ISAKOS CONGRESS 2023

Boston
Massachusetts
June 18–June 21

"Repair or resect? That is the question!"

Inside-out repair of long meniscus tears is used to identify prognostic factors and improve decision-making

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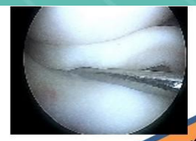
Disclosures:

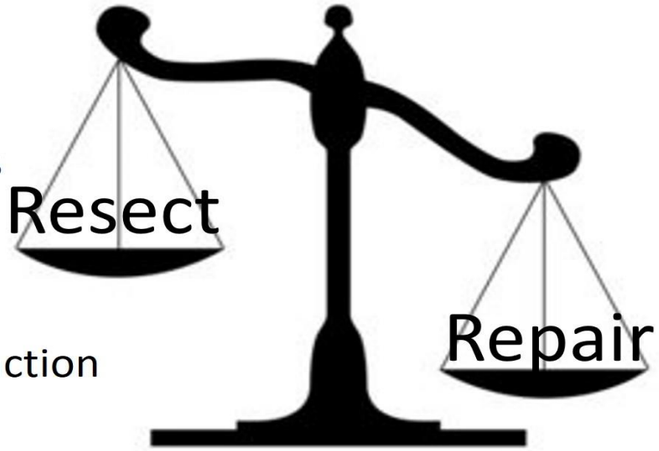
All authors on this study declare that they DO NOT have any financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in relation to the study



-Torn fragment is reducible
-Adequate tissue for repair

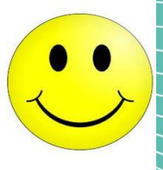
1. Short operation
2. Fast return to activities

1. Development of OA
2. Long-term knee dysfunction



1. Longer operation & rehab
2. Surgical risks & repair failure

1. Improved knee kinematics
2. Keeping healthy articular cartilage



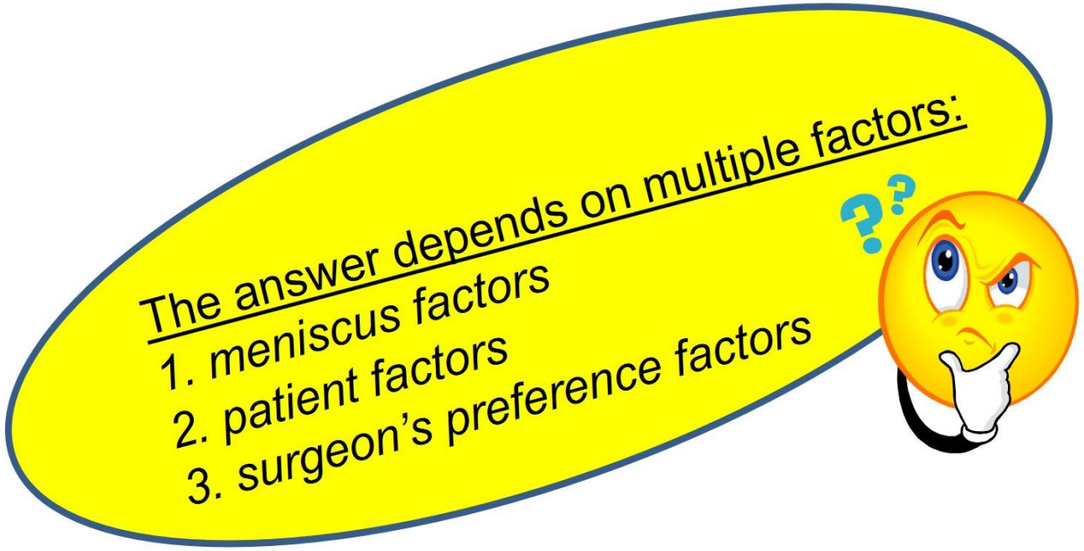
"Save the meniscus!" concept is evolving in the last decade

But:

- Many meniscus repair techniques exit (different failure rates?)

- Lack of long-term “gold- standard” technique studies on specific tear patterns

“Which tear is worthwhile repairing!?”



Why “**Inside-out**” meniscus repair for long meniscus tears?

Because it is a “**high-value procedure**”

Value = Q / C

Q = Quality (PROMs & failure rates)

C = Cost (financial burden on healthcare systems)

The challenge of treatment is to meet the highest value

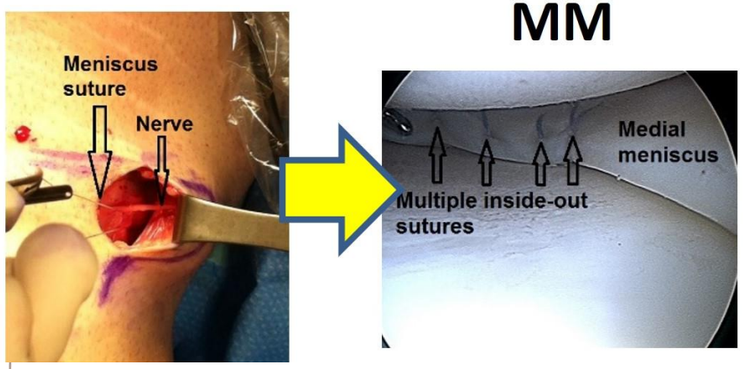
How “**Inside-out**” meniscus repair?

Using PM and PL neurovascular protective windows

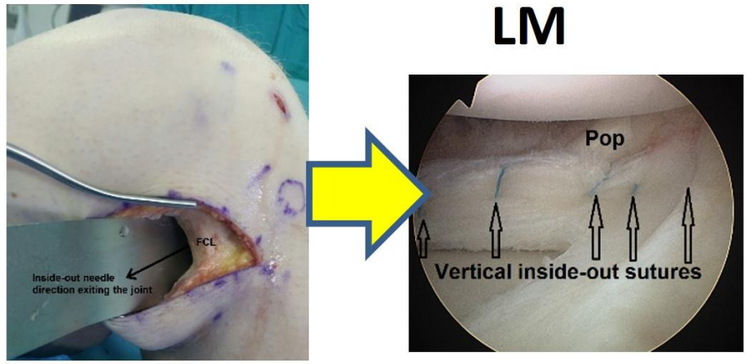
Using consistently the same “gold-standard” method to similar indications (2012-2022)

[Hetsroni I. et al. Arthroscopy Techniques, 2021]

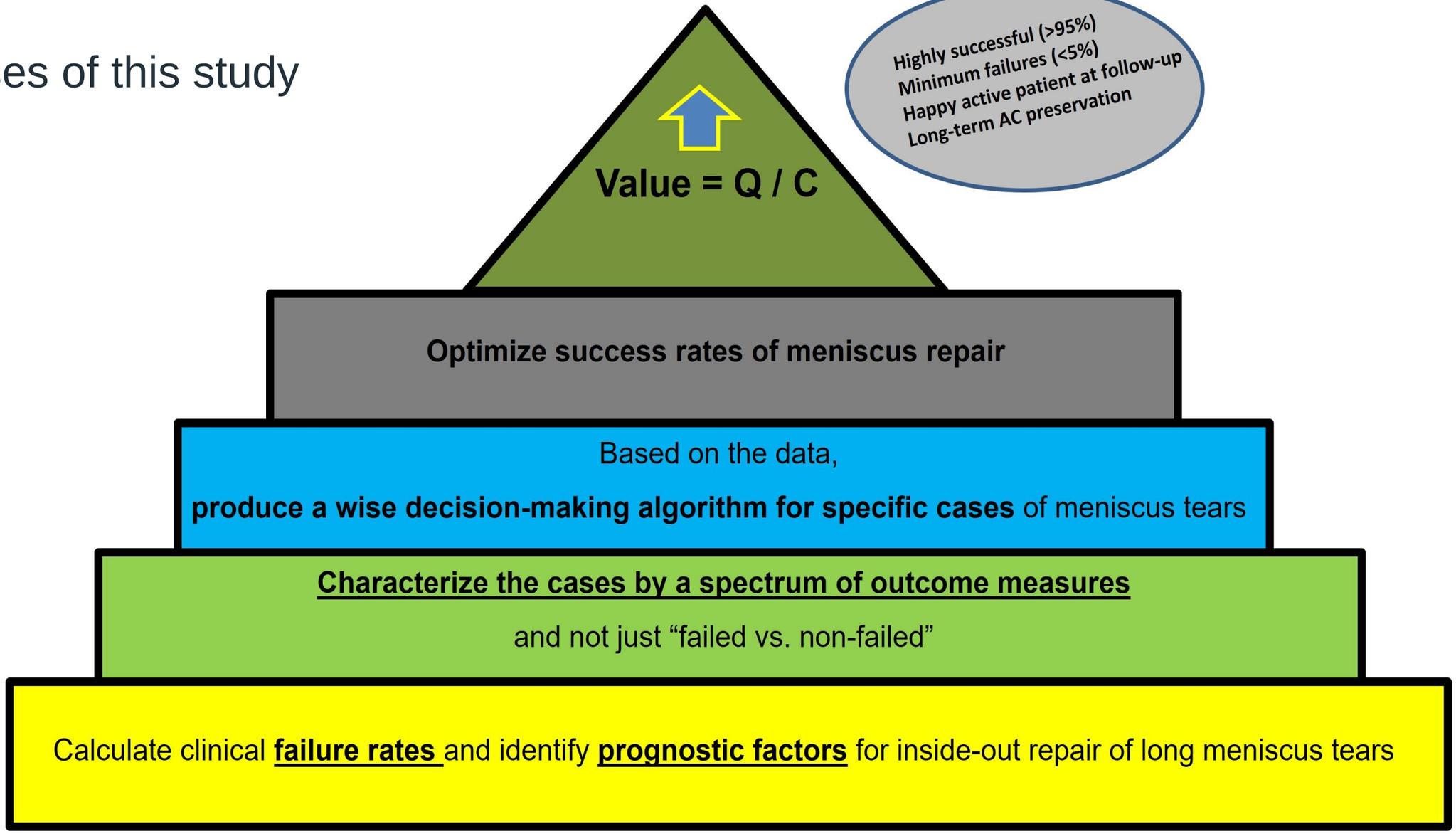
PM window



PL window



Purposes of this study



Inclusion criteria for this follow-up study

1. All operations performed consecutively between July 2012 to December 2022
2. Minimum 3 inside-out sutures (10-mm tear, or longer) using similar technique
3. Minimum 2-year follow-up before study-specific outcome evaluation

Outcome measures

1. **PROMs** (Tegner level, Marx score, IKDC-subjective, KOOS)
2. **Physical examination** measures
3. **Re-operation details** (particularly re-arthroscopy for resection of failed meniscus repair)
4. **Motion-analysis laboratory measures** (in men with the contralateral limb uninjured):

- Muscle strength (knee flexors and extensors torque on a Biodex dinamometer)
- Landing kinetics and kinematics measures & Single-hop for distance LSI

Study cohort

120 patients (127 menisci repaired)

Minimum 3 inside-out suture repair

Operated between 2012 and 2022

96♂; 24♀

MM repair = 89; LM repair = 38; Meniscus repair + ACLR = 56

78 patients (80 menisci repaired)

Operated between 2012 and 2020 (≥ 2-year FU)

42 additional patients (47 menisci repaired)

Operated between 2021 and 2022 (< 2-year FU)

Will be evaluated once they reach the "minimum 2-year follow-up"

67♂; 11♀

MM repair = 58; LM repair = 22; Meniscus repair + ACLR = 34

6 patients (6 menisci: 4 MM, 2 LM) not available to FU (of which 3 living abroad)

(of these 6 patients, 2 had concomitant ACLR)

Follow-up rate 90%

Failure rates (re-arthroscopy for resection)

Variable	n.	%
Re-arthroscopy of all meniscus repairs	11	14
Re-arthroscopy of meniscus repairs with concomitant ACLR	3	9
Re-arthroscopy of medial meniscus with concomitant ACLR	3	9
Re-arthroscopy of lateral meniscus with concomitant ACLR	0	0
Re-arthroscopy of meniscus repairs w/o concomitant ACLR	8	20
Re-arthroscopy of medial meniscus repairs w/o ACLR	6	24
Re-arthroscopy of lateral meniscus repairs w/o ACLR	2	11

Failed cases were not different in:

1. ***Age***
2. ***Sex***
3. ***Smoking status***
4. ***Tear chronicity or Tear length***

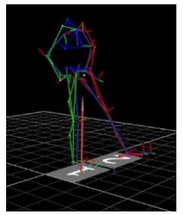
In these cases, our DM algorithm may depend on:

1. ***Other patient factors?*** *(Athletes? Alignment? Compliance)*
2. ***Other meniscus factors?***
3. ***Other factors?*** *(Socioeconomical? Others?)*

Follow-up PROMs in the “non-failed” cases

Reported Outcome Measure	
Return to pre-injury Tegner level [%]	68
Return to pre-injury Marx scores [%]	51
IKDC-subjective score [mean ± SD]	91 ± 7
KOOS – Symptoms [mean ± SD]	88 ± 9
KOOS – Pain [mean ± SD]	91 ± 8
KOOS – ADL [mean ± SD]	96 ± 5
KOOS – Sports [mean ± SD]	80 ± 18
KOOS – QOL [mean ± SD]	65 ± 19

Among patients who did not undergo resection of a “failed meniscus repair”, subjective function & satisfaction was high on average



Preliminary analysis of the first 30 men with unilateral injuries who completed the gait analysis evaluations demonstrates **symmetric and nearly symmetric recovery of strength and landing kinematics** both in isolated meniscus repairs and in repairs with ACLR

Correlations between patient/ meniscus characteristics and PROMs

Patient/ meniscus variables	PROMs
Women vs. Men	**IKDC-subjective** (85±8 vs. 92±6, *p*<0.01); **KOOS-Sports** (68±15 vs. 82±17, *p*=0.02)
Delay injury-surgery (tear chronicity)	**Inverse correlations with KOOS-**Pain, ADL, Sports, QOL (*r*=-0.3, *p*<0.04)
Tegner level at pre-injury	**Highly correlated** with follow-up Tegner and Marx scores (*r*=0.5, *p*<0.01)
Marx score at pre-injury	**Highly correlated** with follow-up Tegner and Marx scores (*r*=0.5, *p*<0.01)
Age at operation	*p* = NS (not correlated with follow-up PROMs)
Smoking status	*p* = NS (not correlated with follow-up PROMs)
Tear length (number of sutures)	*p* = NS (not correlated with follow-up PROMs)

Thus, for optimal outcomes:

- ***Men and active populations can expect higher PROMs***
- ***Repair should be performed as early as possible***
- ***Age, positive smoking status, and tear length were not critical factors "at this point of the study"***

Take-home message

At this preliminary time point of this study, it can be said that:

1. **Concomitant ACLR is a powerful predictor of successful** meniscus repair
2. **Lateral meniscus tears should be repaired** with high success rates
3. **Medial meniscus repair without concomitant ligament reconstruction is the most challenging subgroup** that requires a specific algorithm to reduce failure rates
4. **Additional prognostic factors** include tear **chronicity, sex, preinjury activity levels,** whereas **age or smoking status may not be critical** for a decision in this dilemma

- Hetsroni I, et al. Inside-out repair of extensive meniscal tears using posteromedial and posterolateral neurovascular protective windows. Arthrosc Tech, 2021