



ISAKOS
CONGRESS
2025



MUNICH
GERMANY
June 8-11



兵庫医科大学



Differences in Postoperative Clinical Outcomes and MRI Findings Based on the Method of Fixation of Artificial Collagen Membranes in Autologous Chondrocyte Implantation in Middle-Aged and Elderly Patients

Akira Kawai, MD, Nishinomiya, Hyogo JAPAN

Tomoya Iseki, MD, PhD, Nishinomiya, Hyogo JAPAN

Ryo Kanto, MD, PhD., Nishinomiya, Hyogo JAPAN

Yoshitaka Nakao, MD, Nishinomiya, Hyogo JAPAN

Shunsuke Akai, MD, Nishinomiya, Hyogo JAPAN

Hiroshi Nakayama, MD., PhD., Nishinomiya, Hyogo JAPAN

Toshiya Tachibana, MD, PhD, Nishinomiya, Hyogo JAPAN



Faculty Disclosure Information

- Grant/Research - Support; Japan Tissue Engineering Co., Ltd. (J-TEC).



ISAKOS
CONGRESS
2025



MUNICH
GERMANY
June 8-11





Evolution of Collagen Membrane Fixation Methods in Autologous Chondrocyte Implantation (ACI) in Japan

- ✓ The use of artificial collagen membranes has been permitted since 2019
 - Reduction of surgical invasiveness
 - Simplification of surgical technique
 - Enables stable cartilage repair.^{1, 2}
- ✓ Various fixation methods have been reported.^{3, 4, 5}

No studies have yet investigated the impact of suture anchor devices on postoperative clinical outcomes or MRI findings.



ISAKOS
CONGRESS
2025



MUNICH
GERMANY
June 8-11



兵庫医科大学





Purpose

To compare postoperative clinical outcomes and MRI findings in cases of ACI performed using either an all-suture anchor (JuggerKnot Mini®) or a knotless suture anchor (BC PushLock Anchor®).

Materials & Methods

- ✓ Traumatic Knee cartilage injury in patients aged 50 years or older
- ✓ ACI performed in our institution between 2020 and 2023
- ✓ Minimum follow-up period of 6 months



- ✓ 18 cases 18 knees (male: 12 cases, female: 6 cases)
- ✓ Average age: 58.8 years
- ✓ All suture anchor: AA group, n=11, ~ Oct. 2020
Knotless suture anchor: KA group, n=7, Nov. 2020 ~



ISAKOS
CONGRESS
2025



MUNICH
GERMANY
June 8-11



兵庫医科大学



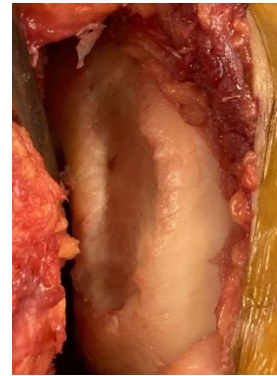
Surgical Technique and Suture Devices

➤ Arthroscopic cartilage harvesting

After one month of Cell cultivation

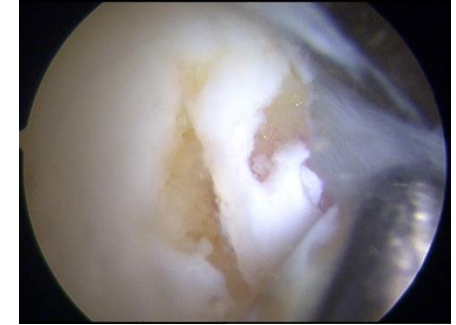
➤ ACI (JACC®)*

✓ Medial parapatellar mini-incision



✓ Autologous chondrocyte implantation was performed after debridement of the lesion.

*JACC®: J-TEC Autologous Cultured Cartilage

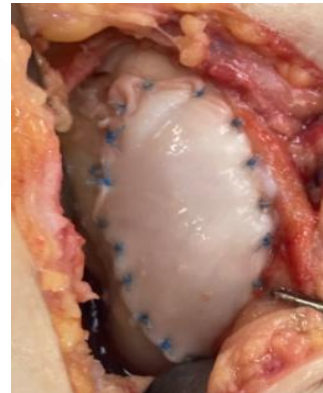


✓ Cartilage was harvested from a non-weight-bearing area.

➤ Suture Devices

AA group

All suture anchor:
Zimmer JuggerKnot Mini®
Anchor material: polyester
Anchor diameter: 1.0mm



KA group

Knotless suture anchor:
Arthrex BC PushLock anchor®
Anchor material: PLLA, β -TCP
Anchor diameter: 2.4m



ISAKOS
CONGRESS
2025



MUNICH
GERMANY
June 8-11



兵庫医科大学



Rehabilitation / Outcome Measures

- **Postoperative rehabilitation protocol**
 - ✓ ROM: From 1 week postoperatively.
 - ✓ Partial weight bearing: From 2 weeks postoperatively.
- **Clinical Outcomes**
 - ✓ KOOS, IKDC, VAS at rest and during motion were evaluated preoperatively and at 6 months postoperatively.
- **MRI evaluation of Cartilage**
 - ✓ Using MOCART 2.0 score.
 - ✓ Measured at 6 months postoperatively.



ISAKOS
CONGRESS
2025



MUNICH
GERMANY
June 8-11



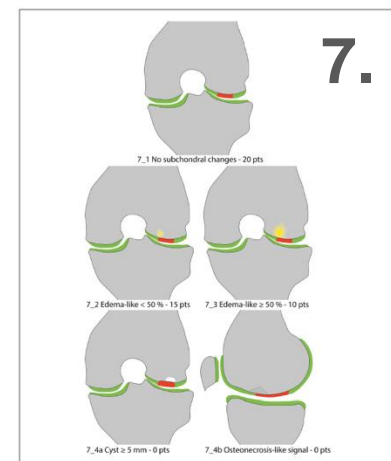
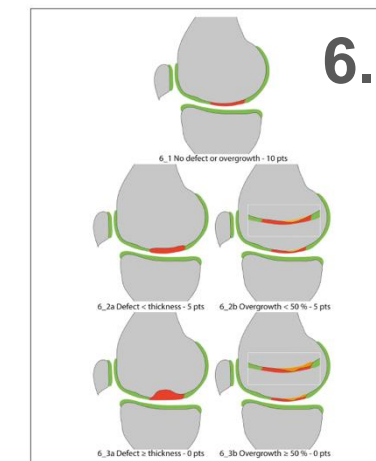
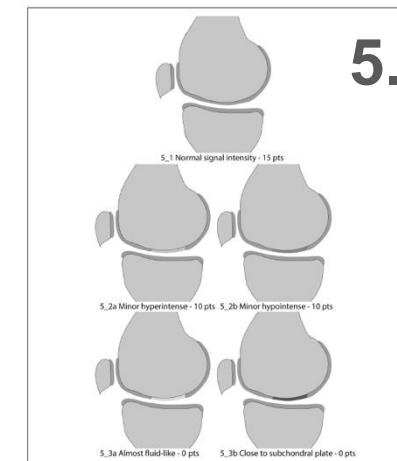
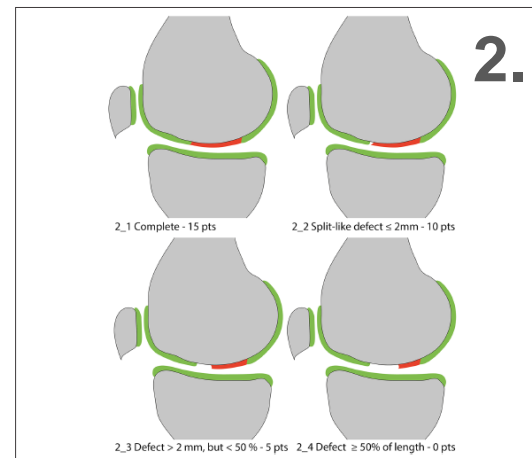
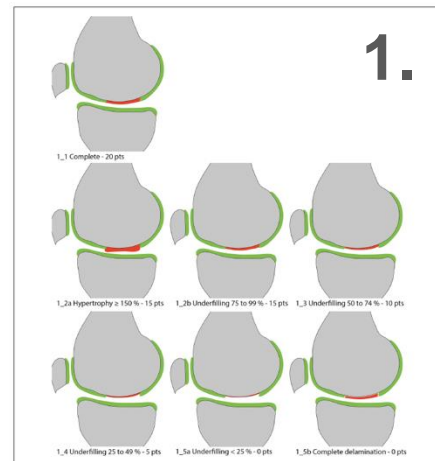
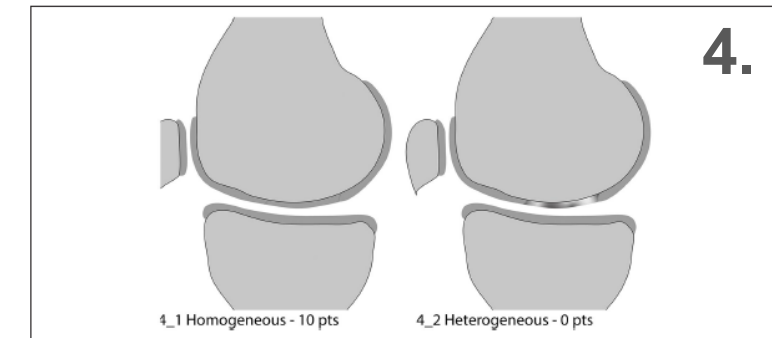
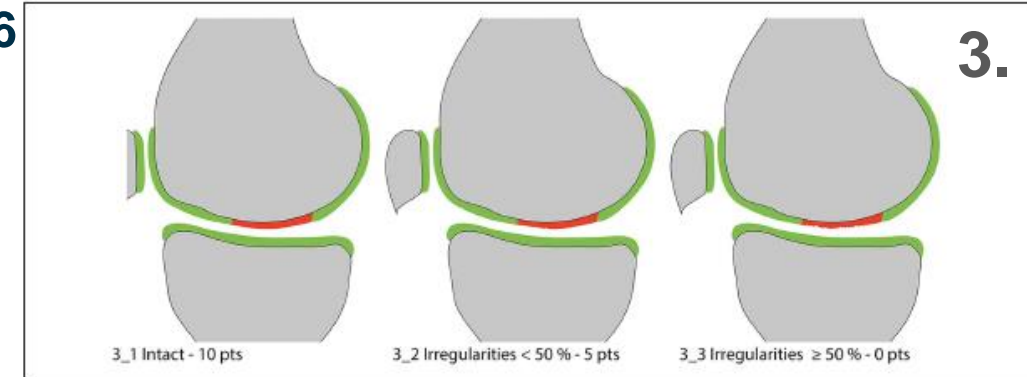
兵庫医科大学



MOCART 2.0 Score

✓ Consists of seven evaluation criteria⁶

1. Volume of cartilage
2. Integration into adjacent cartilage
3. Surface
4. Structure
5. Signal intensity
6. Bony defect or bony overgrowth
7. Subchondral changes



ISAKOS
CONGRESS
2025



MUNICH
GERMANY
June 8-11



兵庫医科大学



Demographic data / Pre-operative Clinical score

	AA group	KA group	P value
Age	59.7 ± 7.3	57.3 ± 3.9	0.37
Male / Female	7 / 4	5 / 2	n.a.
KOOS score	54.2 ± 14.1	47.6 ± 14.2	0.36
IKDC score	32.3 ± 16.5	35.6 ± 10.9	0.62
VAS (at rest)	40.1 ± 37.1	46.6 ± 19.3	0.63
VAS (during motion)	68.6 ± 28.3	77.1 ± 16.6	0.43



ISAKOS
CONGRESS
2025



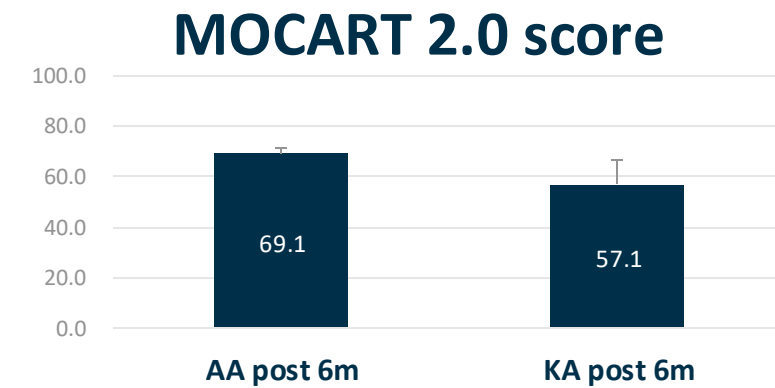
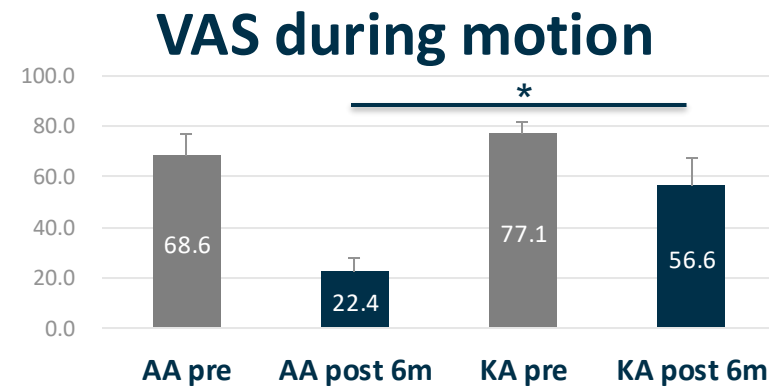
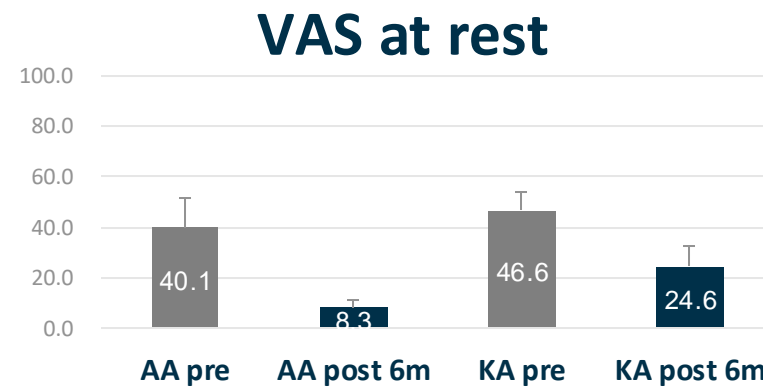
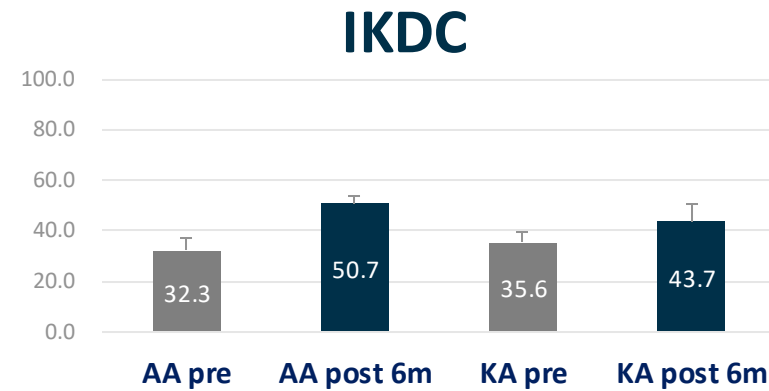
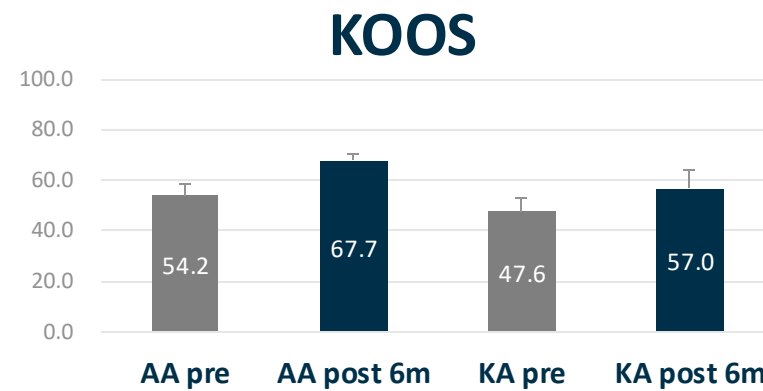
MUNICH
GERMANY
June 8-11



兵庫医科大学



Results [Clinical scores]



- ✓ Post-operative VAS during motion was significantly lower in the AA group.
- ✓ AA group tended to have higher scores in other clinical outcomes and MOCART 2.0 score, although not statistically significant.



ISAKOS
CONGRESS
2025



MUNICH
GERMANY
June 8-11



兵庫医科大学



Discussion

- **Evolution of Membrane Fixation Methods**
 - ✓ Initially, pull-out suture were utilized.^{7, 8}
→ Technically demanding.
 - ✓ Fixation using all-suture anchors has been reported⁴
→ Although the technique is simple, leakage of transplanted cells through the suture sites remains a concern.
 - ✓ The use of knotless suture anchors was employed to increase the contact area.⁵
- **Membrane fixation with Knotless suture anchor**
 - ✓ Its use in rotator cuff tears has been widely reported.
 - ✓ While some evidence indicates that bone tunnel enlargement may pose risks, its effect on clinical outcomes is still debated.^{9, 10}

There are still few reports regarding the knee joint



ISAKOS
CONGRESS
2025



MUNICH
GERMANY
June 8-11



兵庫医科大学



Discussion

- The relationship between the MOCART score and clinical outcomes
 - ✓ The correlation between the MOCART score and clinical outcomes remains inconclusive, as studies have reported conflicting results.^{11, 12}
- In this study...
 - ✓ We investigated postoperative clinical outcomes and MOCART scores in ACL procedures utilizing different suture devices.
 - ✓ Post-operative VAS during motion was significantly lower in the AA group.
 - ✓ AA group tended to have higher scores in other outcomes, although not statistically significant.

In middle-aged and older patients, considering factors such as bone fragility, it may be preferable to select devices with smaller anchor diameters.



ISAKOS
CONGRESS
2025



MUNICH
GERMANY
June 8-11



兵庫医科大学





Limitation

- ✓ **Small sample size.**
- ✓ **Short follow-up period.**
- ✓ **Assessment of bone fragility has not been conducted.**
- ✓ **Inter-rater variability has not been assessed.**

Conclusion

- ✓ **Postoperative VAS during motion was significantly lower in the all-suture anchor group.**
- ✓ **All-suture anchor group tended to have higher scores in other clinical outcomes and MOCART 2.0 score, although not statistically significant.**
- ✓ **In middle-aged and elderly patients with knee cartilage injuries, careful selection of suture devices is necessary.**



ISAKOS
CONGRESS
2025



MUNICH
GERMANY
June 8-11



兵庫医科大学



References

1. *Gooding CR et al. Knee 2006*
2. *Harris JD et al. Osteoarthritis and Cartilage 2011*
3. *Minas T et al. Orthop Relat Res. 2014*
4. *Kato Y et al. Regen Ther. 2019*
5. *Seki T et al. Cureus. 2024*
6. *Markus MS et al. Cartilage 2021*
7. *Ochi M et al. Artif Organs. 2001*
8. *Ochi M et al. J Bone Joint Surg Br. 2011*
9. *Pilge H et al. Arch Orthop Trauma Surg. 2012*
10. *Lee HY et al. Knee Surg Sports Traumatol Arthrosc. 2021*
11. *Migliorini F et al. J Orthop Traumatol. 2021*
12. *Windt S et al. Am J Sports Med. 2013*



ISAKOS
CONGRESS
2025



MUNICH
GERMANY
June 8-11



兵庫医科大学

