



# Welkom!

## Complexe kniesparende chirurgie

- Tony van Tienen
- Ronald van Heerwaarden
- Martijn Brinkman
- Ralph Eijdemans
- Niels Langens

kliniek **ViaSana**

# Programma

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- 18.30u | Ontvangst met koffie en thee
- 19.00u | Meniscus – hechten, transplantatie, meniscusprothese, door Tony van Tienen
- 19.30u | Het belang van alignment en standscorrecties, door Ronald van Heerwaarden
- 20.00u | Pauze
- 20.15u | Ligamentaire reconstructies van eenvoudig naar complex, door Martijn Brinkman en Ralph Eijdemans
- Discussie en vragen + Niels Langens (FysioSupport)
- 21.15u | Einde

# Meniscus

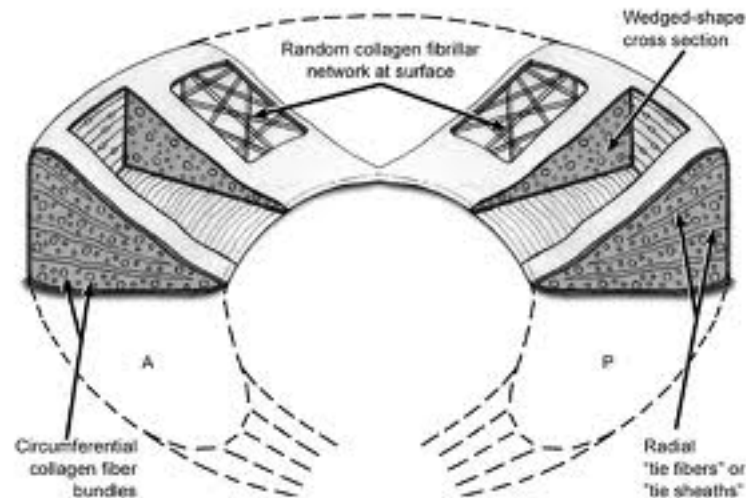
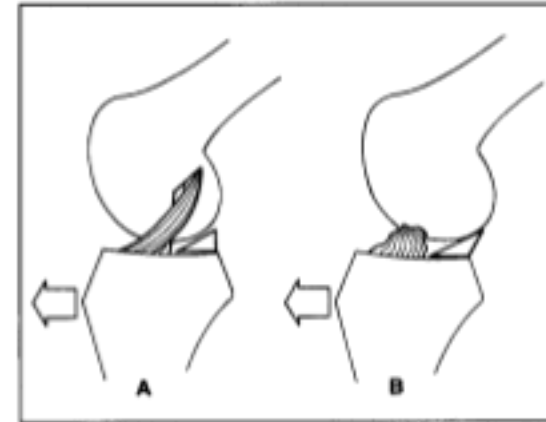
(Graft) choices for meniscus repair

Tony van Tienen

Orthopedisch chirurg

# Function meniscus

- shock absorption
- diminishing peak stresses
- secondary restraint ACL
- protects the cartilage



## What are we talkin' about...?

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- In NL 30000 meniscectomies/yr. (lateral/medial 1:3)



10 yrs. after medial Mx:  
20% radiologic changes  
15% pain

10 yrs. after lateral Mx:  
40% radiologic changes  
21% pain

## What are we talkin' about...?

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■ In NL 30000 meniscectomies/yr.

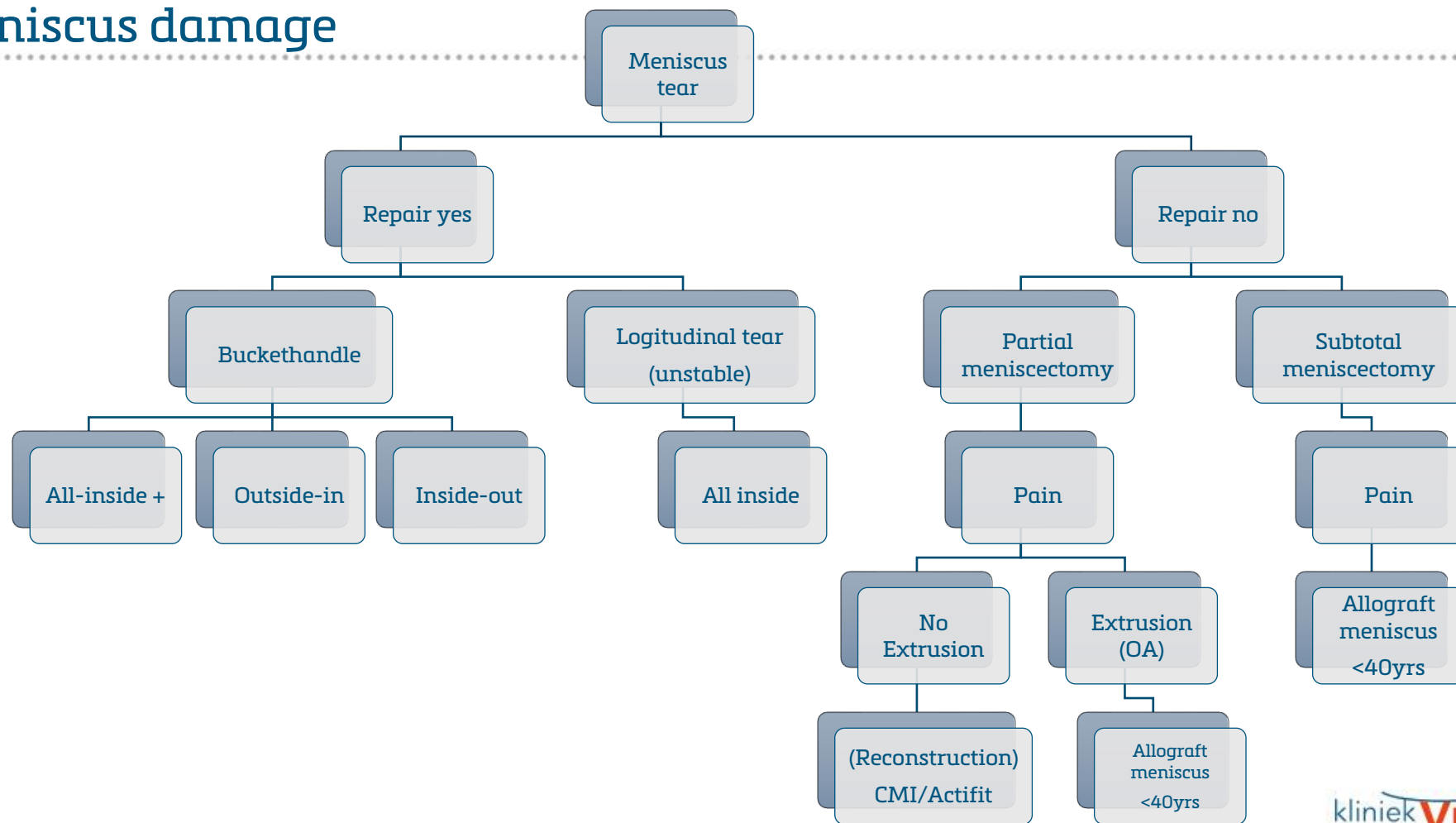


0.2% repeat surgeries for OA ~ 60 patients/yr. after 10 yr.

15% pain after medial Mx ~ 3000 patients/yr. in NL

21% pain after lateral Mx ~ 1500 patients/yr. in NL

# My algorithm meniscus damage



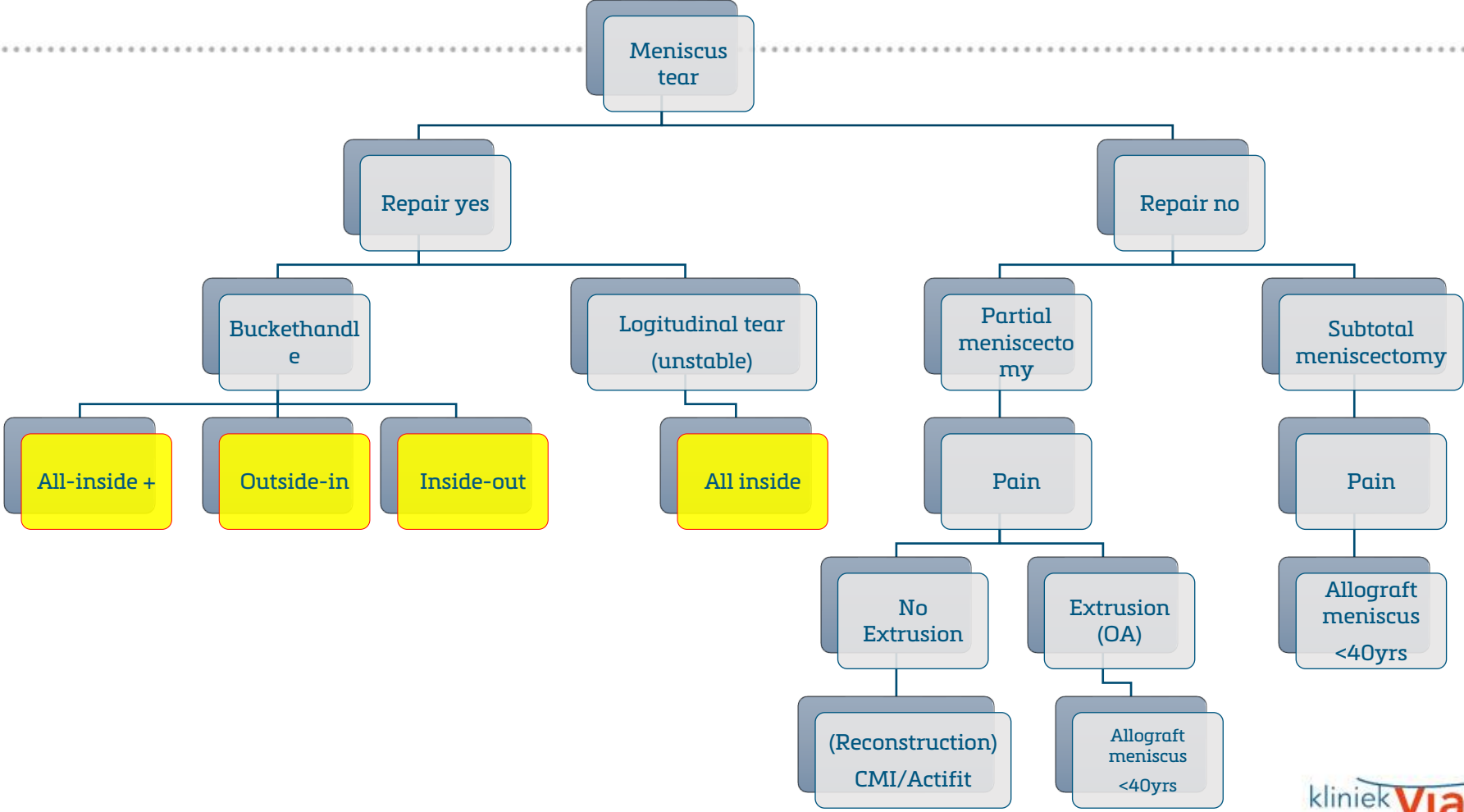
# Outline talk

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What is possible?	Techniques	Difficulties
Repair	All inside Inside-out Outside in	Technique Failures
Reconstruction	Actifit® CMI®	Biological possible? Indication?
Replacement	Donor meniscus Artificial	Availability Early stage

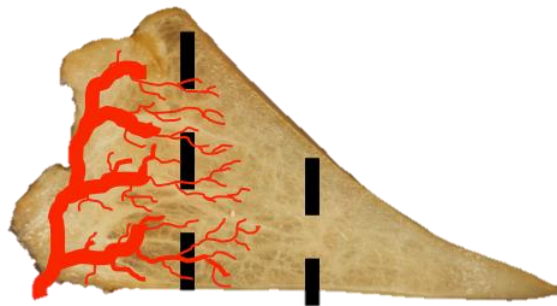


# Repair

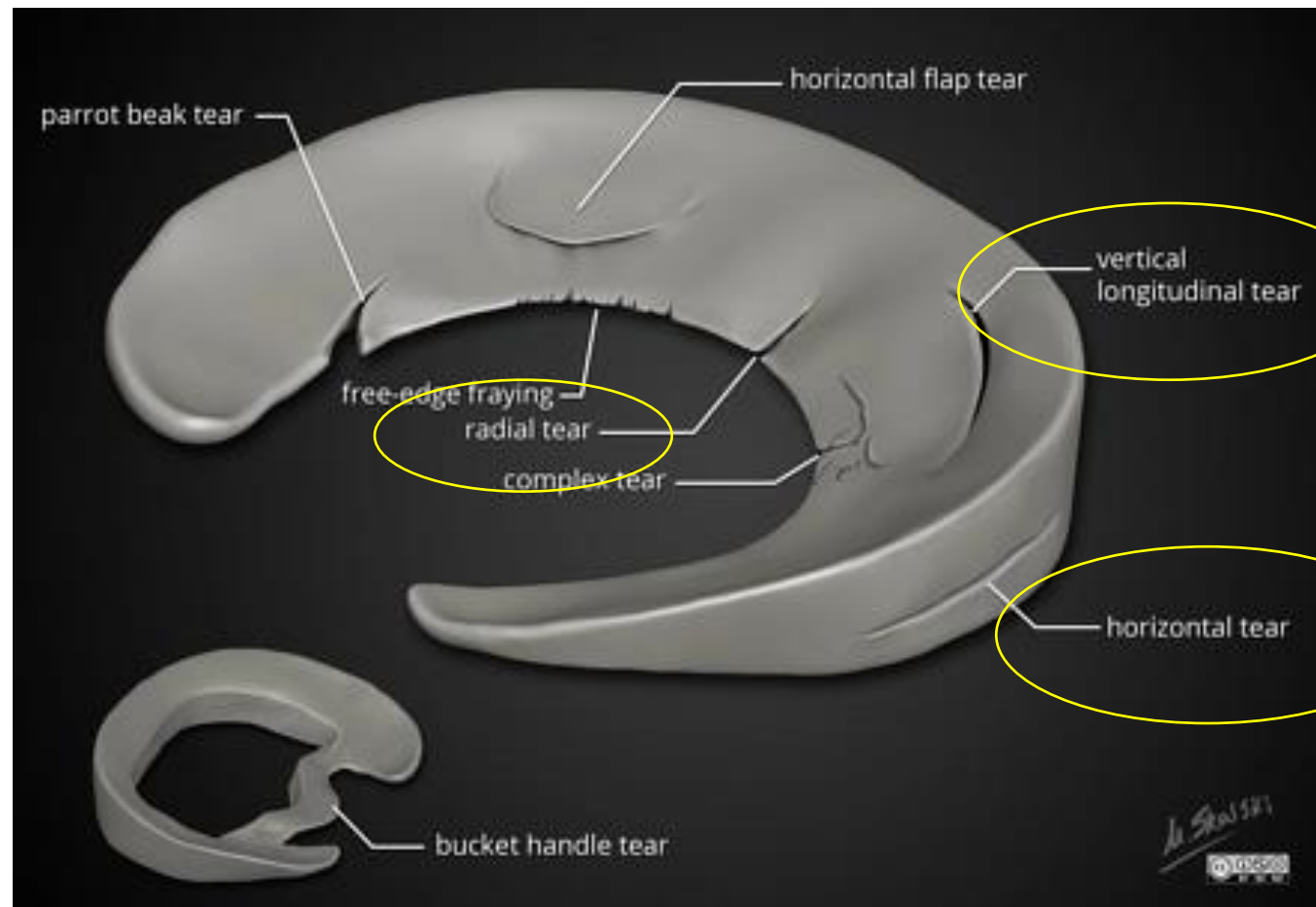


# Repair

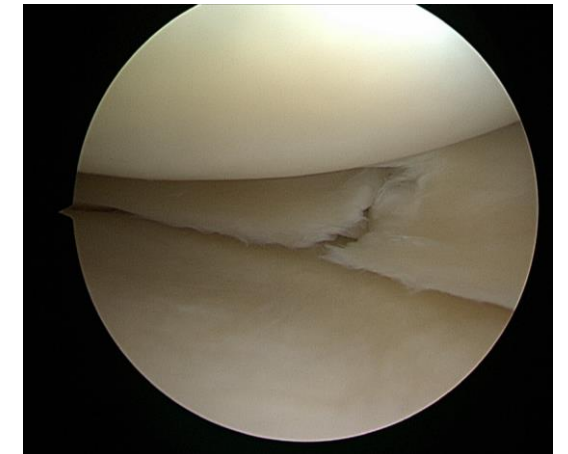
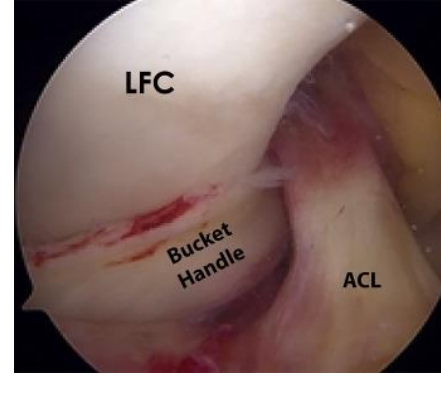
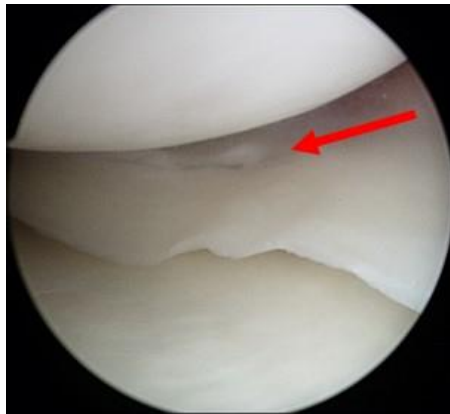
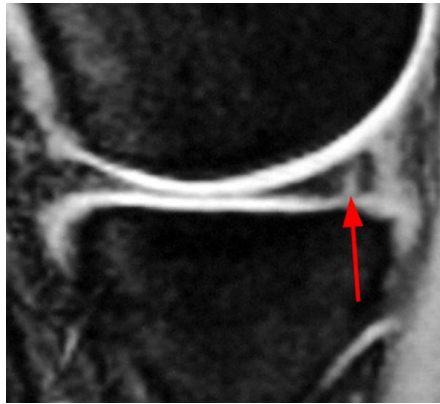
- Tears which are limited to the semilunar cartilage probably never heal. (White-white zone)
- A torn meniscus can be healed by connective tissue if the tear communicates with the synovial membrane laterally. (Red zone)



# Tear patterns meniscus



# Tear patterns meniscus



Vertical tear

Degenerative horizontal tear

Bucket handle tear

Radial tear

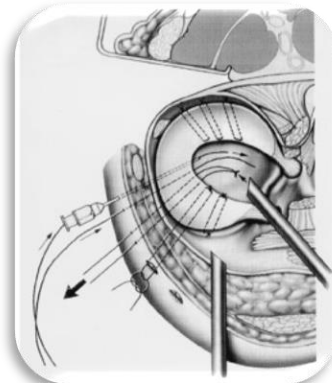
# Repair

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- 25-50% lower chance on OA after repair vs meniscectomy
- More cost-effective than meniscectomy



All-inside  
70%



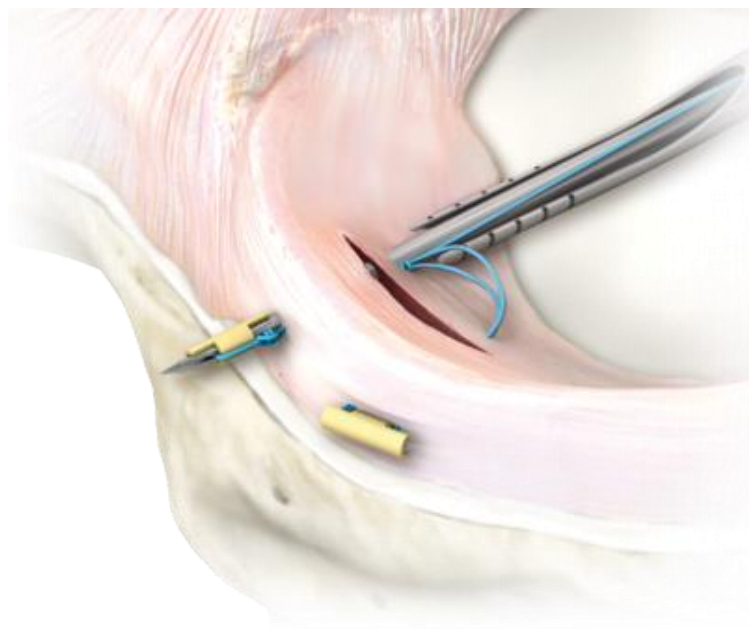
Outside-in



Inside-out  
30%

# Meniscus repair (all-inside)

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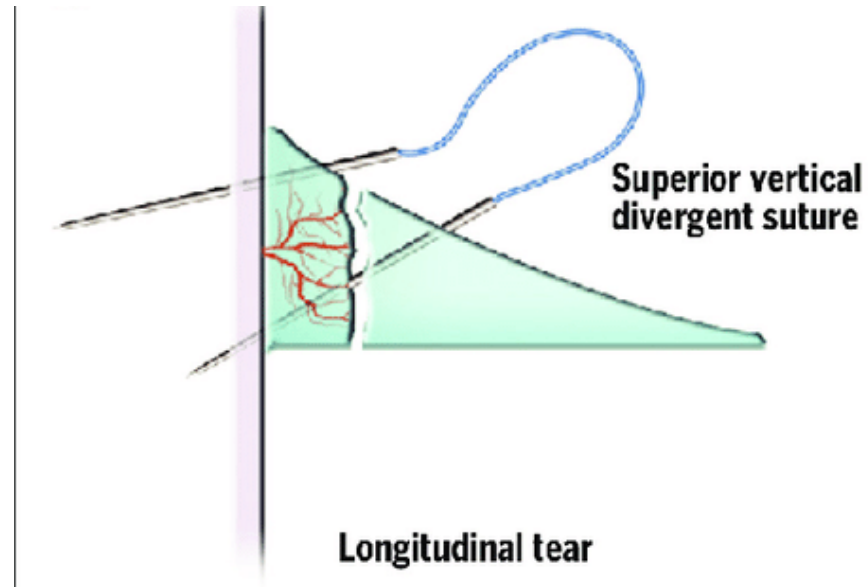
## All-inside meniscus repair

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# Inside out meniscus repair

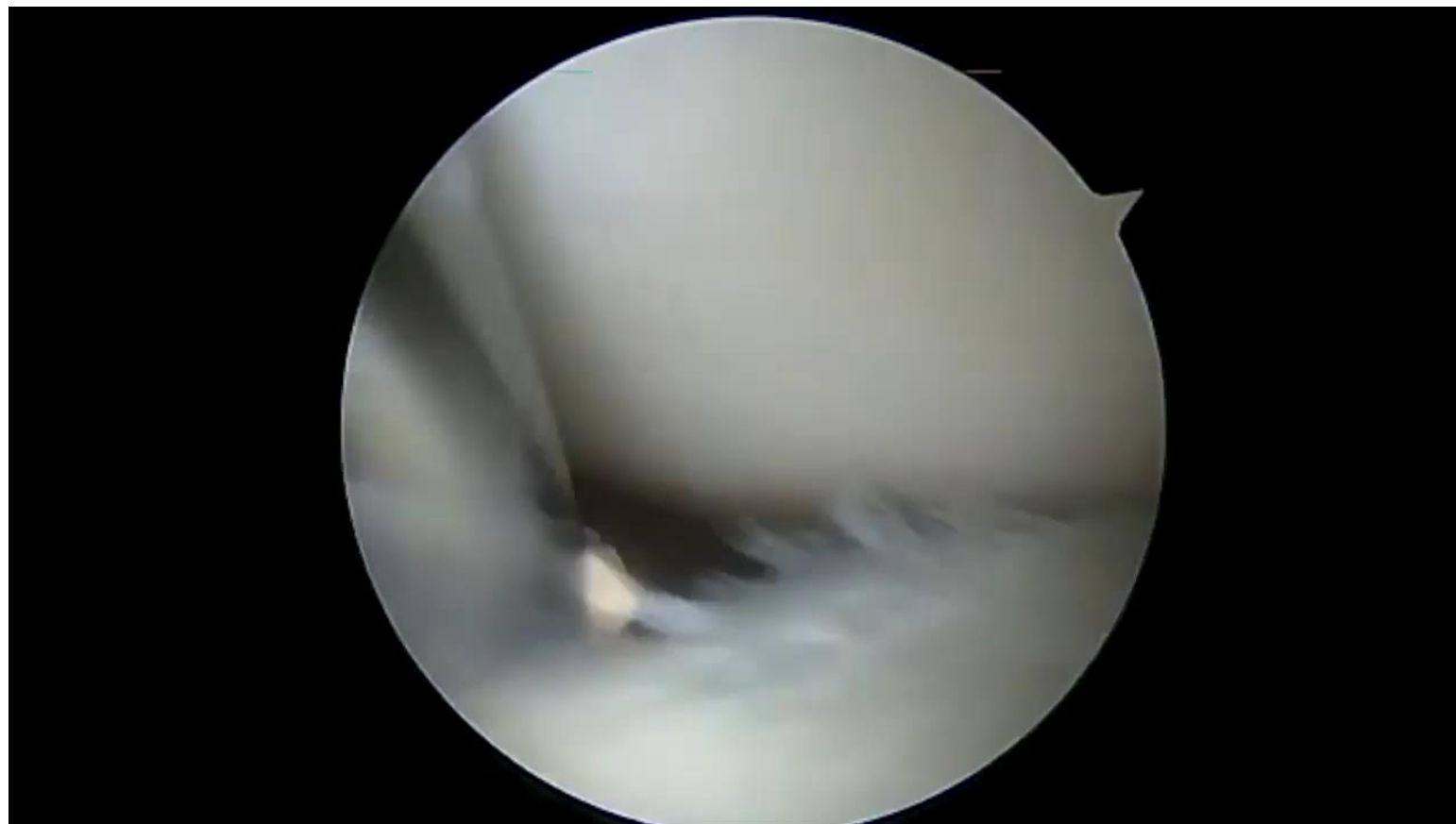
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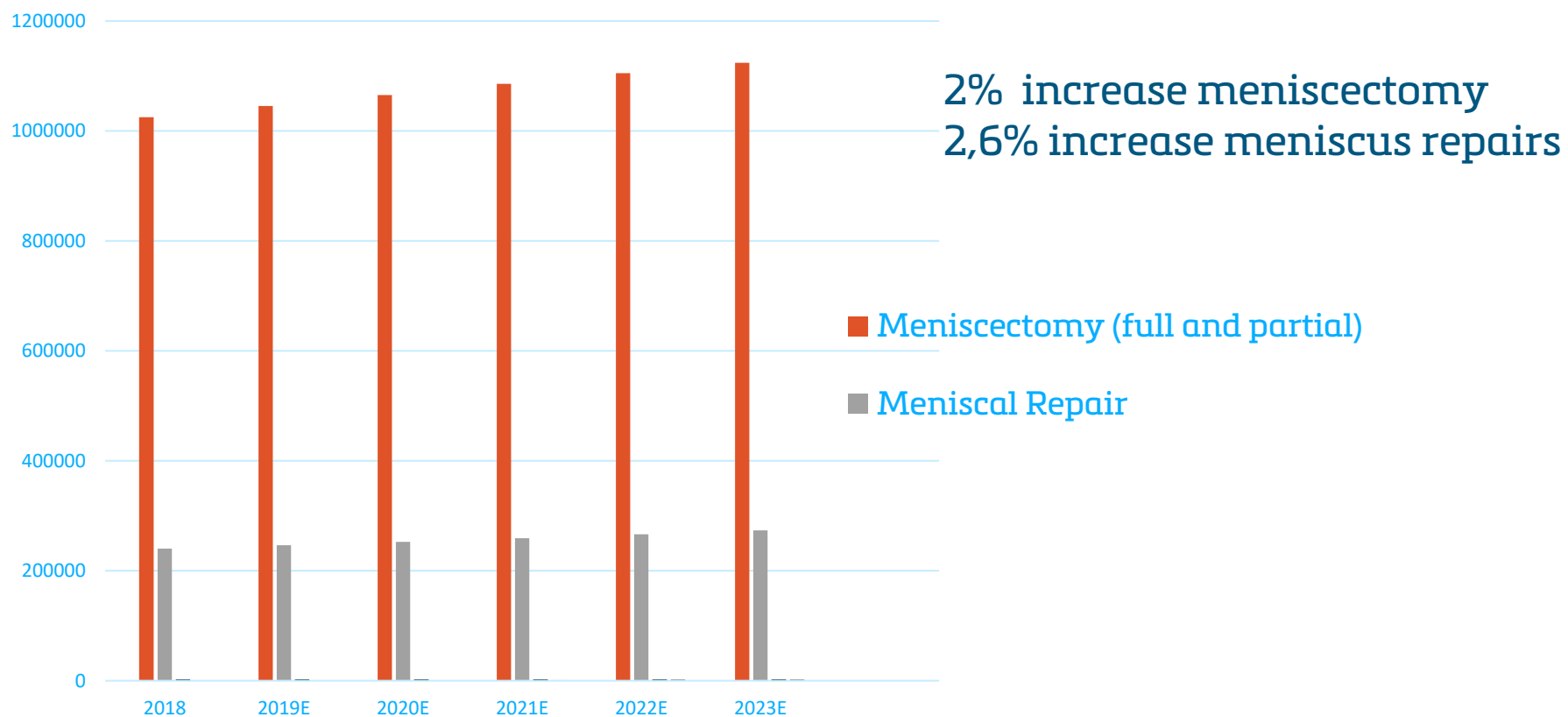


# Inside out meniscus repair

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# Meniscus procedures in US



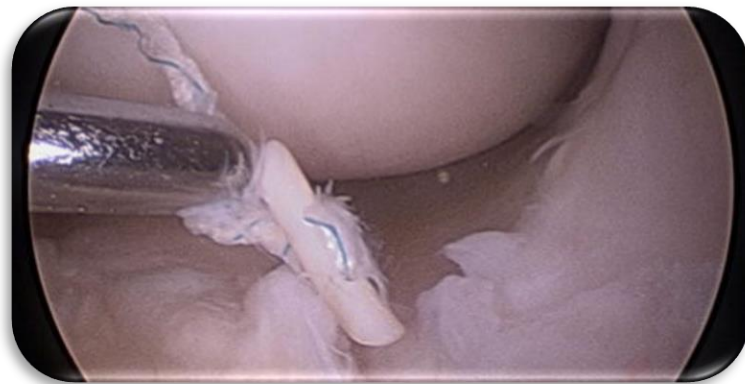
## Why such a slow increase?

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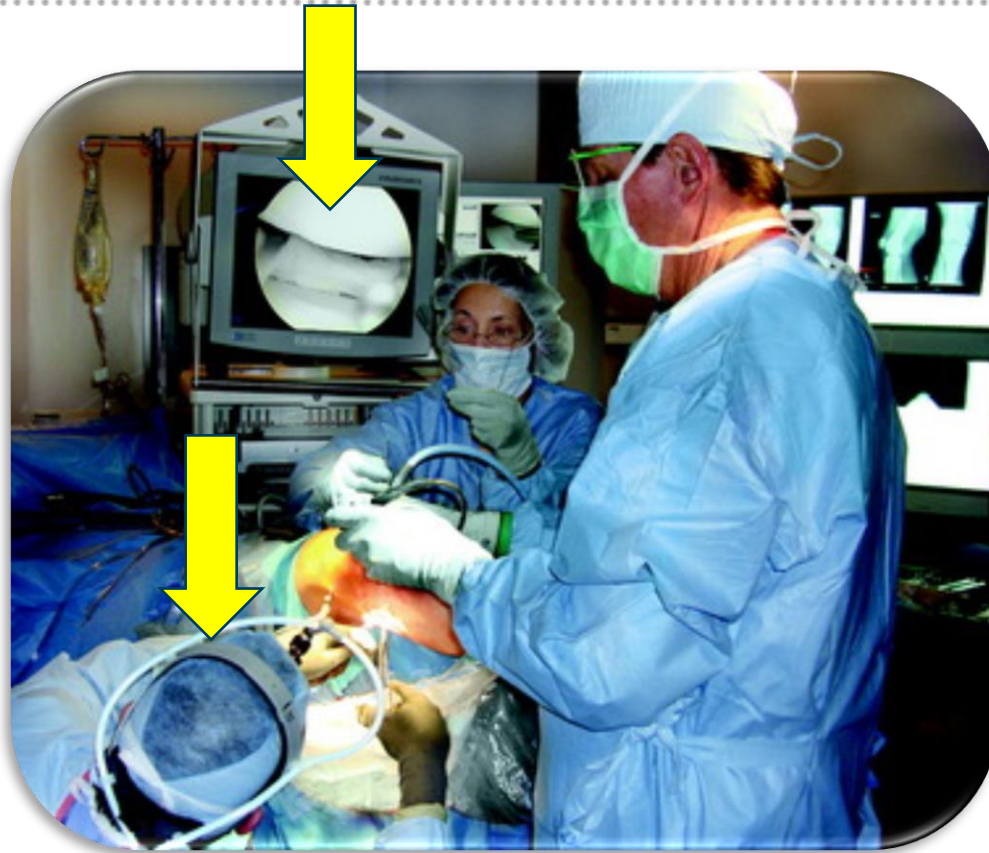
- Results are uncertain, complications, many failures
  - 10% clinical failures
  - 15% anatomic failures (medial)
  - 5% complications
- Too expensive
  - €250 euros per device, bucket handle tear = 3 devices
- Repair = Time consuming

# Failures, complications

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# Technique

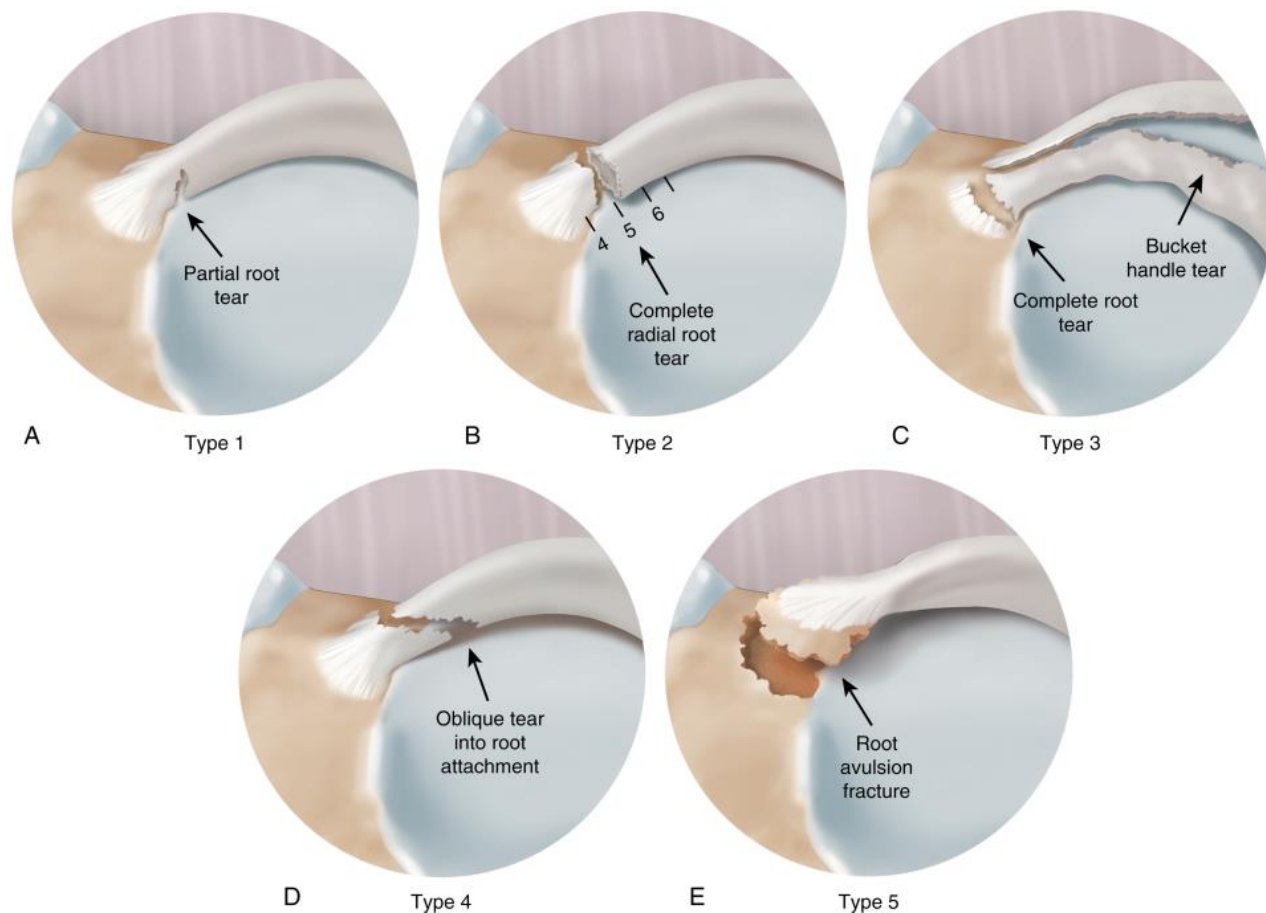


# Repair

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- Learning curve
- Too time consuming?
- Failures
- Costs

# Meniscus root tear



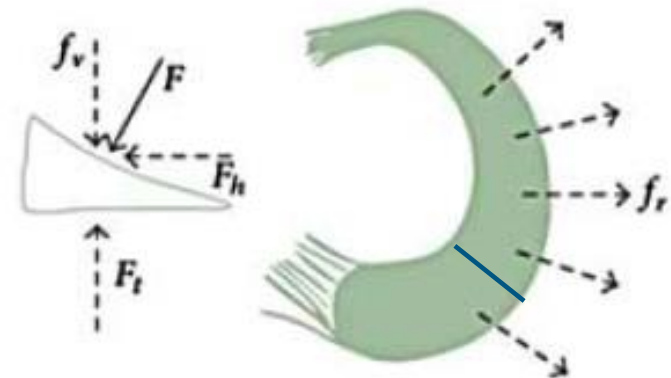
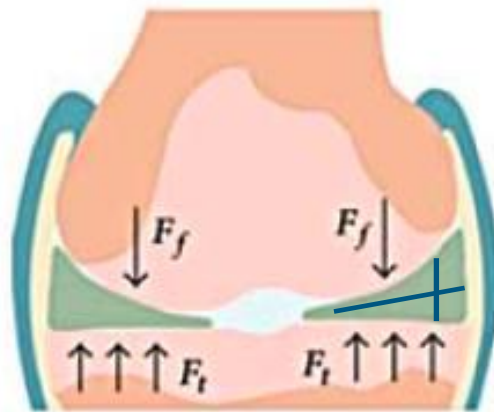






# Rehabilitation

- Depends on tear pattern (vertical, horizontal, radial)
- Surgical technique
- Physical performance demands
- Long-term goals



## Meniscushechting standaard beleid 1<sup>e</sup> 6 weken:

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Instabiele scheur/root repair:

- 5% belasten met afwijking van voet

Stabiele scheur:

- 15% belasten met afwijking van voet

Mediale meniscus: maximaal 90 graden buigen

Laterale meniscus: maximaal 70 graden buigen

Hometrainer is niet toegestaan

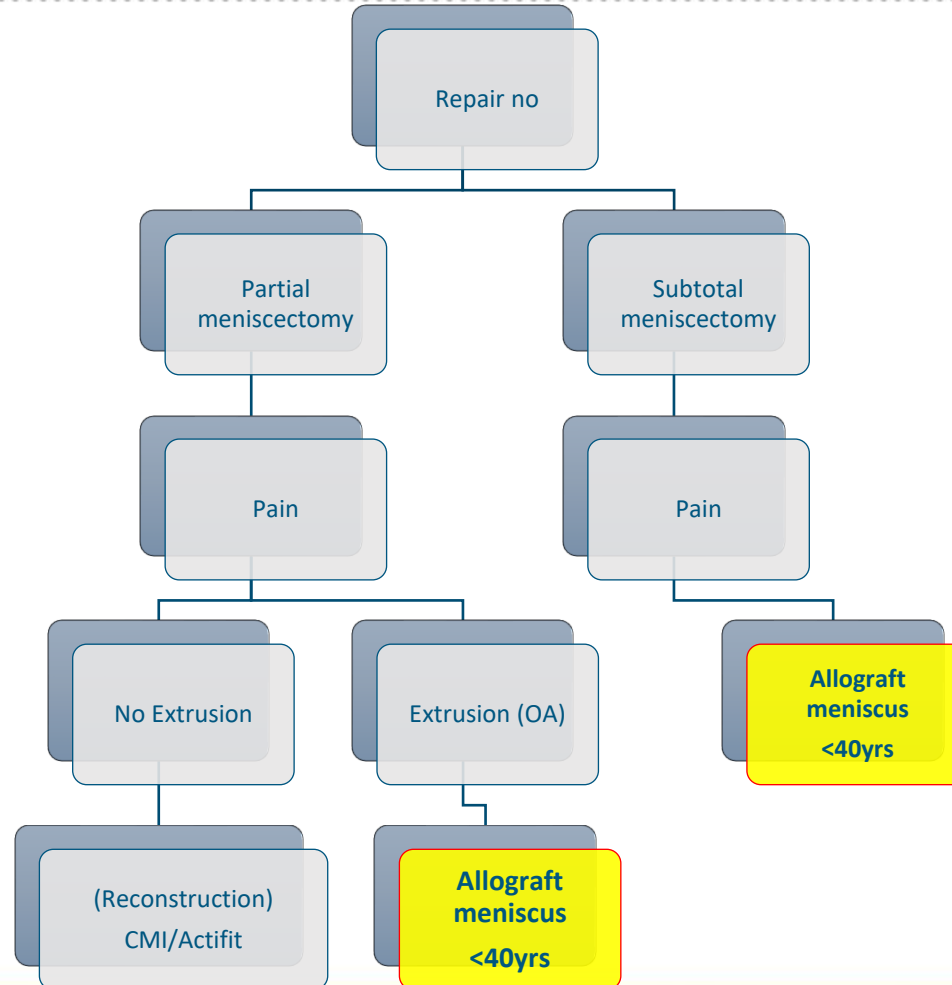
## Meniscushechting na 6 weken:

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- Krukken gebruiken op geleide van de pijn, zwelling en het looppatroon.
- Revalidatie volgens criteria return to play KNGF ES: VKB-R
- 3 maanden niet hurken of knielen
- 6 maanden geen roterende sporten

Continue leerproces: wat is de beste revalidatie?

# Replacement



# Replacing the meniscus? History

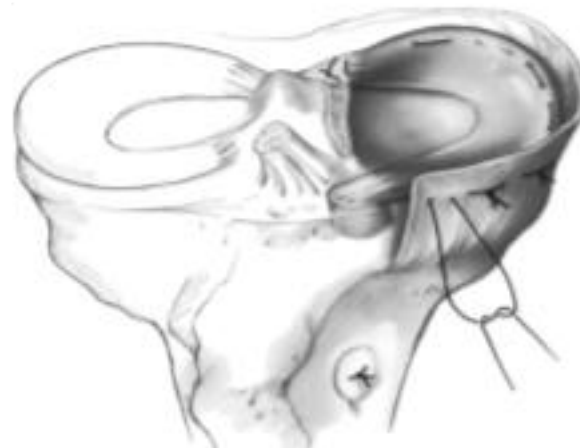
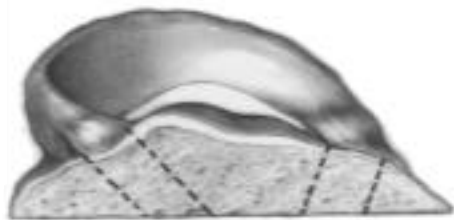
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- Milachowski first serie meniscus replacements  
FU 14 months: only 3 of 22 transplants failed
- Since then +/- 14 retrospective studies on allograft transplantation
- 1 RCT

# technik

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## ■ Boneblocks or not?



## Rational: Biomechanical studies:

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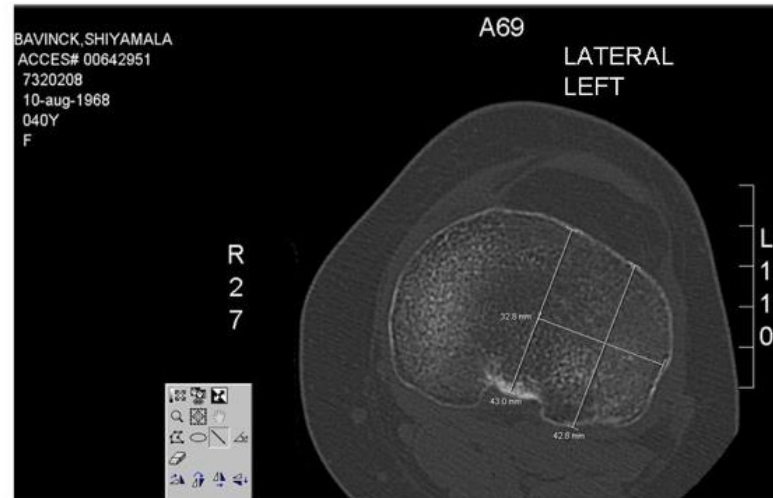
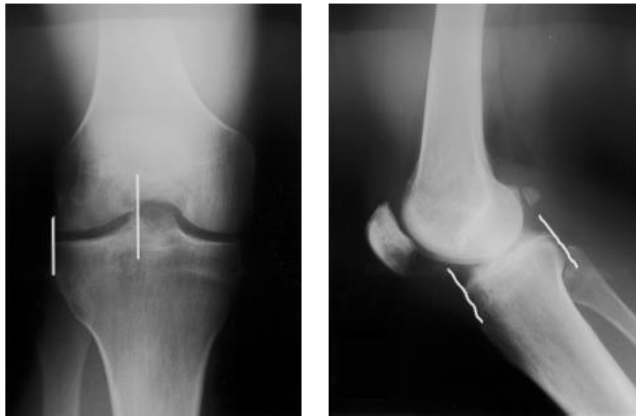
- Meniscus transplant does reduce contact pressures (not normal).  
Boneblocks better than sutures

Alhalki et al. AJSM 2000, Chen Arthroscopy 1996, McDermott et al. KSSTA 2008

- Replanted grafts restore biomechanics to normal
- oversizing: higher peak stresses on cartilage  
undersizing: higher peak stresses on meniscus  
+17.5% and -10%
- Bigger allografts extrude



# Graft sizing



# Indication

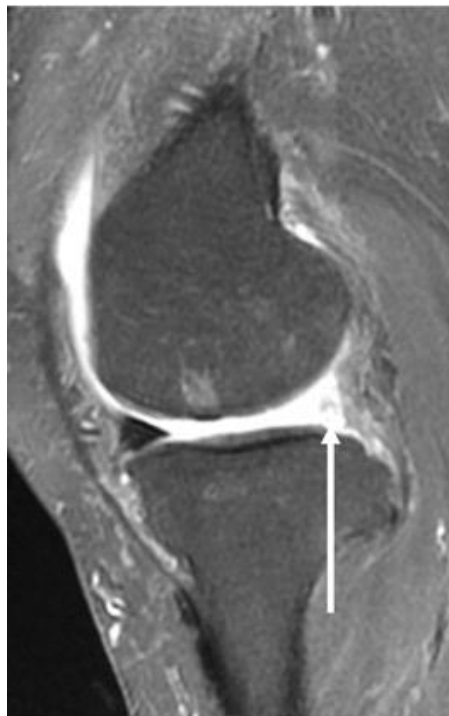
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- Post-meniscectomy pain syndrome
- Neutral leg alignment
- Maximum Kelgrenn Lawrence grade 2



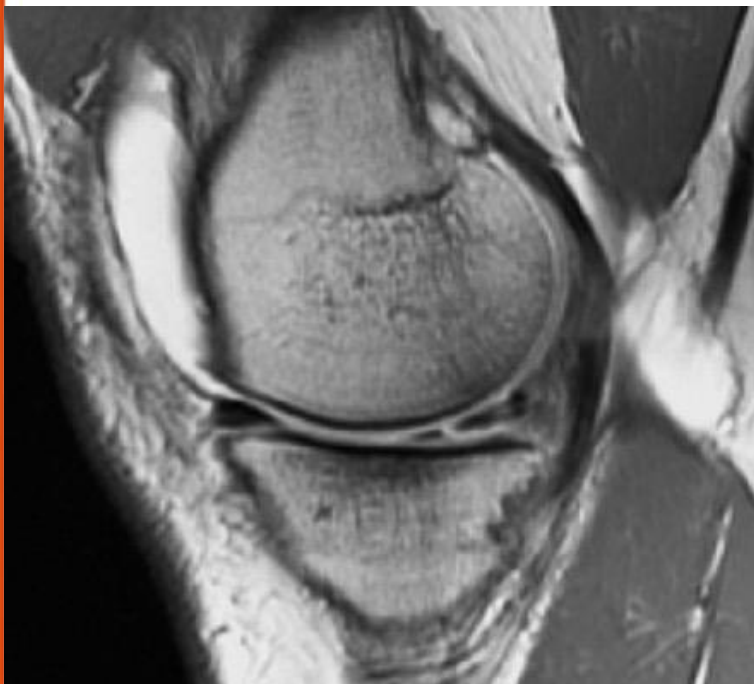
# Indication

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# Indication

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# Indication

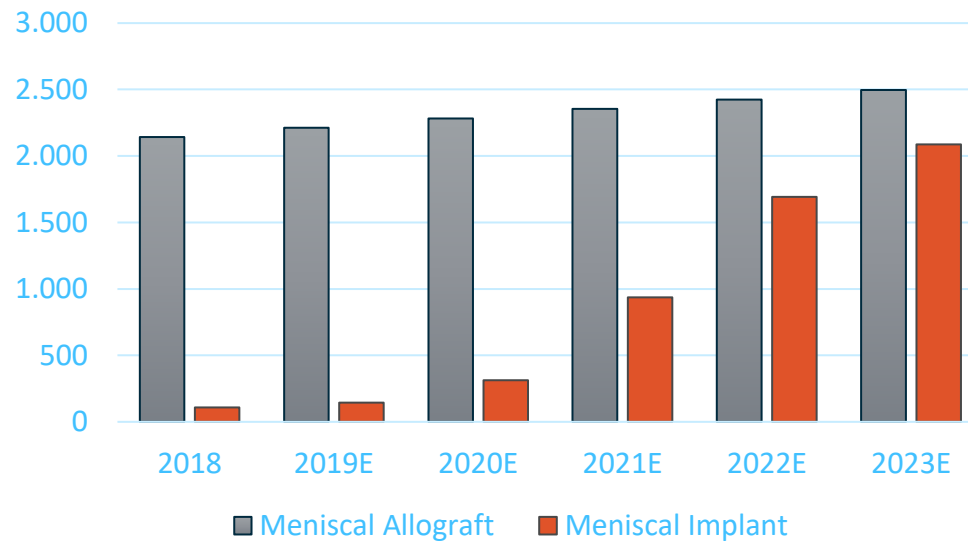
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# Meniscus allograft transplantation

## Allografts

Meniscus procedures US



## Results meniscus replacement (allografts)

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- Pain reduction
- No rejection of graft
- 30% (med) en 15% (lat) fails
- 70-80% survival 3-7-jaar (survival 10-20 yrs)
- 50% survival after 20 yrs
- No cartilage damage progression
- Better than physiotherapy alone

*Verdonk 2007, van Arkel 1995, 2004, 2009, Cameron 1997, Noyes 1995, Carter 1999, Smith/Spalding 2018*

# Difficulties allograft

- Availability
- Size match
- Costs (>\$3000)
- (Technically challenging)





# Rehabilitation

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- First 6 weeks
  - Removable cast or Velcro strap splint
  - Non-weight bearing
  - Passive ROM exercises (if combined ACL)
- 6-12 weeks
  - Partial weightbearing → full at 12 weeks
  - Passive ROM exercises
- 3 months and further
  - Full weightbearing
  - Loaded ROM exercises



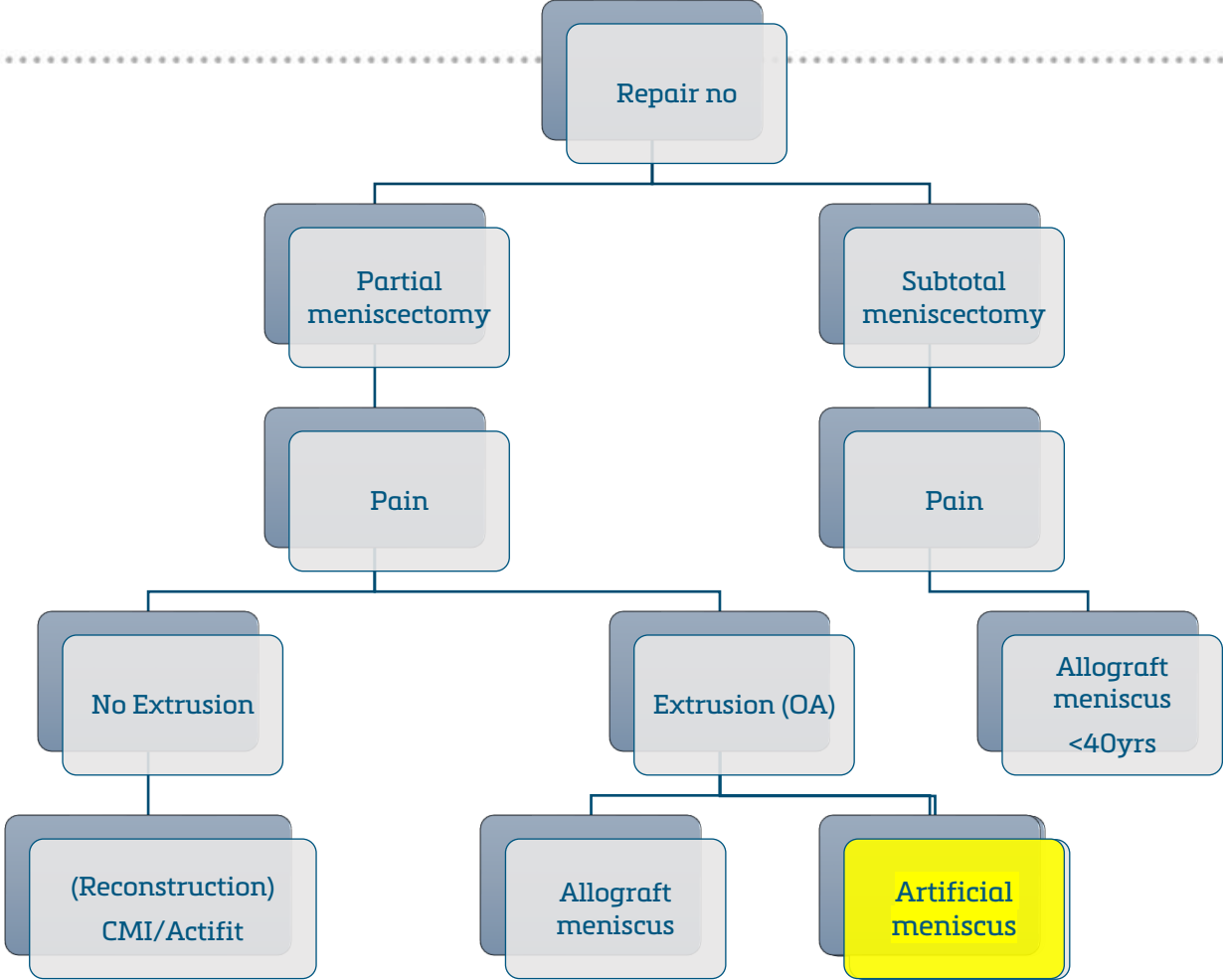
# Conclusion

## management meniscus damage

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- Not enough repairs (too difficult, too many failures, too expensive)
- Reconstruction unknown: just for chronic patients without extrusion?
- Not enough replacements (too expensive, not enough allografts)

# Future



# Future: artificial meniscus

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Trammpolin



Nusurface



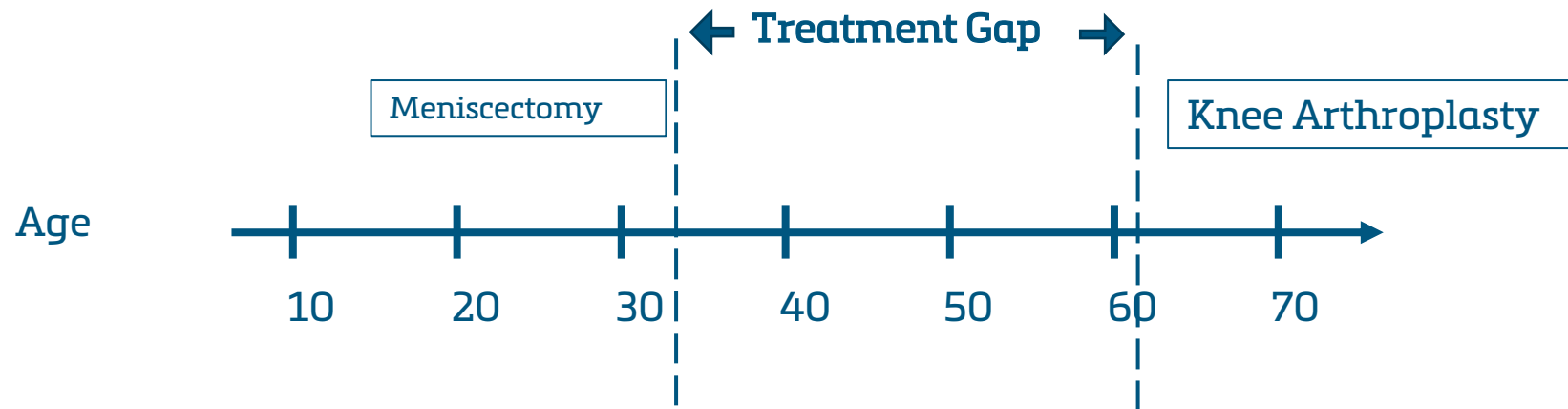
# Pain with no/little joint space narrowing

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# Why TRAMMPOLIN?

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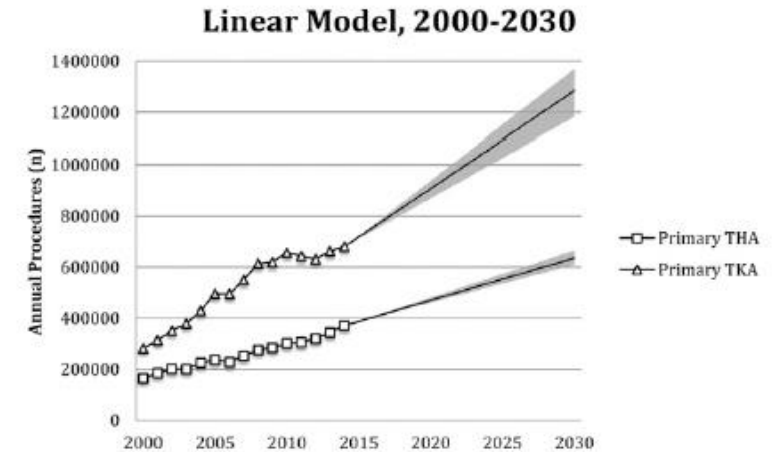


Long-term pain relief  
(Joint preservation)

# TKA procedures in the US by age cohort.

Age	Year	1990	2000	2010	Growth %*
18-44		No data available			
45-64		30,934	78,680	302,328	12
65-74		59,909	120,277	235,152	7
75-84		28,434	73,301	112,586	7
85+		3,746	9,710	18,676	8

\*growth per year



CDC.gov: center of disease control

# TRAMMPOLIN<sup>®</sup> meniscus prosthesis

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## Aim

- Meniscus implant medial compartment
- Anatomic
- Arthroscopic procedure
- Survival > 5 yrs

Less pain

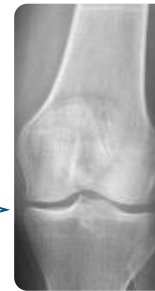




## Indication TRAMMPOLIN®

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- 18-70 yrs
- Pain medial compartment
- Post meniscectomy
- Joint space narrowing grade 1,2
- Max 5° varus
- No bare bone arthroscopy/MRI



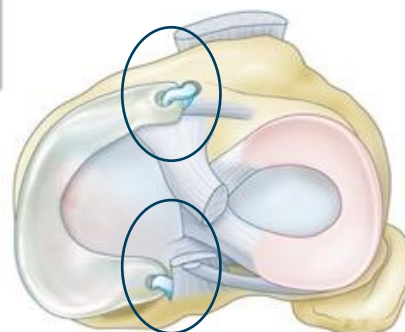
# Meniscus prosthesis 2.0

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- Polymer meniscus (polycarbonate urethane)
- Flexible implant
- Flexible tape fixation & interference screws

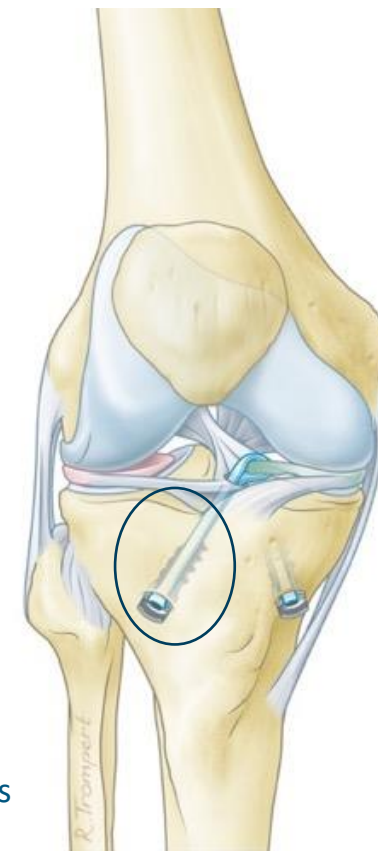


# Tape fixation instead of screws



Tape fixation

Peek interference screws



# Surgical technique



# Clinical

Approval ethical committee for:

- 10 patients
- Primary endpoint: pain
- Secondary endpoint: safety
- Start April 2022



# Clinical study so far

- 10 patients received meniscus prosthesis

