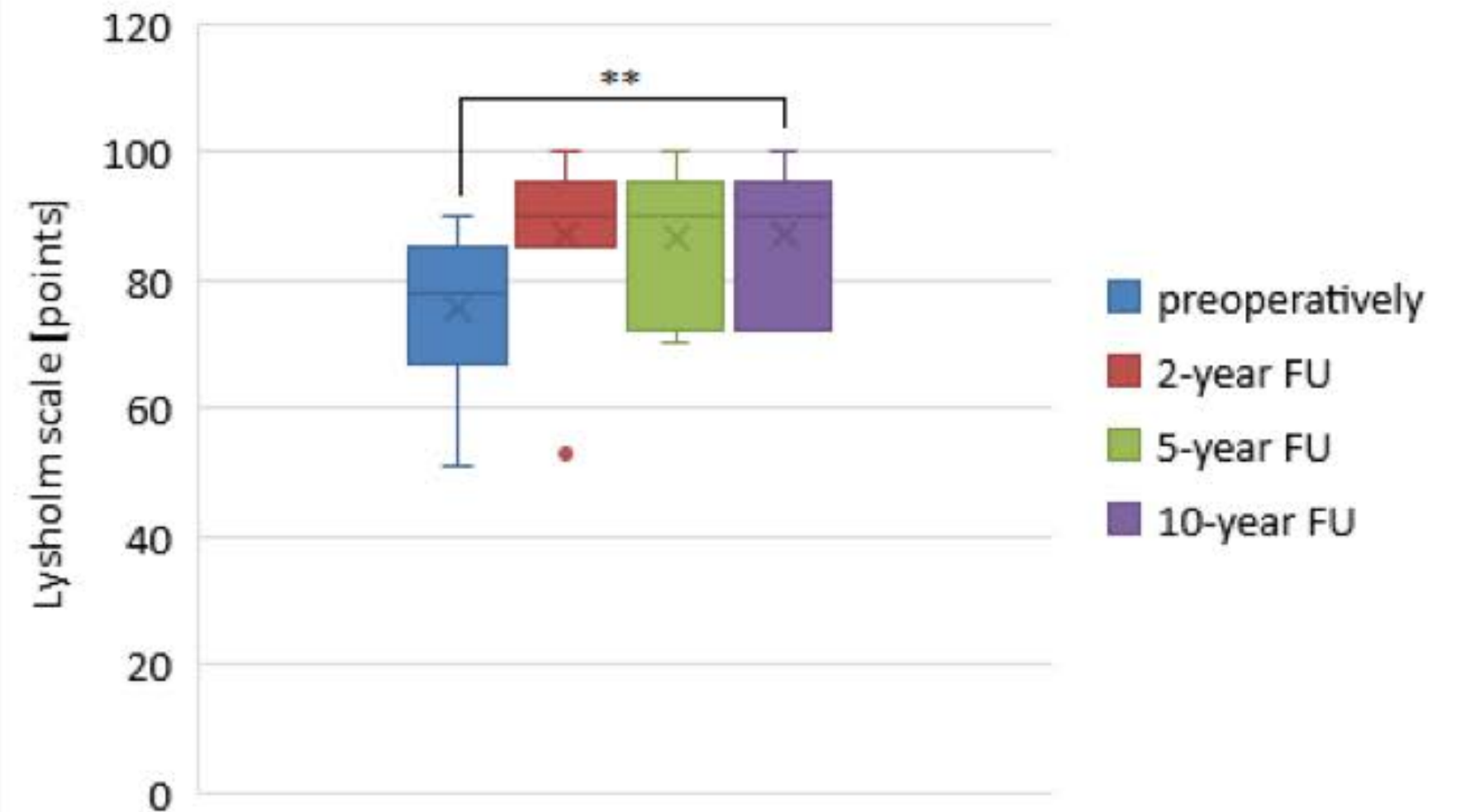


Results 10 years

AMMR



AMMR + ACLR



Results 10 years

	All patients	AMMR	AMMR + ACLR	p value
WORMS 2-year FU	6.9 ± 5.0	5.0 ± 4.2	7.5 ± 5.0	n.s.
WORMS 5-year FU	11.1 ± 9.6	6.0 ± 7.2	13.8 ± 11.0	p=0.005
WORMS 10-year FU	8.0 ± 12.0	6.3 ± 2.9	12.3 ± 14.4	n.s.



Results

Only 4 patients underwent arthroscopic debridement (in 1, 2, 3 and 7-year time point), after the AMMR for persistent knee pain and swelling. These patients did not draw benefit from the AMMR and therefore was considered a failure.

The overall survival rate at final follow-up was 88%.

Complex Meniscus Tears Treated with Collagen Matrix Wrapping and Bone Marrow Blood Injection: Clinical Effectiveness and Survivorship after a Minimum of 5 Years' Follow-Up

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Kinga Ciemniowska-Gorzela¹ , Paweł Bąkowski¹,
Jakub Naczka¹, Roland Jakob^{2,3}, and Tomasz Piontek^{1,4} 

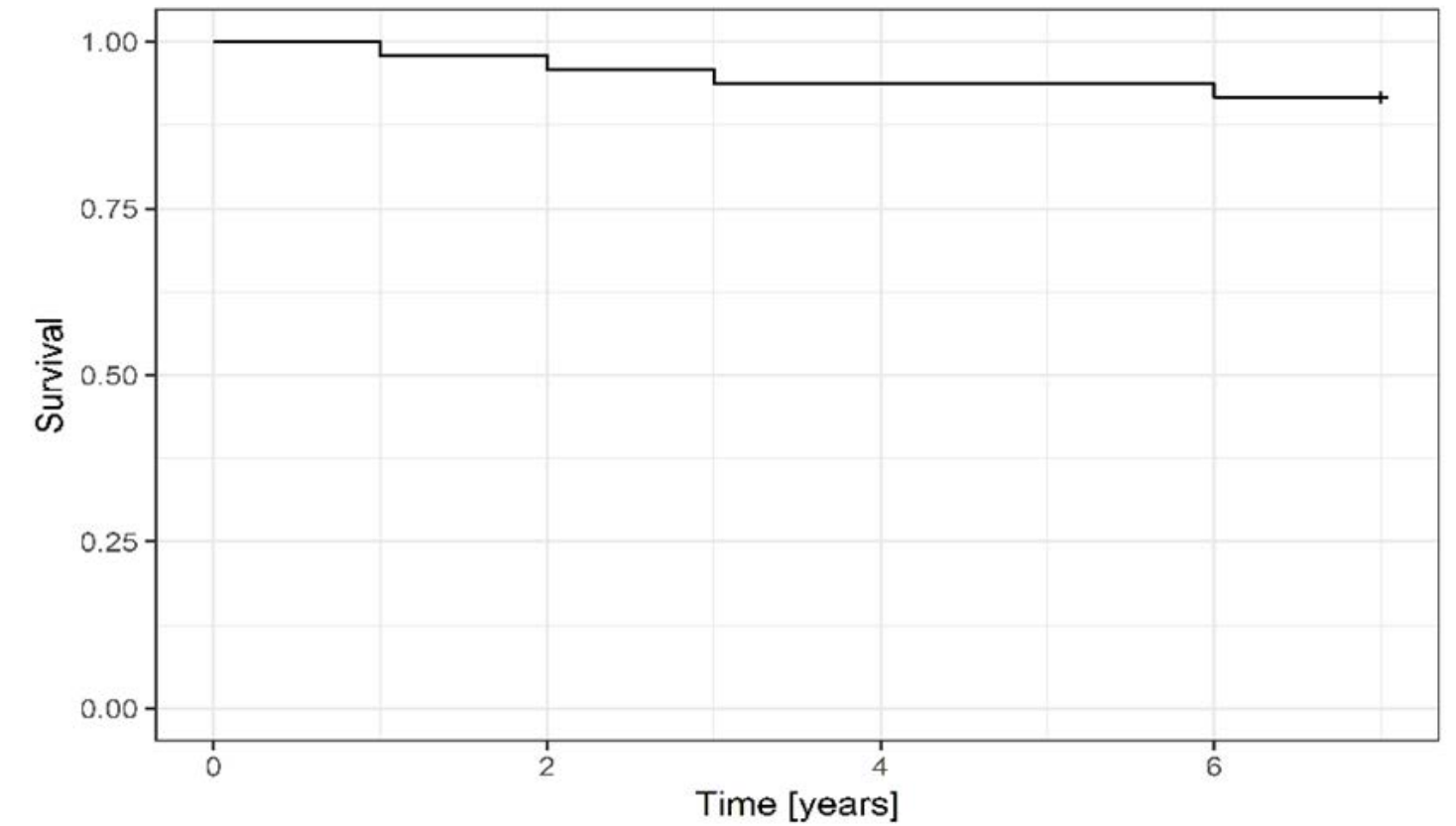
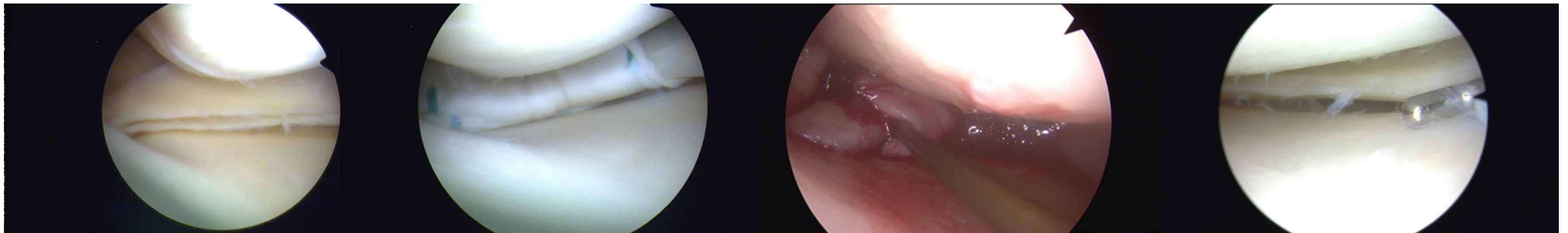


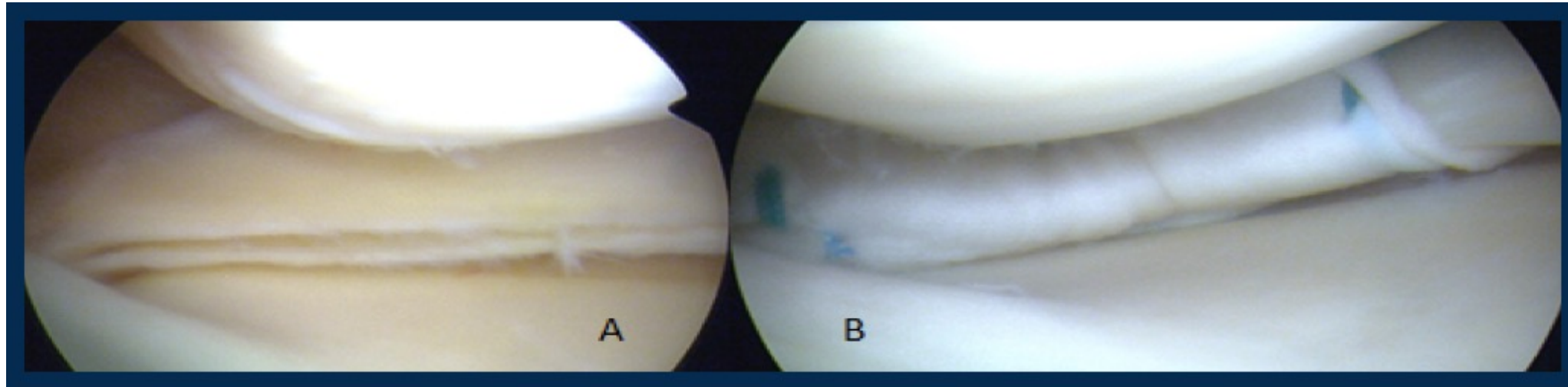
Diagram of Kaplan–Meier survival analyses

The overall survival rate at final follow-up was 88%.

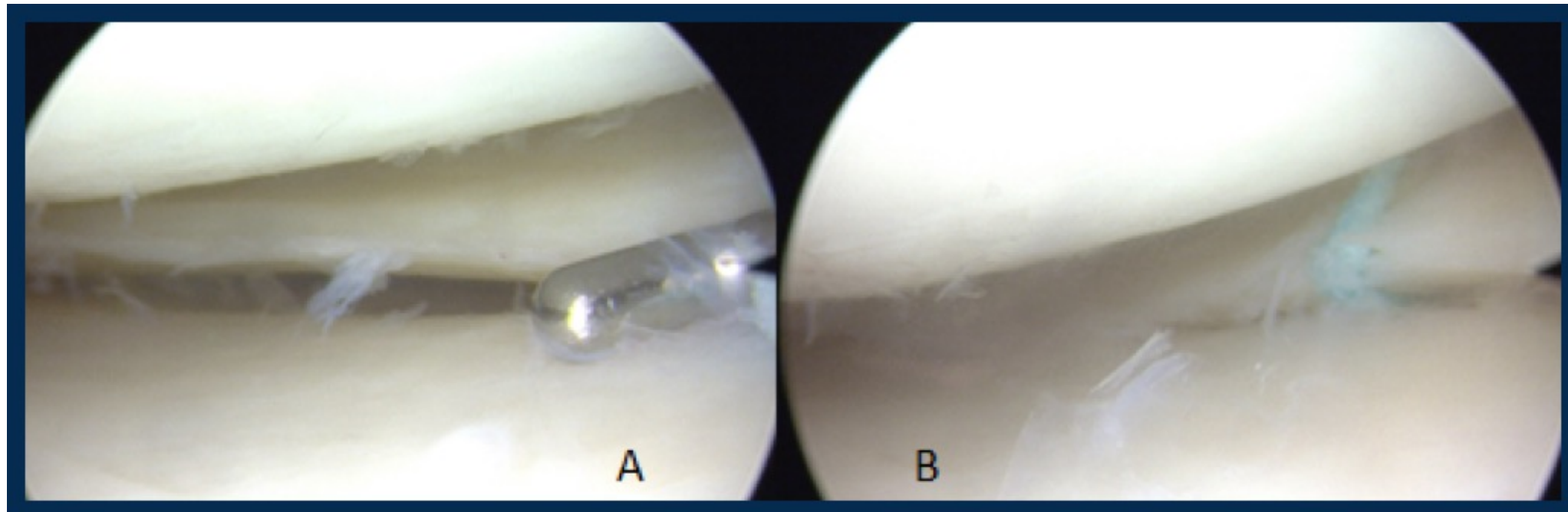


Cases: 35 year old men

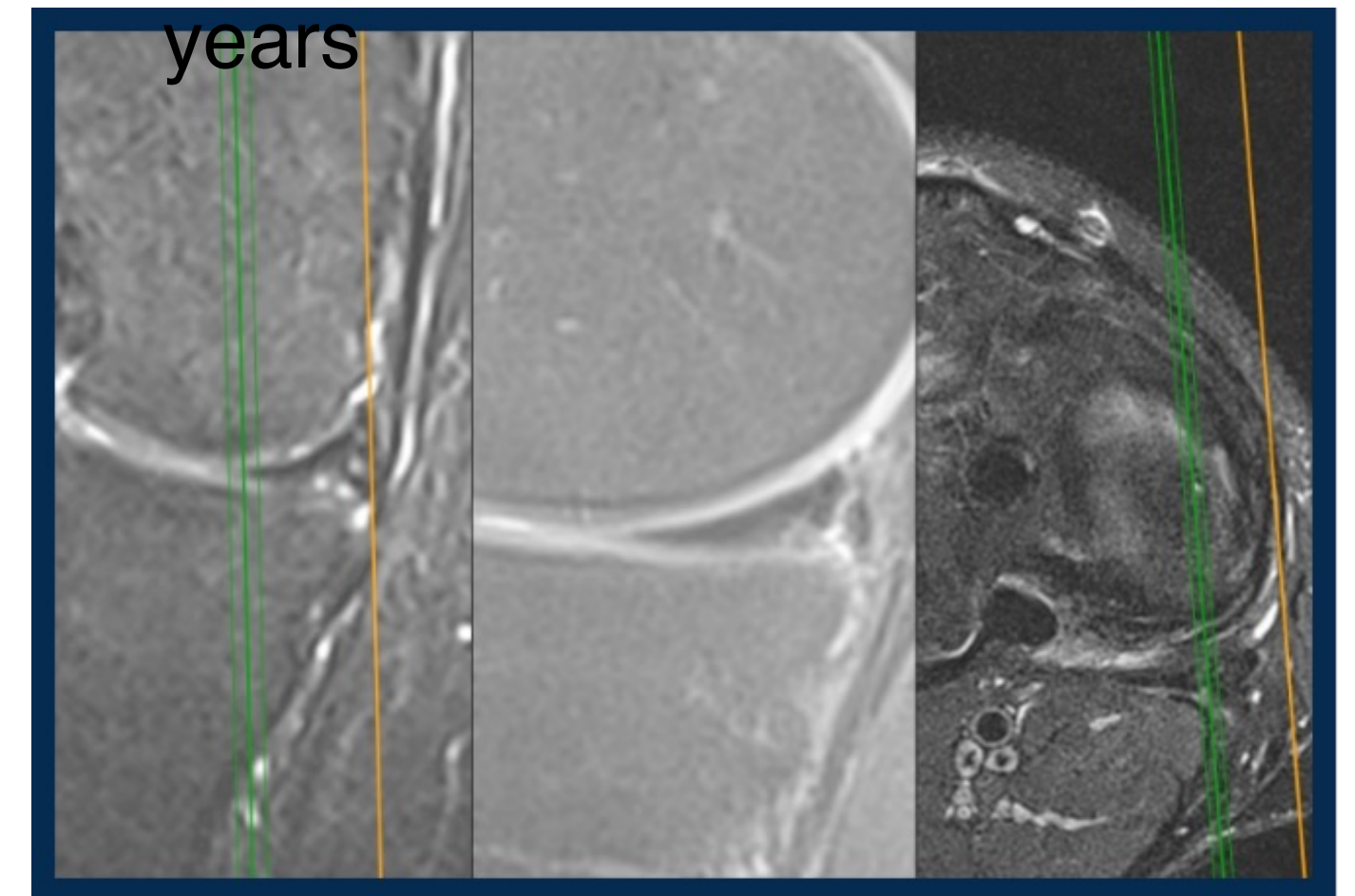
During OP



Two months



After 2



IKDC subj.

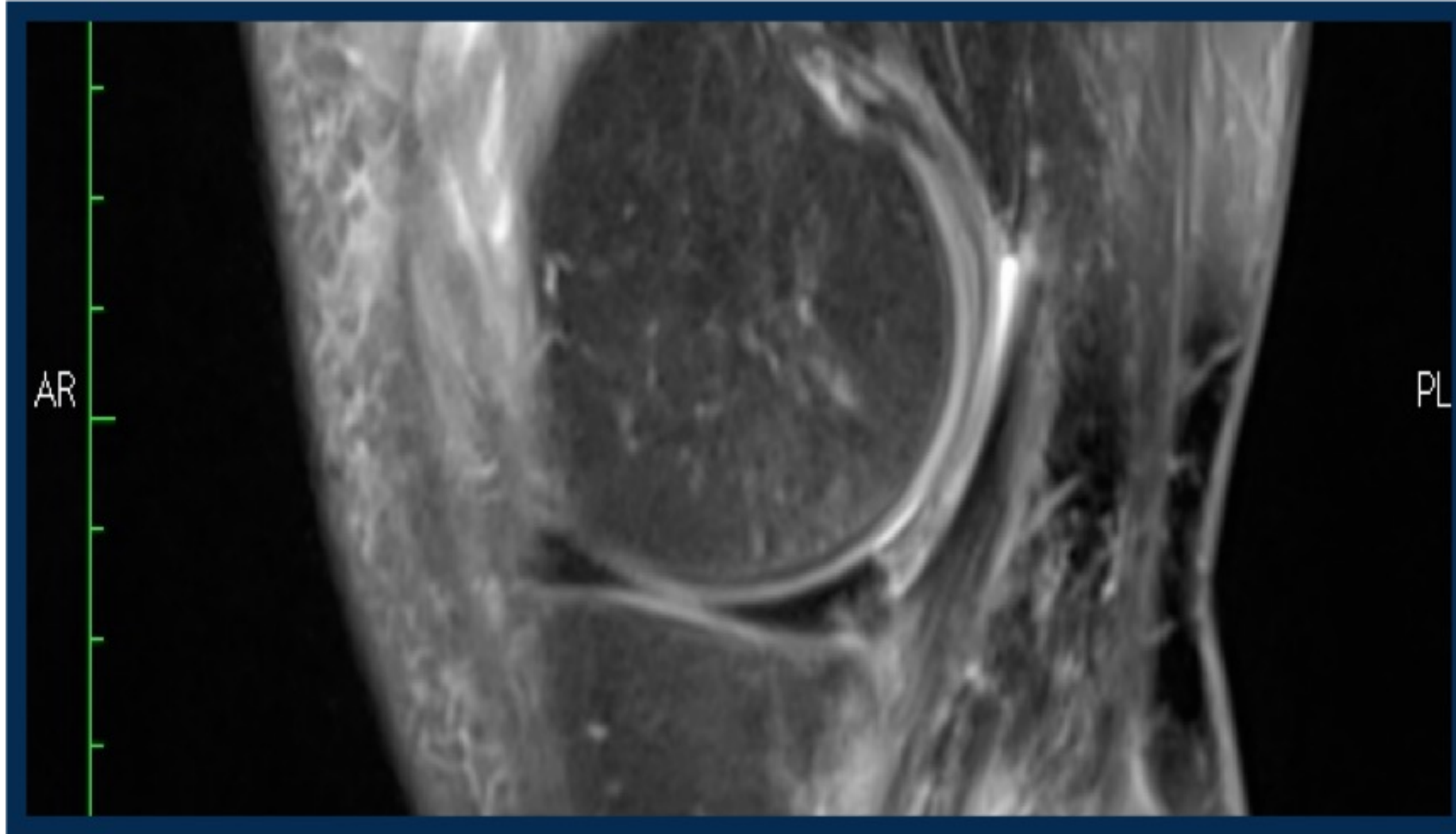
100

Lysholm 100

Barrett 0.0.0.0

MOCART 1

Cases: 40 year old men – 5 years post-OP

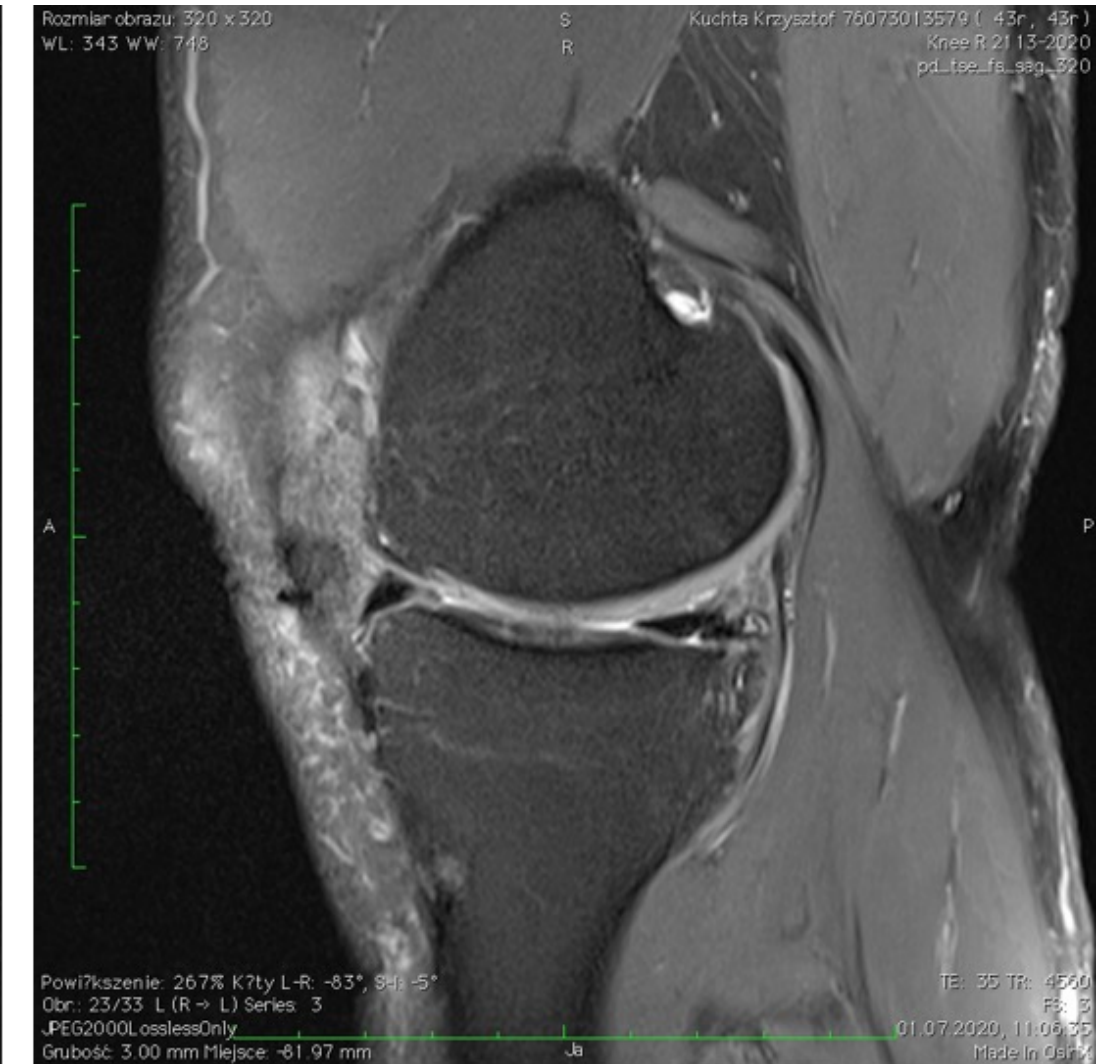


IKDC, Lisholm
100
Barett 0.0.0.0

Cases: 40 year old men – 5 years post-OP



IKDC, Lisholm
100
Barett 0.0.0.0



Case Presentation: 46 year old women with a medial meniscus tear

- Non-contact injury to the left knee
- Twisting injury
- Pain, swelling



Physical Examination

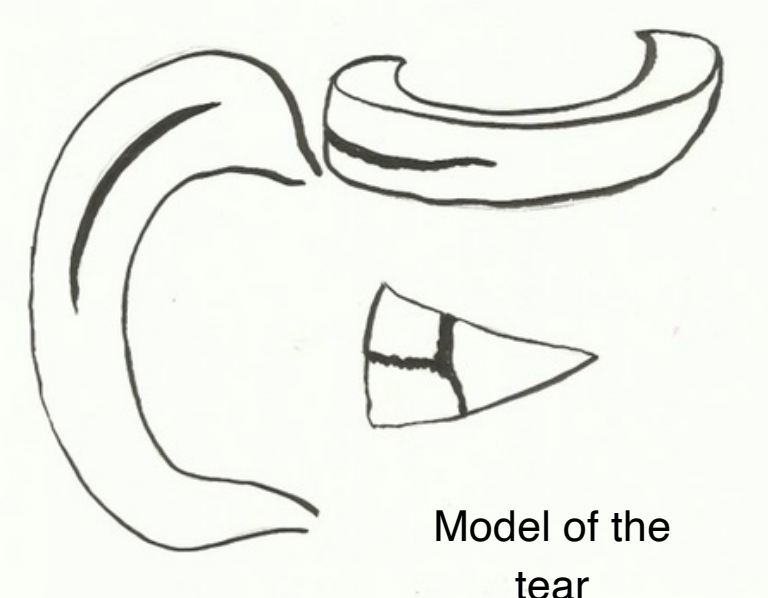
- Painful ROM: 110°- 120°
- Pain at terminal flexion
- McMurray test positive
- Patellar apprehension test: negative
- Lachman test negative



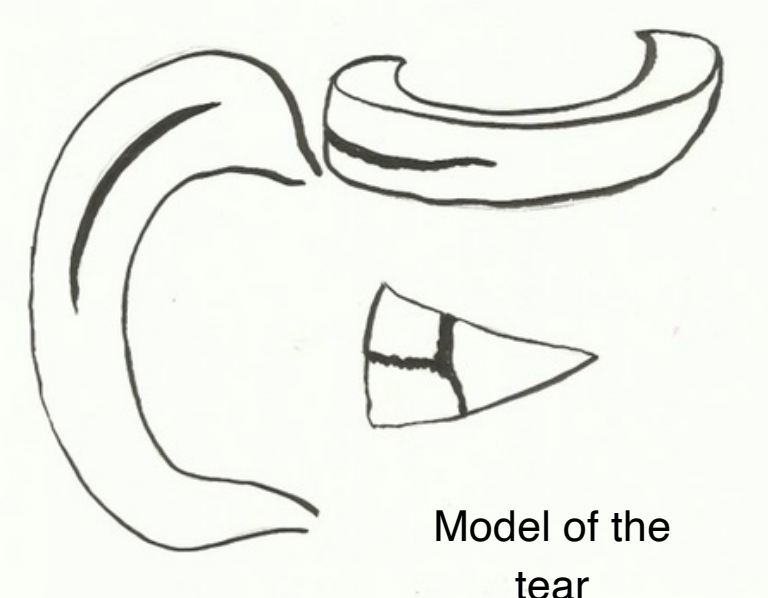
Imaging Studies

- Radiographs normal
- Frontal plane alignment: normal
- Posterior tibial slope: normal

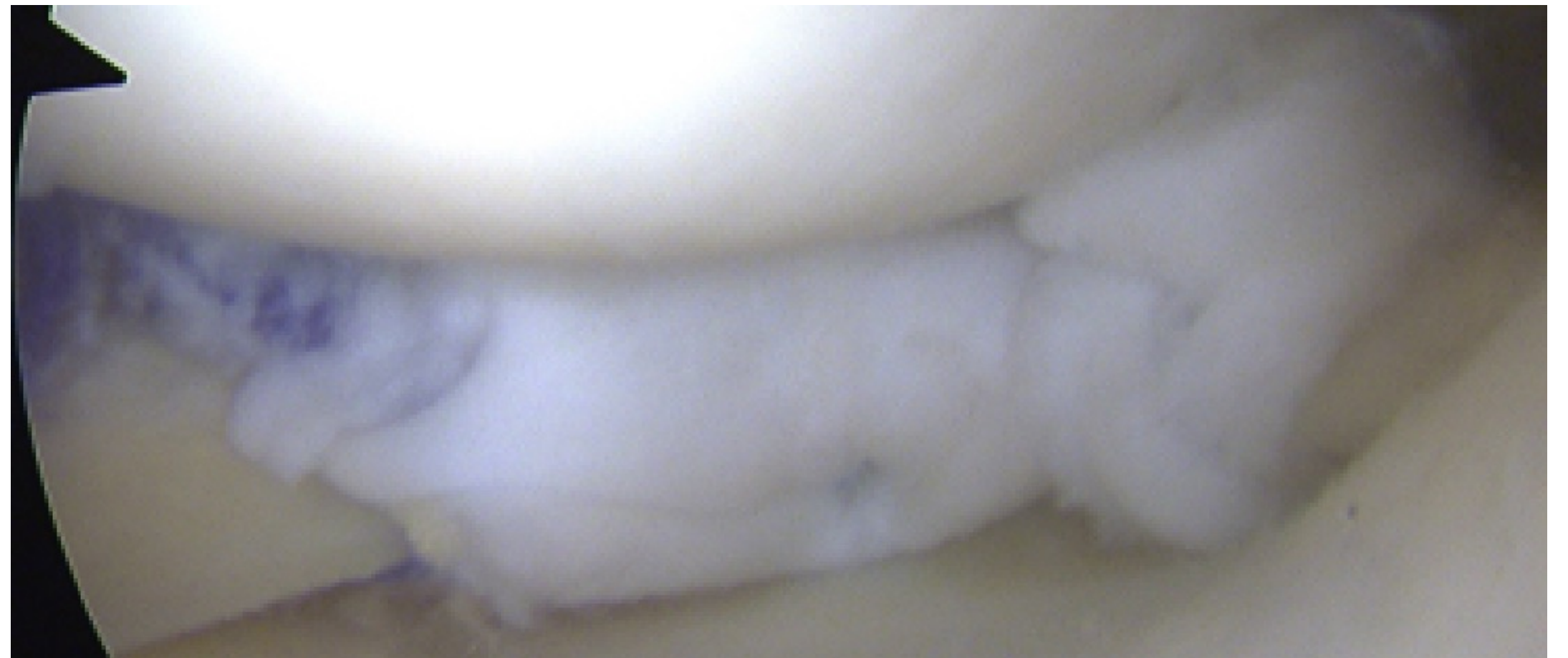
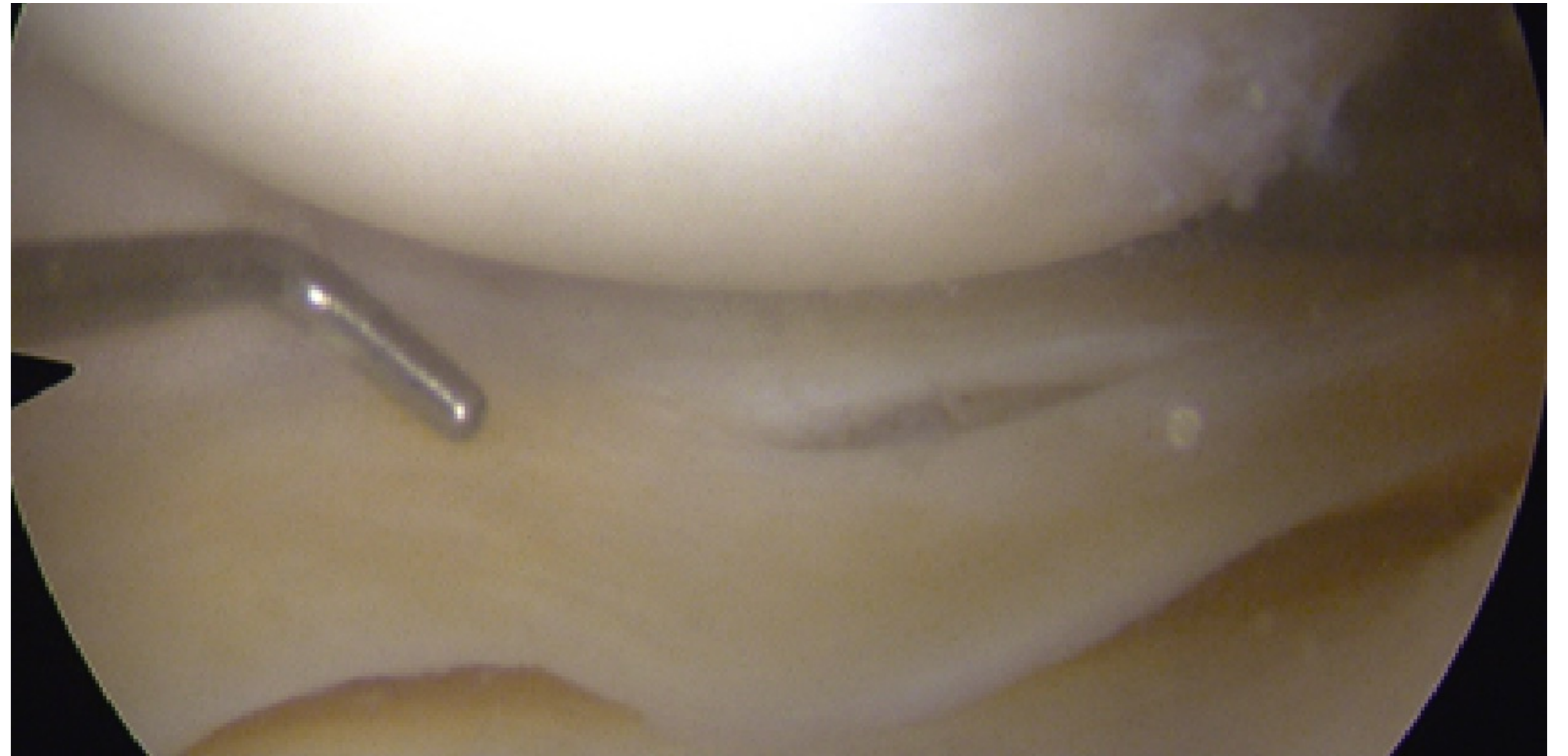
MRI Pre



MRI Pre



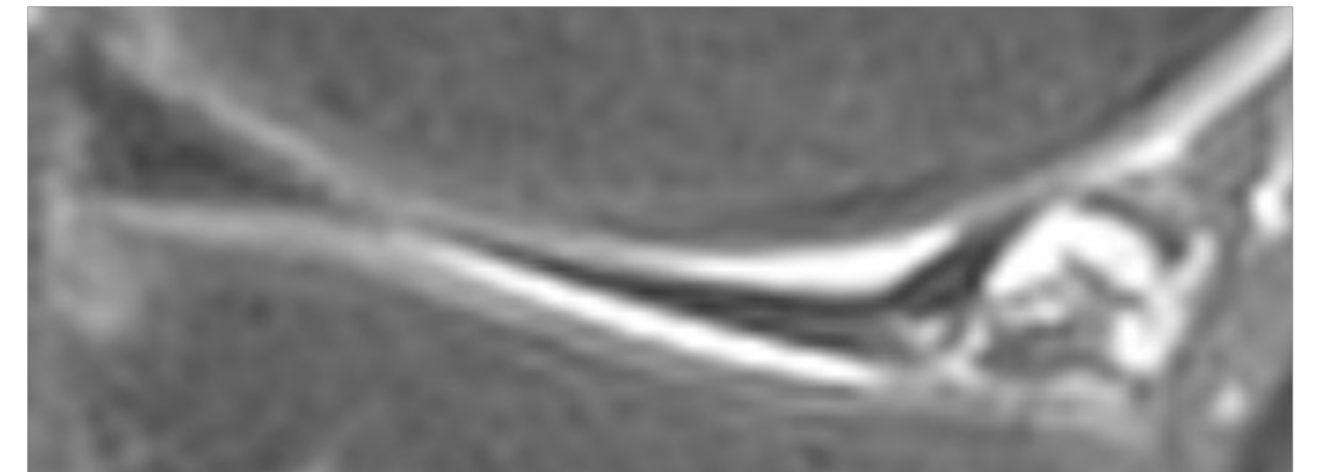
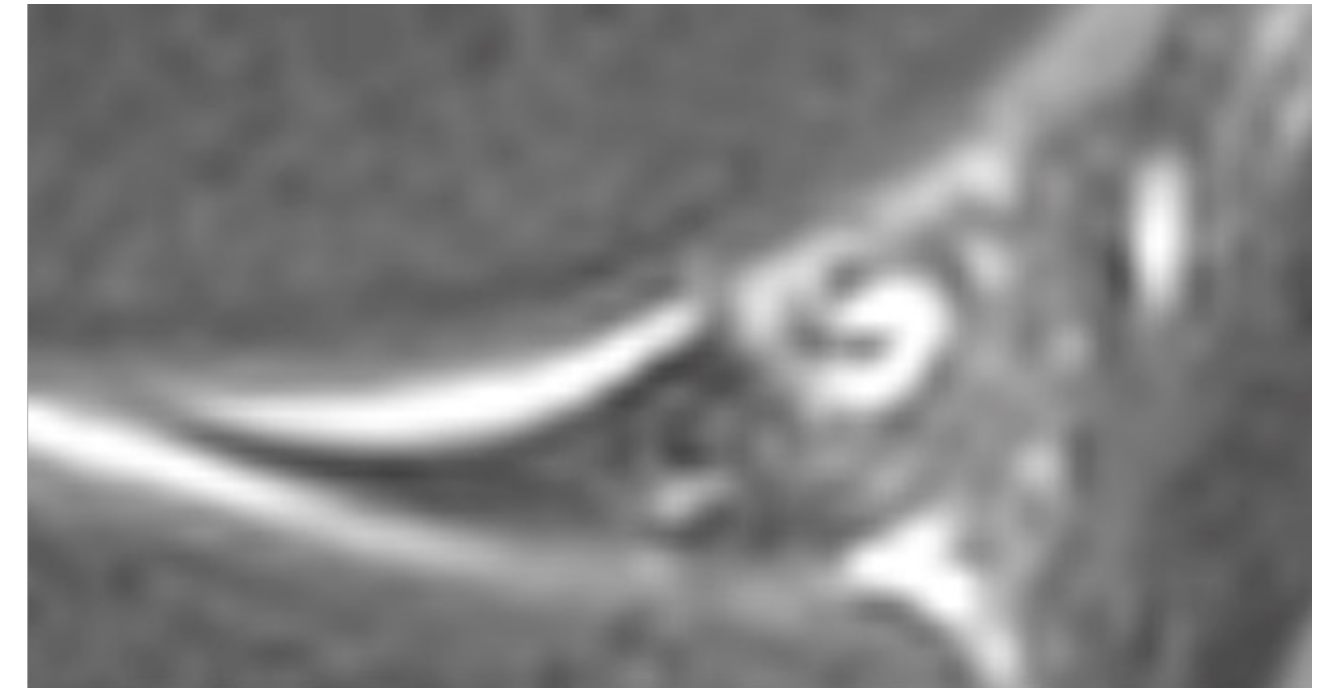
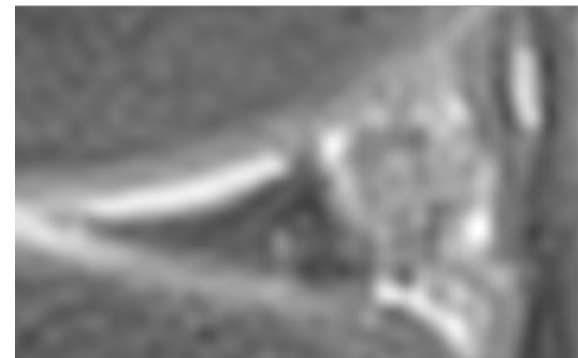
Arthroscopy: photo



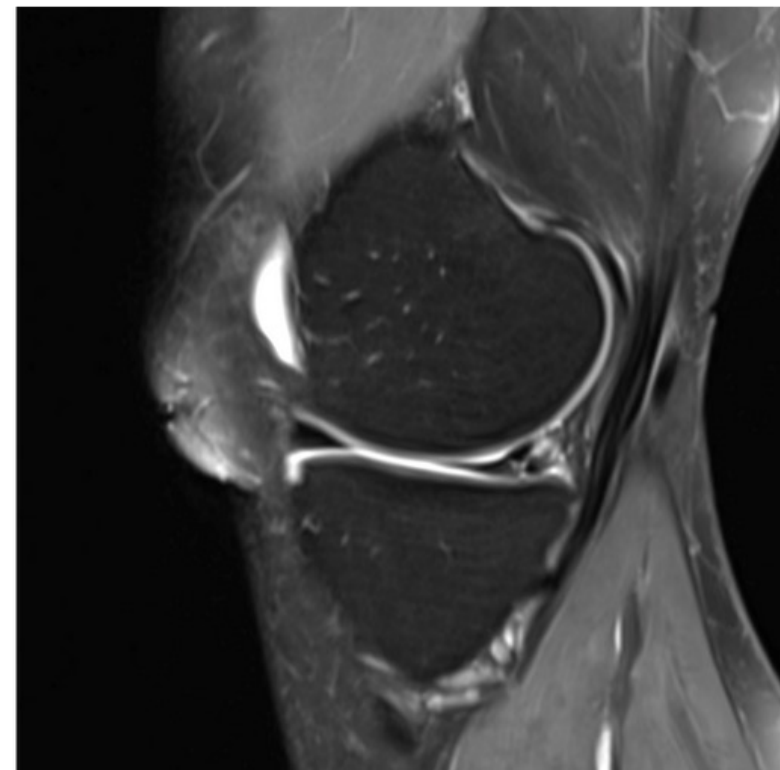
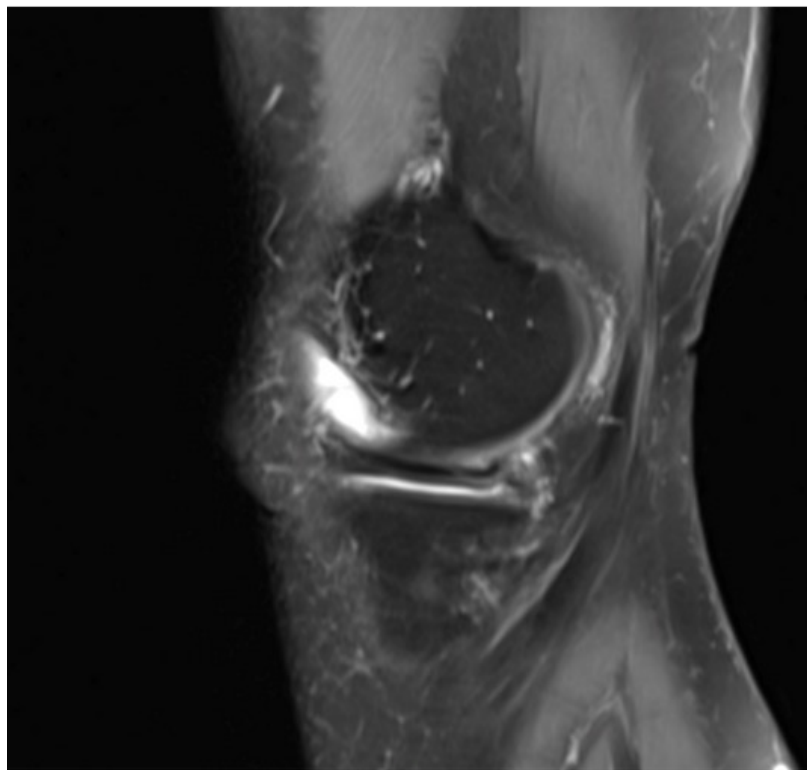
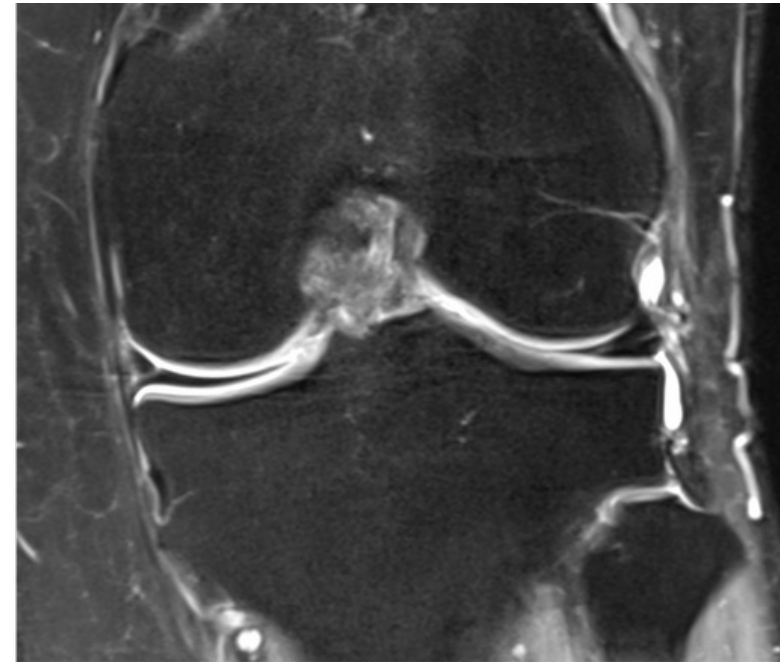
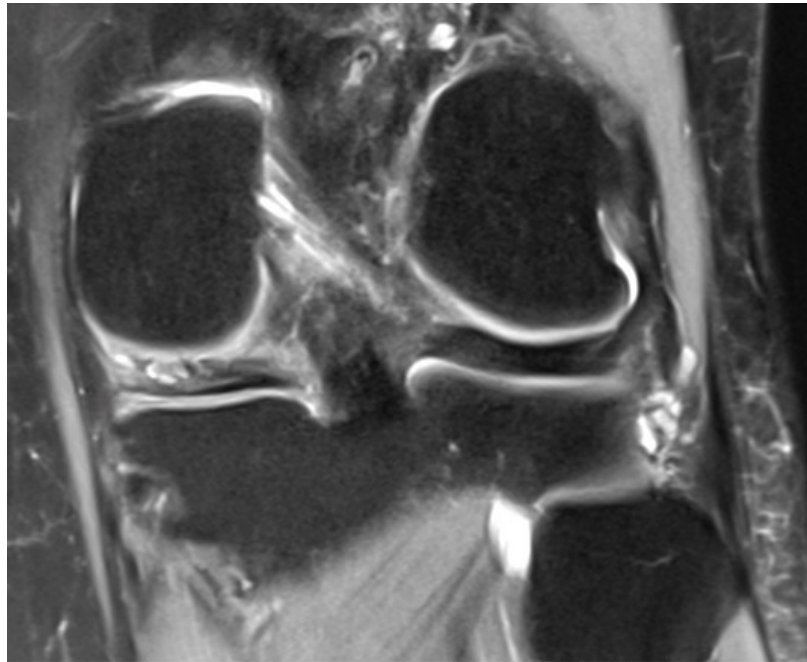
MR after 2 year and result



Coronal
plane



MR after 5 years



Coronal plane

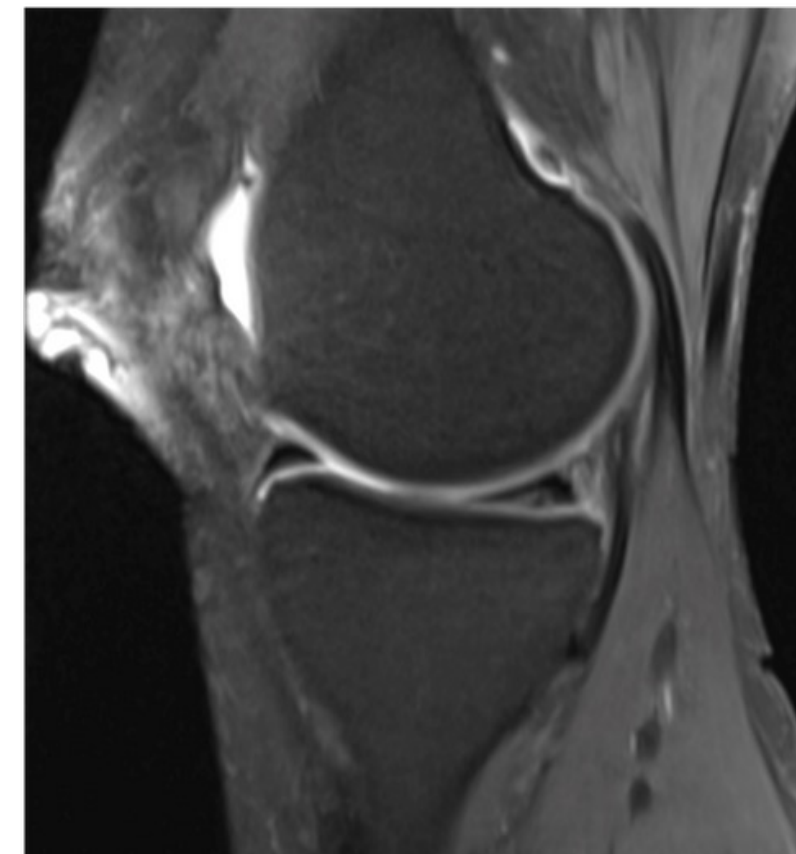
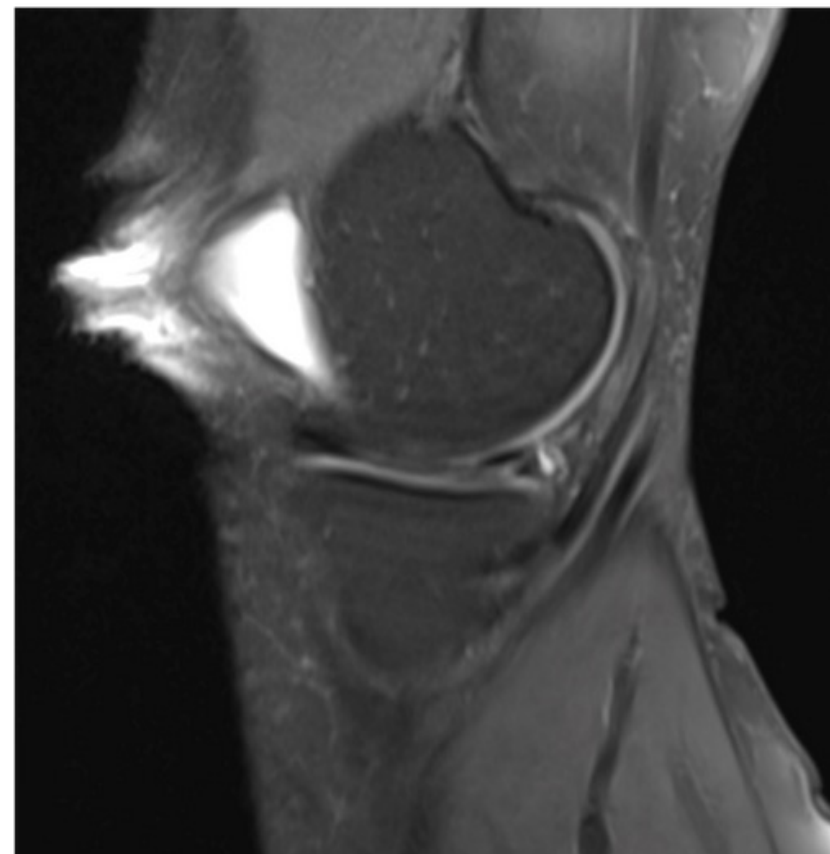
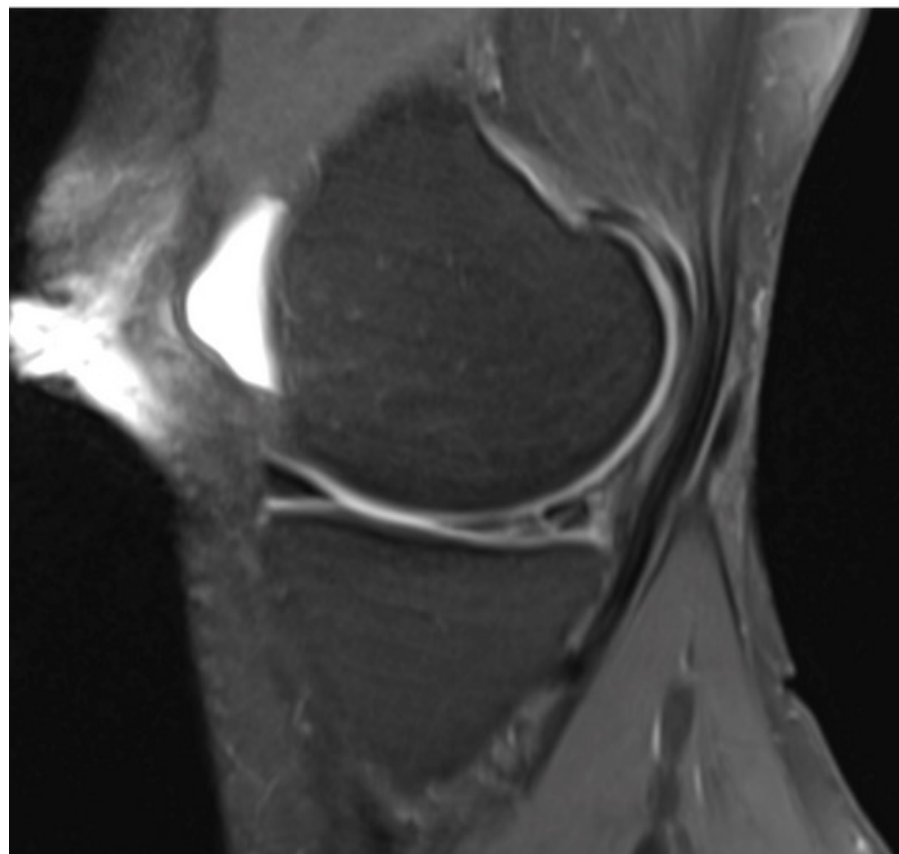


Sagittal plane

MR after 10 years



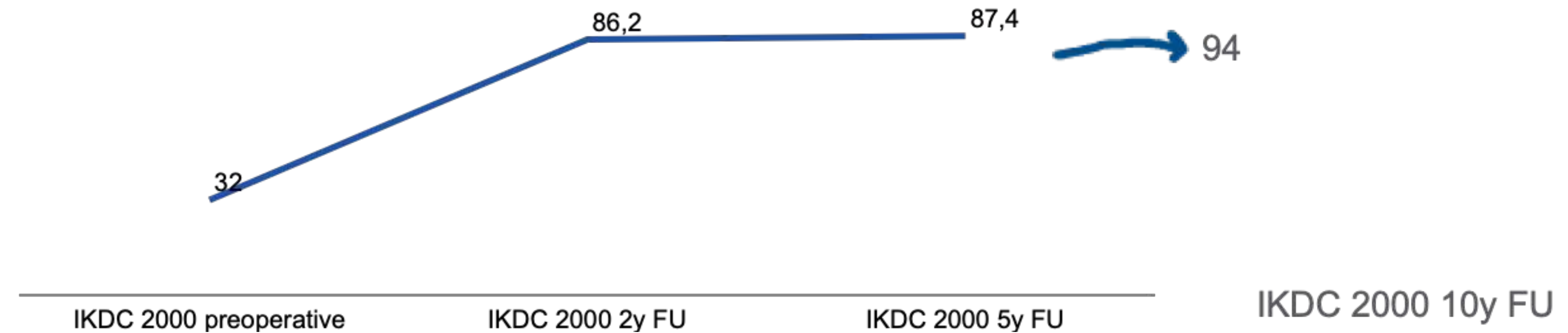
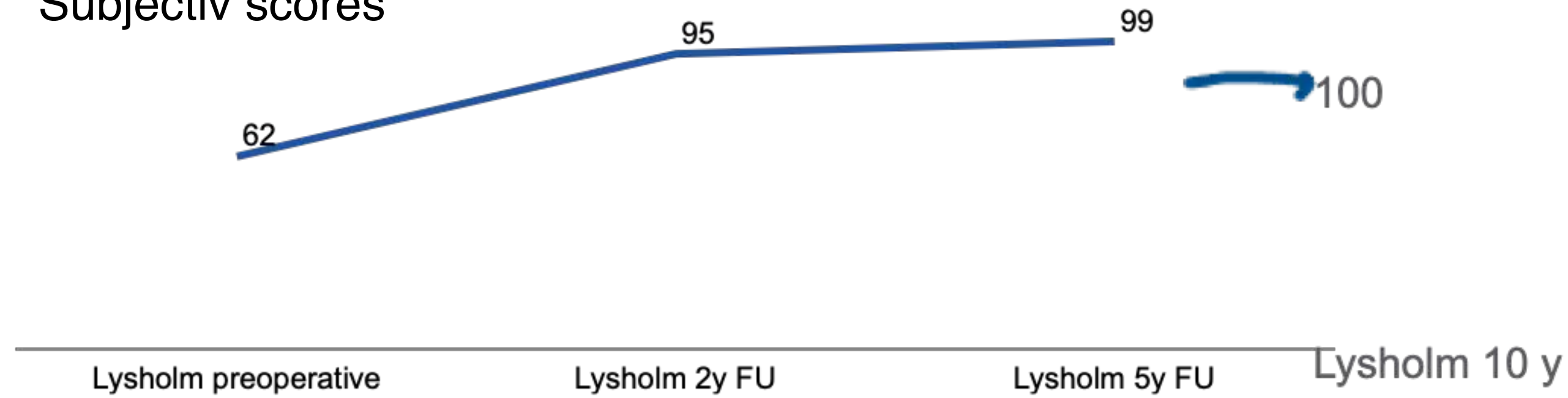
Coronal plane



Sagittal plane

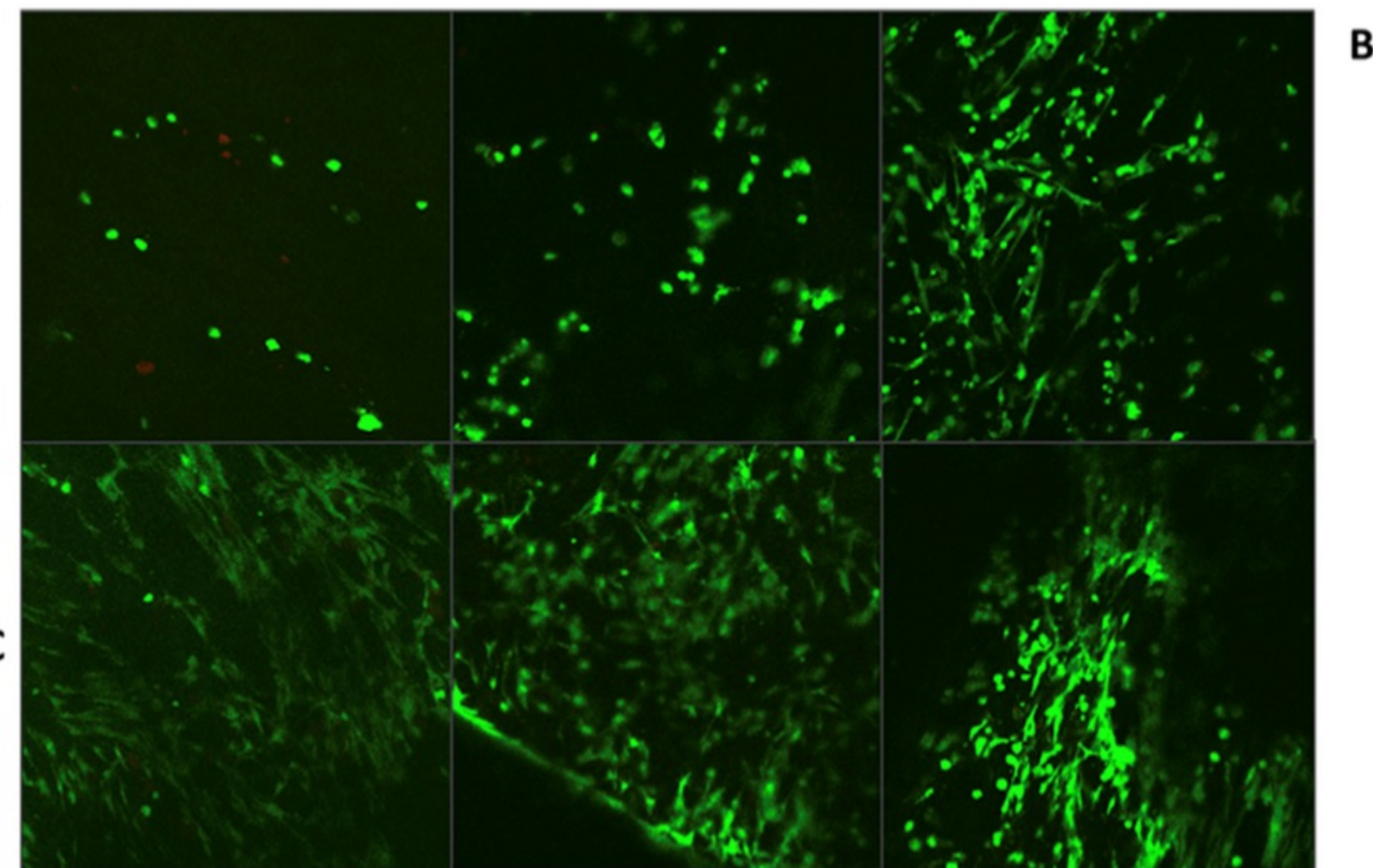
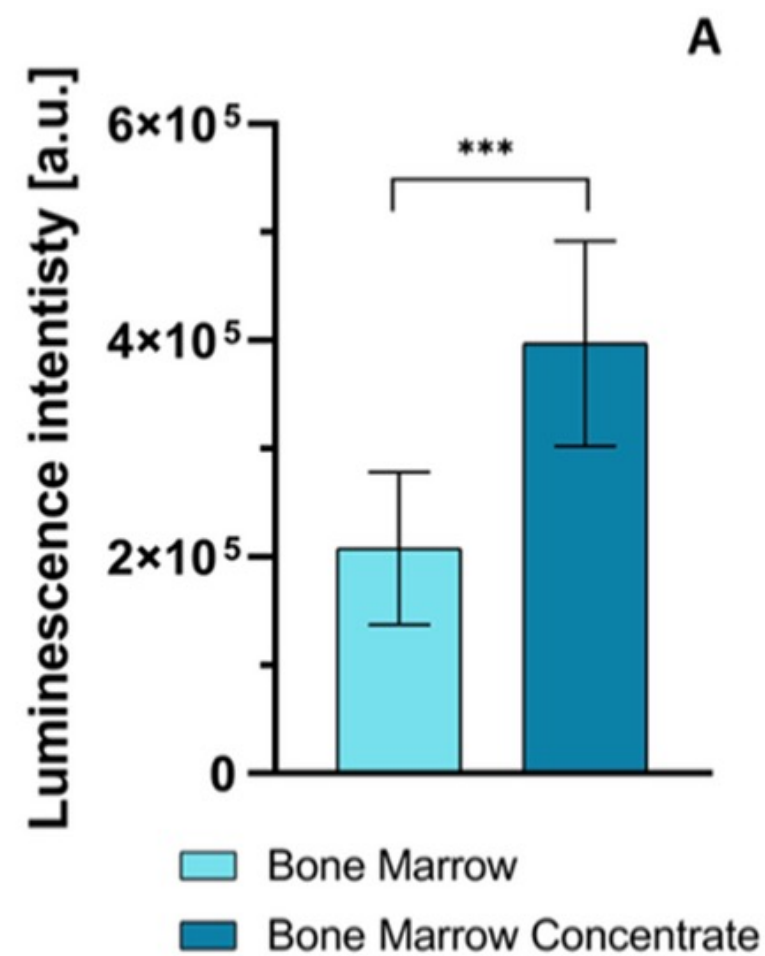
Results

Subjectiv scores



In vitro study

Cytokine	Control	Membrane	Role	References
<i>MCP-1/CCL2</i>	+++	+++	-pro-inflammatory -secreted by monocytes -responsible for M1 macrophage recruitment to inflammation site	10.1089/jir.2008.0027 10.1038/ijo.2015.244
<i>MDC/CCL22</i>	+++	++	-anti-inflammatory -synthesized by monocyte-derived alternative (M2) macrophages -receptor is expressed in regulatory T cells and Th2 cells.	10.1111/jop.12885
<i>MIP-1 alpha</i>	++	+	-pro-inflammatory -chemokine secreted by macrophages -responsible for recruiting inflammatory cells, wound healing, inhibition of stem cells, and maintaining effector immune response -produced by cells during infection or inflammation	10.1007/978-94-007-7696-8_27
<i>MIP-1 beta</i>	++	++	-pro-inflammatory -produced by monocytes -plays a major role in the recruitment of leukocytes to sites of infection -modulates the production of cytokines by T helper (Th) cells	10.1016/S1359-6101(02)00045-X
<i>Eotaxin</i>	++	++	-produced by monocytes -coordinates the recruitment of inflammatory	10.4049/jimmunol.168.4.1911
<i>HGF</i>	+	+	-anti-inflammatory -promotes the transition to M2 macrophage -facilitates muscle regeneration.	10.3389/fphys.2019.00914
<i>NT-3</i>	+	+	-anti-inflammatory -secreted by macrophages -peptide growth factors -promotes neuron survival and regeneration -participate healing mechanisms and osteogenic differentiation	10.1111/j.1365-2249.2007.03578.x 10.1038/s41374-019-0367-x
<i>TNFR1</i>	+	+	-receptor for TNF-alpha proinflammatory cytokine	
<i>TIMP-2</i>	+++	++	-pro-inflammatory -inhibitor of the matrix metalloproteinases -modulates cell proliferation, apoptosis, differentiation, and angiogenesis	10.1007/s00018-013-1457-3
<i>IL-6R</i>	++	++	-receptor for IL-6	
<i>IL-6</i>	-	+	-pro-inflammatory -enhances the development of an M2 macrophages	10.1371/journal.pone.0094188 10.18632/oncotarget.24734
<i>IL-8</i>	++++	++++	-anti-inflammatory -secreted by M2 macrophages	
<i>IL-10</i>	-	+	-anti-inflammatory -secreted by M2 macrophages	10.18632/oncotarget.24734
<i>IL-15</i>	-	+	-pro-inflammatory -produced by haematopoietic progenitors, bone marrow stromal cells, macrophages	10.1111/j.1365-2567.2008.02878.x



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Prof. J.D.Rybka et al., unpublished

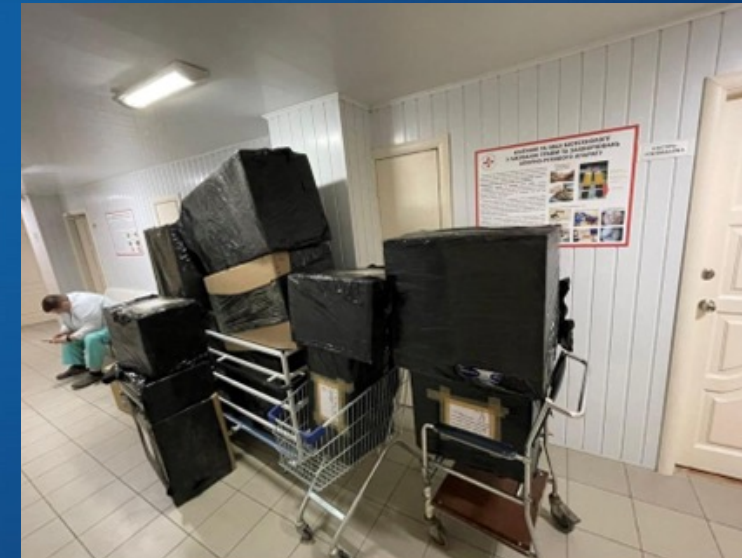
Conclusions

- As an alternative to meniscectomy, AMMR enabled meniscus preservation for complex tears
- AMMR demonstrated very good mid- to long-term clinical and MRI-based outcomes as well as a favorable survival rate at 5 years
- For isolated meniscus lesions, AMMR appears to prevent progression of degenerative cartilage changes up to 10 years
- Although patients with simultaneous ACL reconstruction showed clinical improvement, they may be predisposed to OA progression

Thank you for your attention!

TOMASZ PIONTEK

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