

Meniscal and Cartilage Changes on MRI 5-9 years After Medial Opening-Wedge High Tibial Osteotomy

The Dept. Of Orthopedic Surgery, Asahikawa Medical University

ABE. Satomi, SASAKI. Yusuke



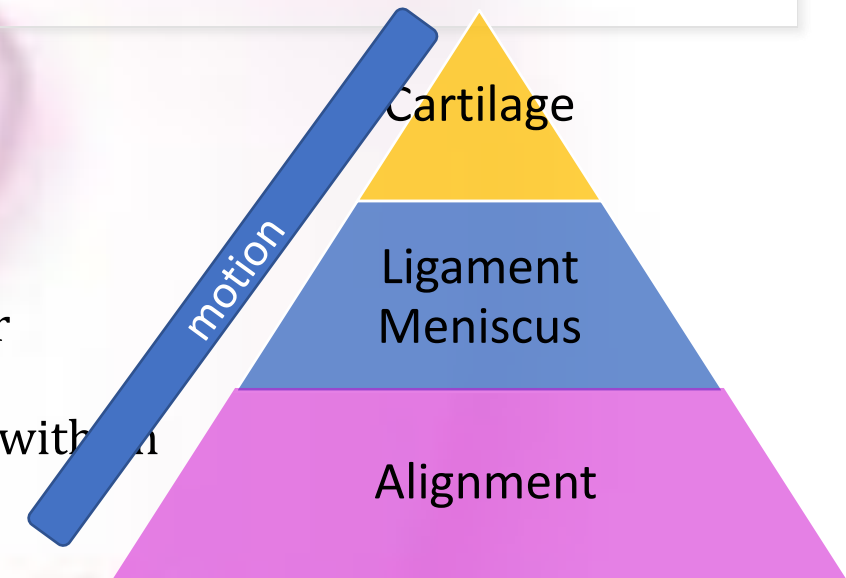
ISAKOS CONGRESS 2023

We have no financial relationships to disclose.

Introduction

- **Alignment** is an important factor for **tissue repair**.

- ✓ **ACL reconstruction**: good results at retrograde correction osteotomy (1)
- ✓ **Cartilage** transplantation: poor results at 5 degrees or higher deformity (2)
- ✓ **Meniscus** transplantation: high survival rate in combination with an osteotomy (3,4)
- ✓ **Meniscus extrusion**: **improved** (5,6)



- **OWHTO** affects the medial compartment positively on arthroscopy and MRI in short term. Middle- to long-term effects are not clear.
- An MRI evaluation was performed **up to 9 years** after OWHTO, and the effect of **tissue repair** on the **medial cartilage** and **meniscus** was examined.

Materials and Methods

- OWTHO for Osteoarthritis, spontaneous knee osteonecrosis
- 24 knees, 49-69 years old, (Male 3 knees, Female 21 knees)
- **Pre-op., an early** (1—2 years), **a mid-term** (5—9 years)
 - X-ray (FTA, HKA, %MA, MPTA, aPPTA)
 - MRI (**MOCART 2.0 Knee Score**, T2 mapping **T2 values**, **MME**)
- Surgery
 - **MMPRT (non-treatment)** : 5 knees
 - **Microfracture of femur**: 5 knees (**kissing lesion/wide defect**)
 - **Partial meniscectomy**: 7 knees (**flap tear**)



Parrot-beak

Results

◆ X-ray

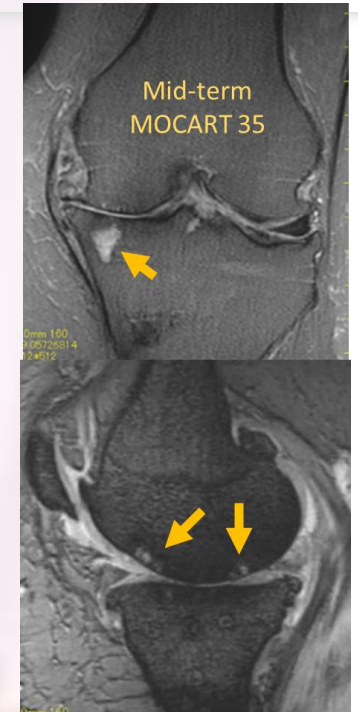
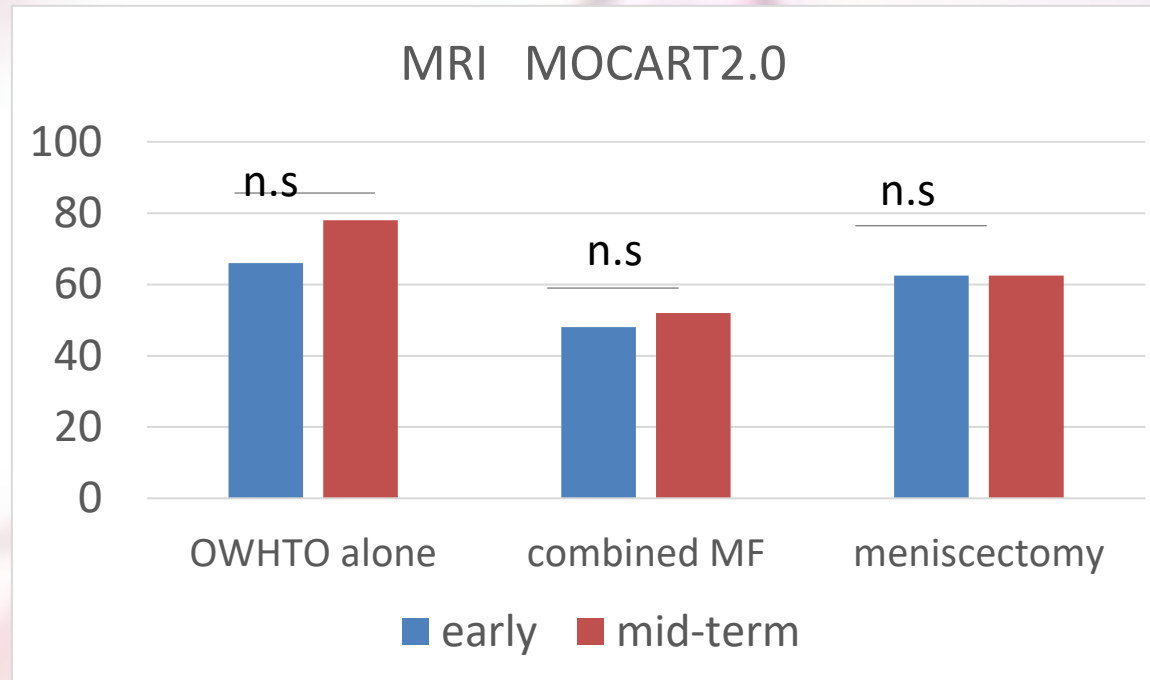
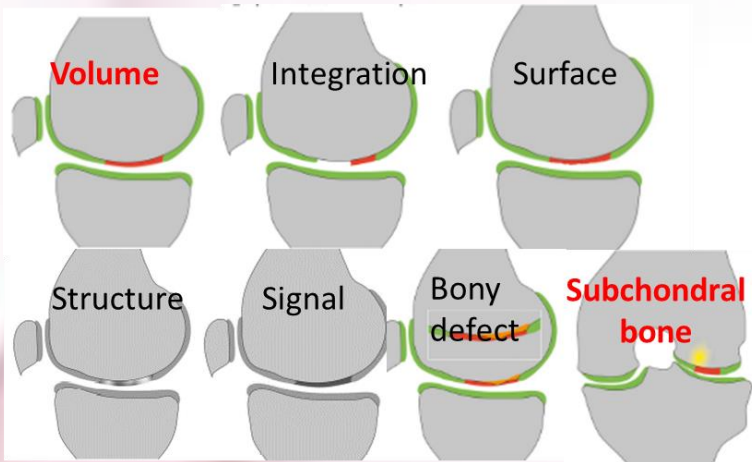
	FTA (°)	HKA (°)	%MA (%)	MPTA(°)	aPPTA (°)
Pre-op.	178.3	183.9	32.1	85.8	82.1
Mid-term	172.2	177.0	62.2	92.7	82.9

		FTA (°)	HKA (°)	%MA(%)	MPTA (°)	aPPTA(°)
OWHTO alone	Pre-op.	179.0±3.1	184.3±3.4	32.3±17.1	85.5±1.8	82.3±2.1
	Mid-term(5-8y)	171.7±0.5	175.0±2.4	65.0±7.4	92.0±.9	82.7±0.4
Combined with MF (n=5)	Pre-op.	178.5±5.2	185.0±4.0	29.5±20.8	86.3±5.9	83.5±1.7
	Mid-term(5-9y)	171.0±0.5	177.4±1.4	63.1±10.5	94.4±1.4	82.9±2.12
meniscectomy (n=7)	Pre-op.	180.8±3.0	186.3±4.3	24.8±16.7	84.8±0.9	81.3±2.7
	Mid-term(5-7y)	174.8±3.2	180.5±2.7	54.5±5.3*	93.0±1.7	82.5±1.05

Results

◆ MRI

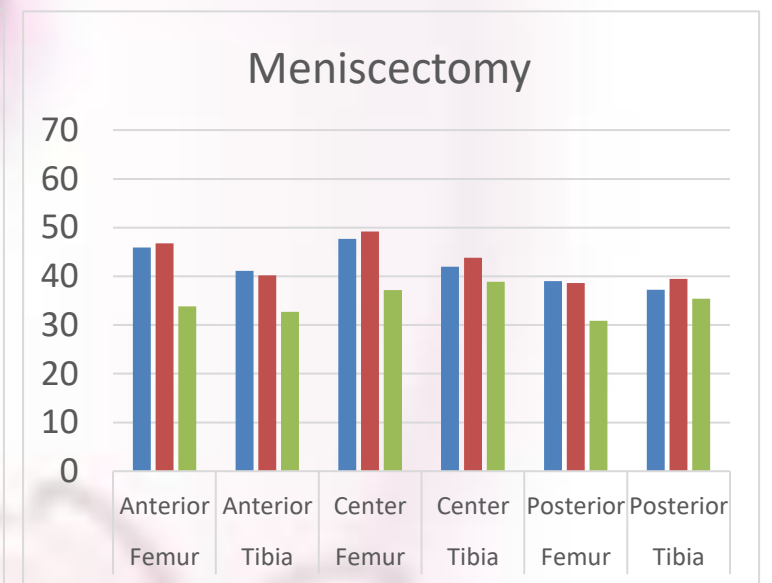
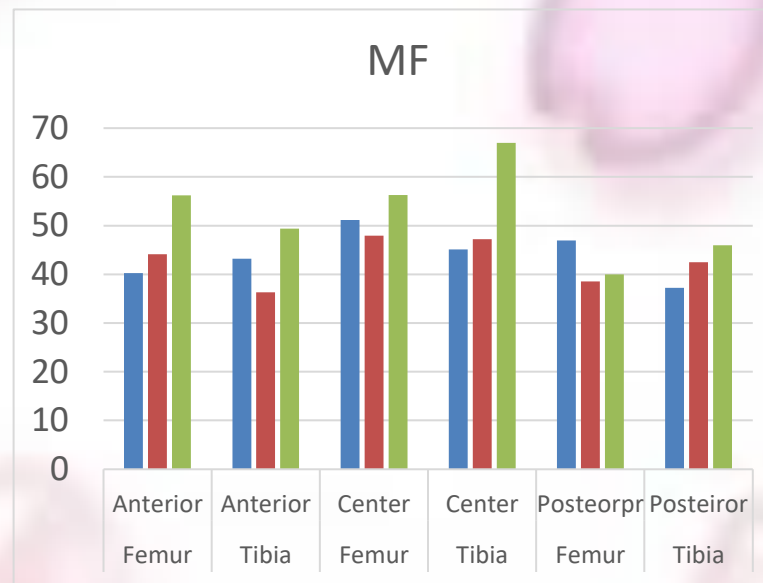
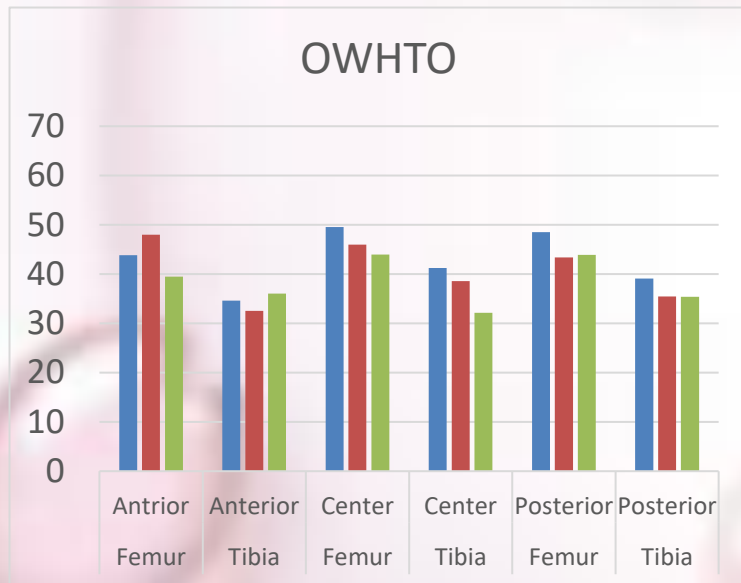
MOCART score



The score was the lowest in the combination with MF. ‘Volume score’ was lower in MF and meniscus resection. ‘Subchondral bone score’ was the lowest in the MF group.

Results

◆ MRI T2 values of cartilage

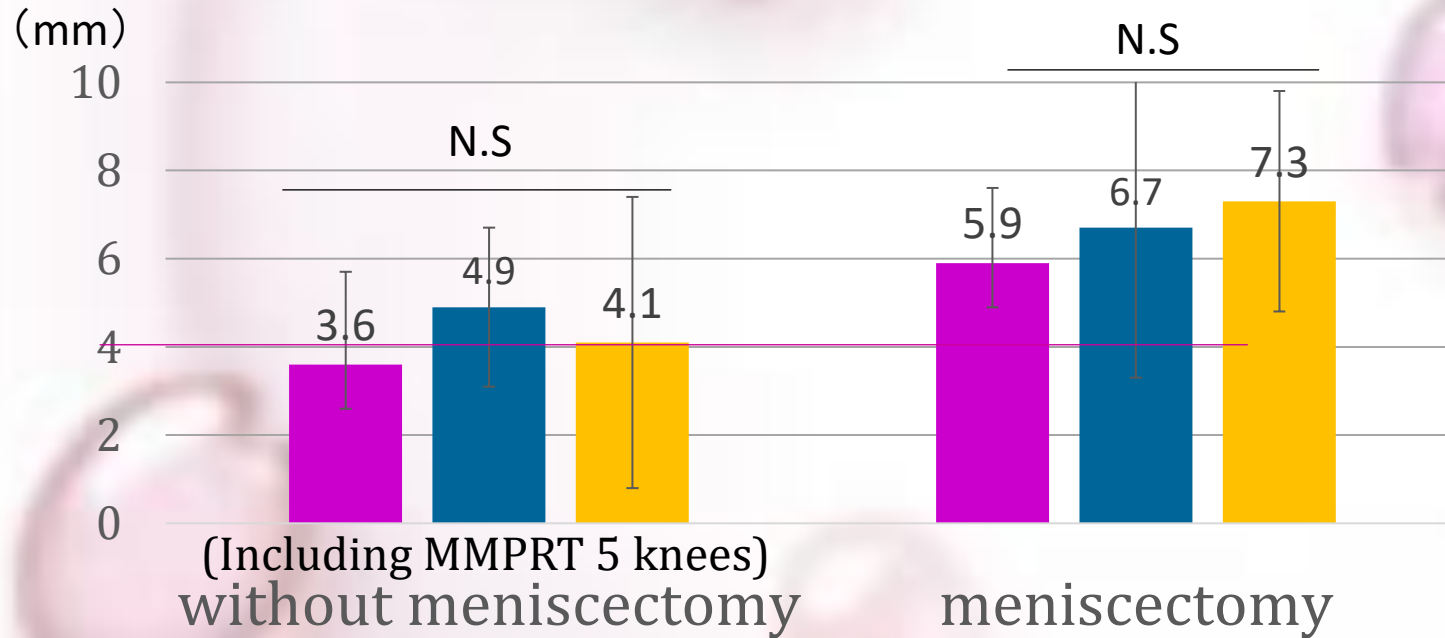


■ Pre-op. ■ Early ■ Mid-term

In OWHTO combined with MF, both the femur and tibia tended to deteriorate toward the mid-term.

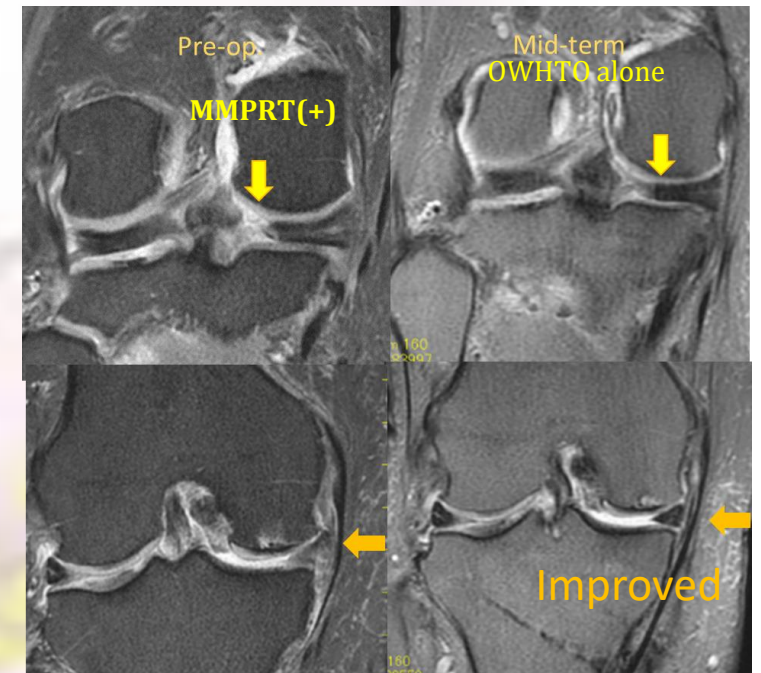
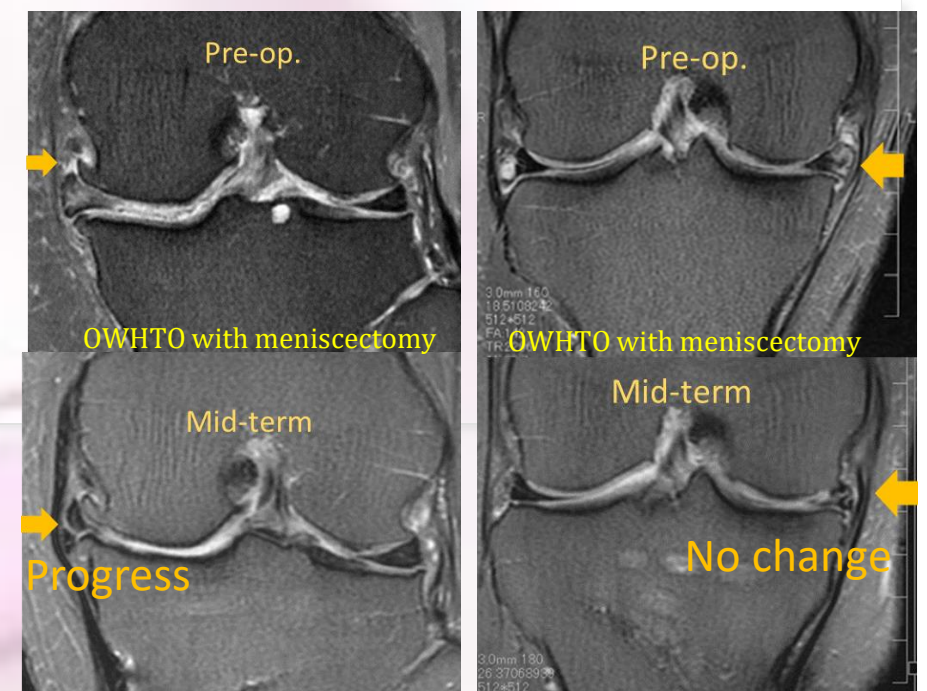
Results

◆ MRI MME



■ pre-op. ■ Early ■ Mid-term

Overall MME was unchanged, two cases were improved. When a meniscectomy was performed, MME tended to progress.



Discussion

< cartilage & bone repair after osteotomy >

● Cartilage: T2 values improved in the medial side ^(7,8)

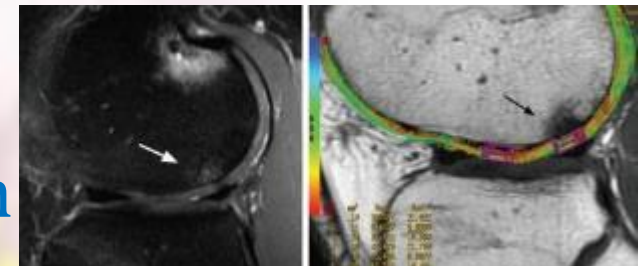
In this study,

- ✓ Overall, the medial side cartilage improve .
- ✓ The cartilage in the MF group *deteriorated* morphologically and qualitatively **in the med-term**.

● Bone marrow stimulation with gel, growth factor, chondrocytes, or stem cell transplantation: good repair ^(9,10)

In this study,

- ✓ Potentially further improvement in **the long-term** clinical results and MRI evaluation



Discussion

< MME and meniscal repair after osteotomy >

● **Clinical results** related MME associated OWHTO

- No correlate ⁽¹¹⁾
- Without MME (<1.5mm): better ⁽¹²⁾
- Preoperative large MME (5mm<) : worse ⁽¹³⁾

● **MME: improved, did not correlate with cartilage repair** ⁽¹¹⁾

In this study,

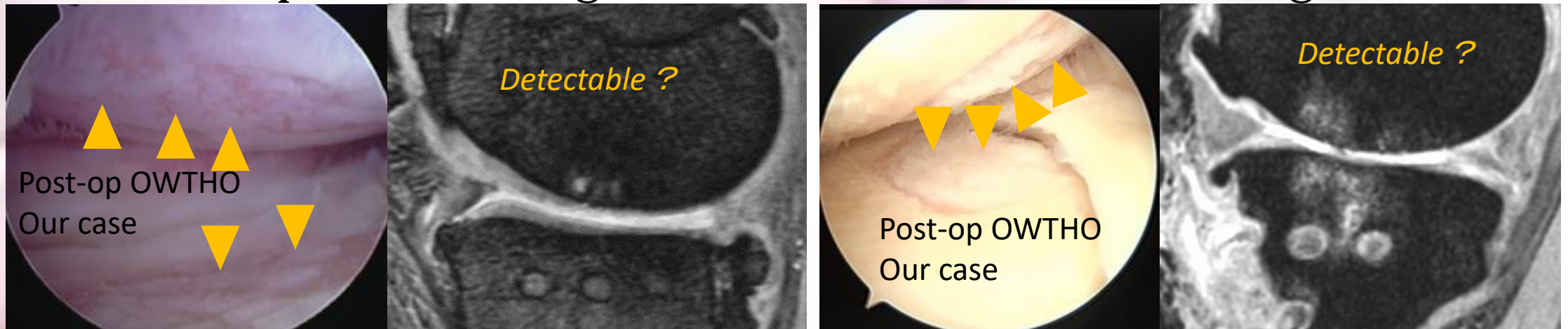
✓ MME: **No change**

(2 cases improved, meniscectomy cases tended to progress)

➤ When the meniscus has not yet undergone irreversible changes, osteotomy alone will help to improve.

Limitation/Future work

- Histology evaluation
- Is the neo-repaired cartilage after OWTHO detectable using MRI?

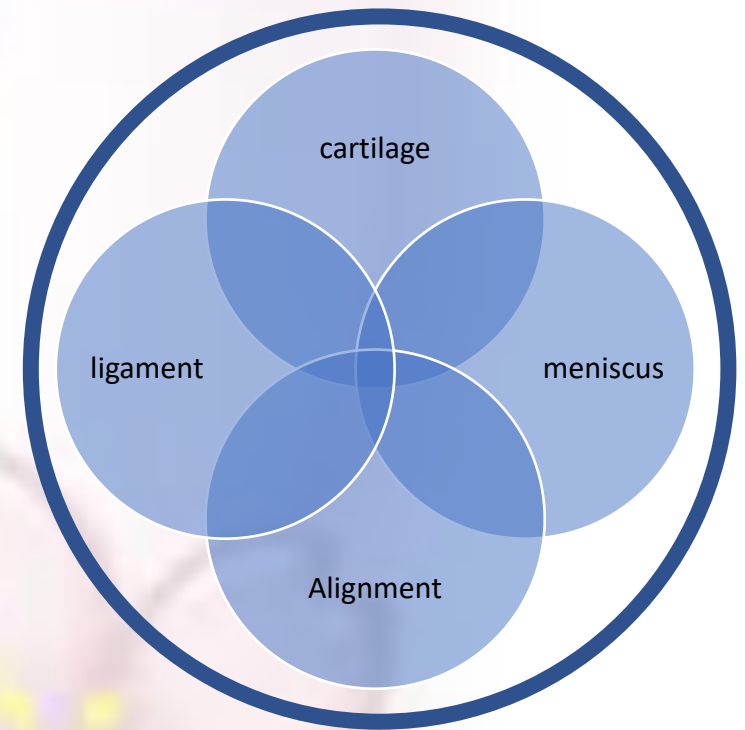


- Quantitative evaluation of meniscus in MRI :
 - ~Meniscus: T2 values in MRI improved ⁽¹⁴⁾
- Correlation with clinical results

Conclusion

- **Mid-term MRI** images were evaluated.
- Osteotomy has **a positive effect on the medial cartilage and meniscus**, but it has **not** been **sufficiently** repaired on the image.
- **Reconstruction** of cartilage and meniscus can be expected to improve **the long-term** evaluation of osteotomy.

Functional Reconstruction



references

1. Lin LJ, JBJS review 2020
2. Bode G, Arch Orthop Trauma 2013
3. Rao AJ, Orthop J Sports Med. 2015
4. Harris JD, Knee. 2013
5. Astur DC, The Orthop J of Sports Med. 2020
6. Choi HG, The Orthop J of Sports Med. 2021
7. Welsh GH, J MRI 2008
8. Nishioka H, JBR 2013
9. Kim MS, AJSM 2017
10. Tan SHS, Orthop J Sports Med. 2021
11. Bae JK. the Arthroscopy Association of North America 2021
12. Astur DJ. OJSM 2020
13. Yang HY. JBJS. 2021
14. Choi HG, The Orthop J of Sports Med. 2021)