# Influence of tibial tuberosity movement direction on postoperative outcomes of combined Maquet procedure and autologous cartilage implantation for patellofemoral cartilage injury

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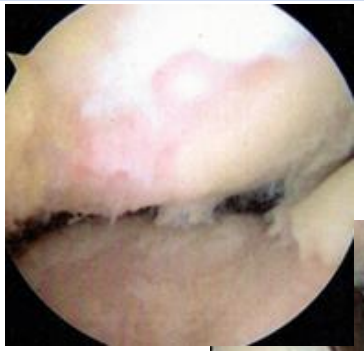
# COI Disclosure

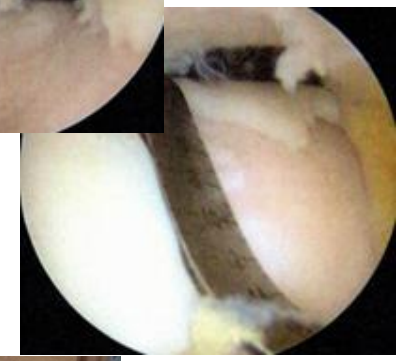
◎Junya Tsukisaka, Atsuo Nakamae, Akinori Nekomoto, Naofumi Hashiguchi, Shunya Tsuji, Koji Takeda, and Nobuo Adachi

There are no COI concerning this presentation.

# BACK GROUND

## Patellofemoral joint (PF) cartilage injury





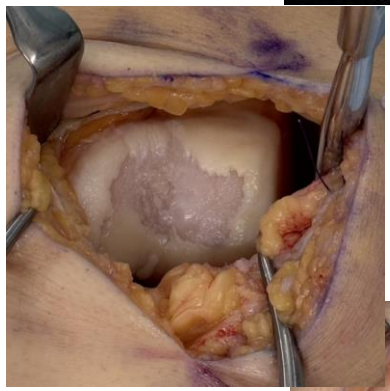
- ✓ The main focal chondral or osteochondral defect was found on the patella in 11% and trochlea in 6%

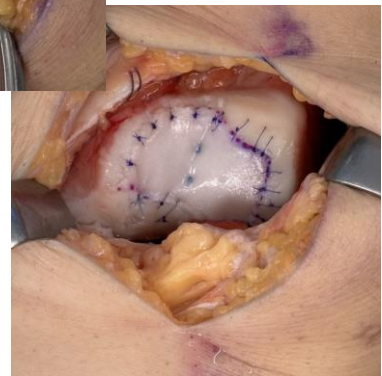
*Hjelle K, et al. Arthroscopy. 2002.*

- ✓ Patellar malalignment and instability is a very common cause for articular cartilage lesions in the patella and trochlea

*Sanders TL, et al. Am J Sports Med. 2017.*

## Autologous Cartilage Implantation (ACI)





- ✓ ACI represents a well-established surgical procedure for the treatment of knee-joint cartilage defects.

*Niemeyer P, et al. Am J Sports Med.2008.*

- ✓ The observed success rate for patellofemoral lesions is significantly lower (60% to 70%) than success rate for femoral condyle defects

*Minas T, et al. Clin Orthop Relat Res. 2005.*

# Distal realignment

## Tibia Tuberosity Osteotomy (TTO)

- ✓ Maquet procedure reduced PF joint pressure leads to good results

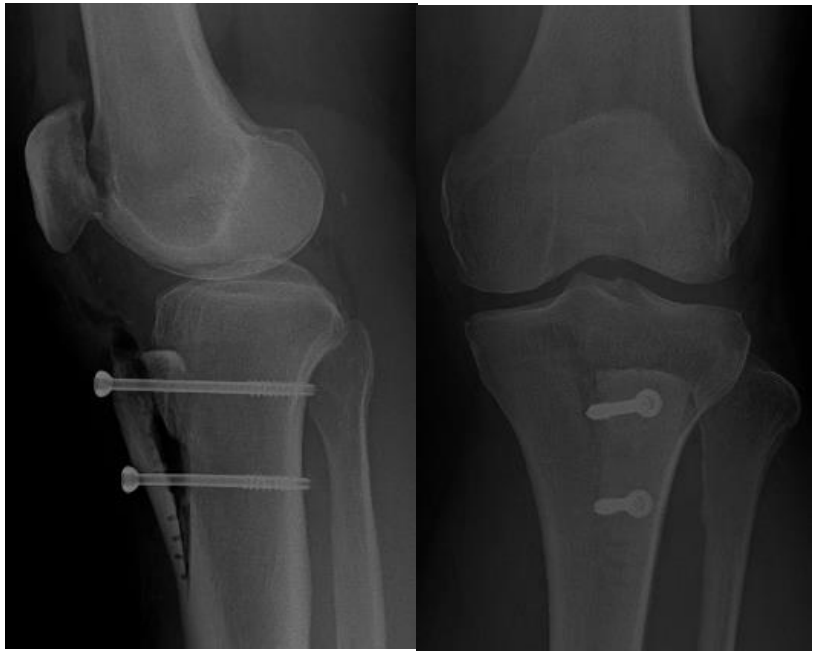
  *Maquet P. Berlin. Springer Vertag. 1984.*

- ✓ The optimum amount of elevation of the tibial tubercle is about one-half inch

  *Furgason AB, et al. J Bone Joint Surg. 1979.*

- ✓ Anteromedialization (AMZ) of the TT is appropriate for unloading the lateral trochlea
- ✓ AMZ may not benefit central chondral defects

  *P. R. Beck, et al. Am J Sports Med 2005.*



**Treatment of PF joints cartilage defects is**

**controversial**

# Purpose

**Influence of tibial tuberosity movement direction on postoperative outcomes of combined Maquet procedure and ACI for PF cartilage injury**

# Methods

- ✓ 9 patients ( 10 knees, male:7, female:3 ) From 2014 to 2022
- ✓ Maquet procedure and ACI for PF cartilage injury
- ✓ One-year follow-up after surgery
- ✓ 2 groups
  - Group L (TT-TG increased after surgery) 6knees
  - Group N(TT-TG unincreased after surgery) 4knees

# Patient Characteristics

| Preoperative | Group L | Group N | P value (< 0.05) |
|---|---|---|---|
| Age at surgery, y | 42.2±5.5 | 42.3±1.3 | 0.59 |
| Body mass index (kg/m²) | 23.5±3.3 | 22.0±1.8 | 0.59 |
| Defect size （mm²) | 499±56.8 | 592.5±352.5 | 0.39 |
| Lysholm score | 68.7±13.1 | 71.8±20.5 | 0.59 |
| IKDC score | 56.6±16.6 | 66.1±13.2 | 0.35 |
| KOOS (Symptom) | 76.8±12.5 | 83.0±17.0 | 0.52 |
| KOOS (Pain) | 74.5±13.9 | 81.3±12.5 | 0.46 |
| KOOS (ADL) | 88.7±7.0 | 88.6±9.3 | 0.98 |
| KOOS (Sports) | 51.7±13.3 | 65.0±9.1 | 0.12 |
| KOOS (QOL) | 41.7±17.1 | 51.6±15.6 | 0.38 |

Mann-Whitney U test

**There were no significant differences in patient character**

# Results

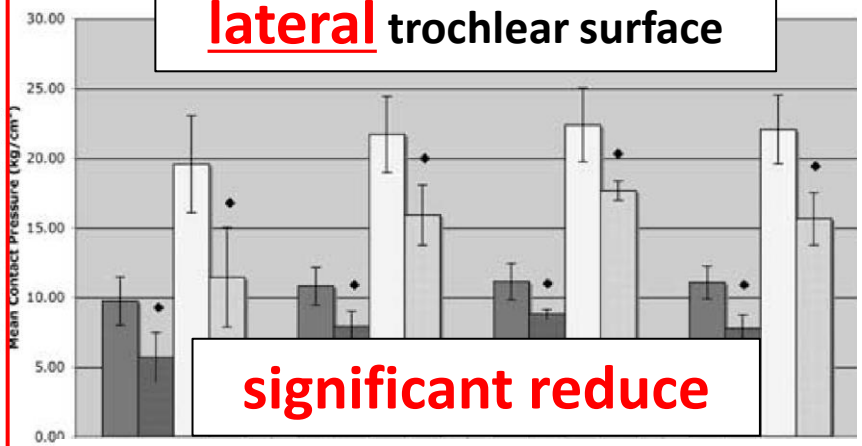
| Postoperative | Group L | Group N | P value (< 0.05) |
|---|---|---|---|
| TT elevation distance | 10.0±1.3 | 9.5±1.7 | 0.90 |
| Lysholm score | 68.7±13.1 | 71.8±20.5 | 0.24 |
| IKDC score | 51.1±6.4 | 68.7±3.3 | **0.01** |
| KOOS (Symptom) | 76.8±12.5 | 83.0±17.0 | 0.12 |
| KOOS (Pain) | 74.5±13.9 | 81.3±12.5 | 0.22 |
| KOOS (ADL) | 88.7±7.0 | 88.6±9.3 | 0.21 |
| KOOS (Sports) | 51.7±13.3 | 65.0±9.1 | 0.14 |
| KOOS (QOL) | 41.7±17.1 | 51.6±15.6 | 0.21 |

Mann-Whitney U test

**There were no significant differences in postoperative outcomes between 2 groups without IKDC score**

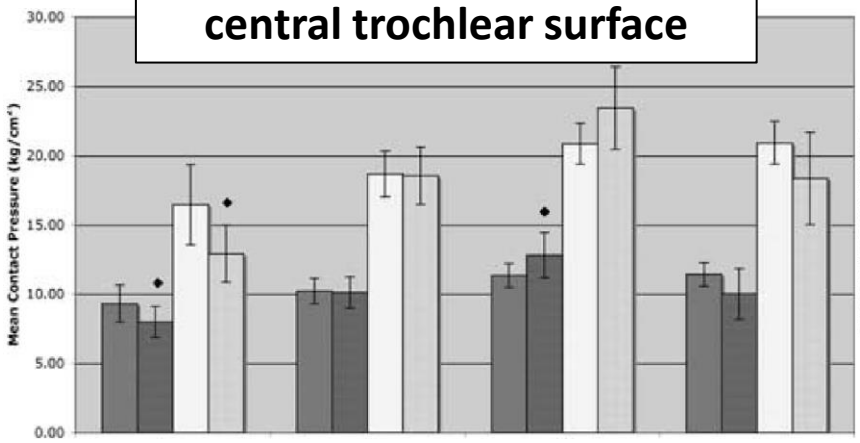
# Discussion anteromedialization

Mean change in pressure for **lateral** trochlear surface

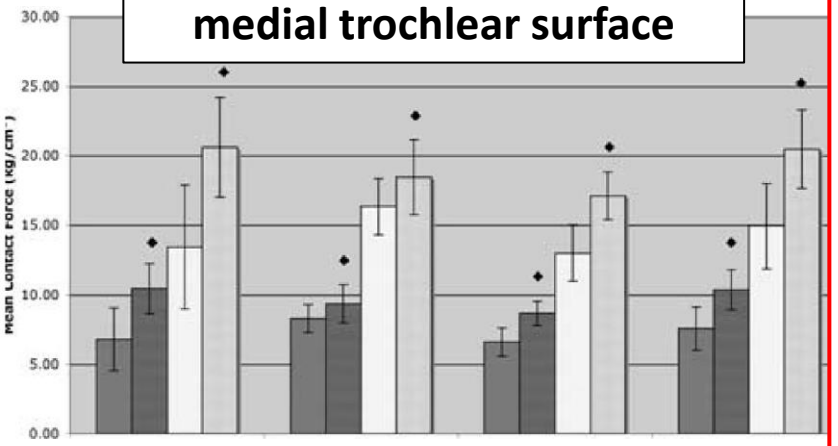



significant reduce

Mean change in pressure for central trochlear surface




Mean change in pressure for medial trochlear surface

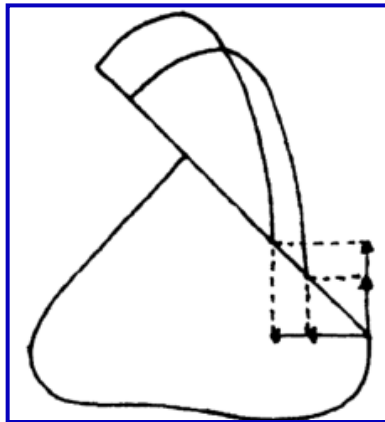



**Anteromedialization reduce the pressure for lateral trochlear surface**

*P. R. Beck, et al. Am J Sports Med 2005.*

**Good?**

**Not good?**



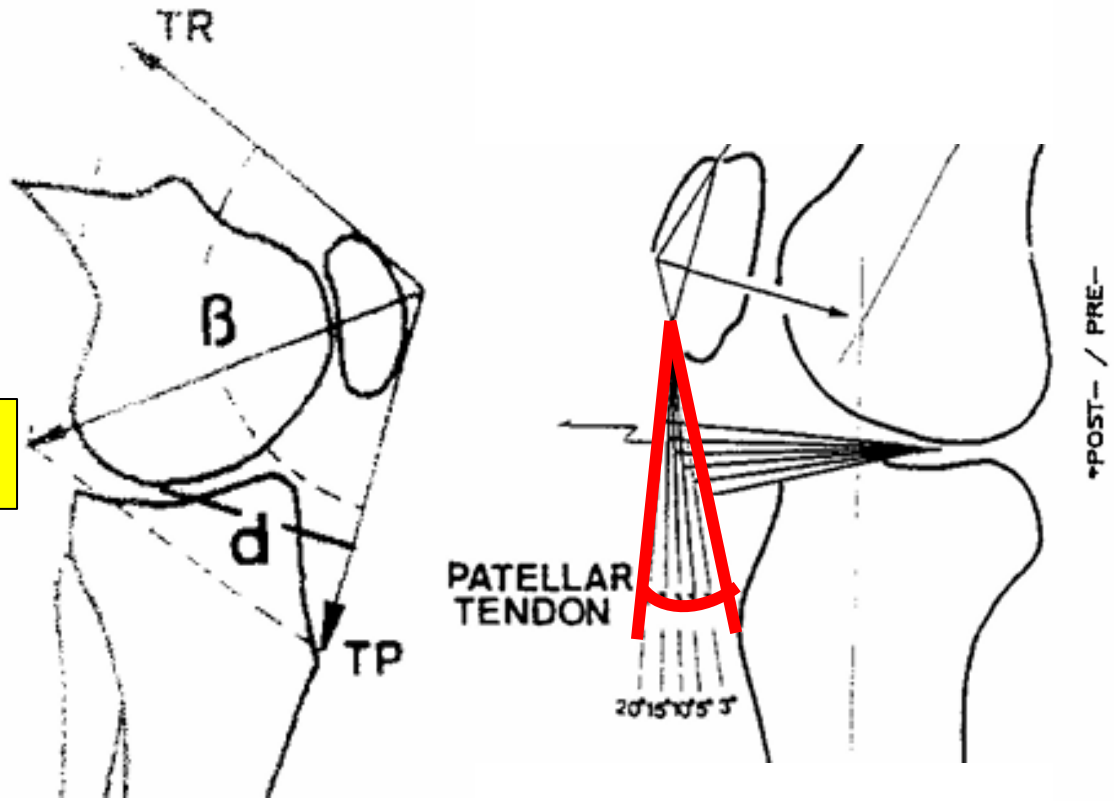
- ✓ Medialization or lateralization of TT may reduce the amount of anterolization of TT
- ✓ Long-term follow-up studies have noted degenerative joint disease as a sequela of distal and medial tibial tubercle transfer

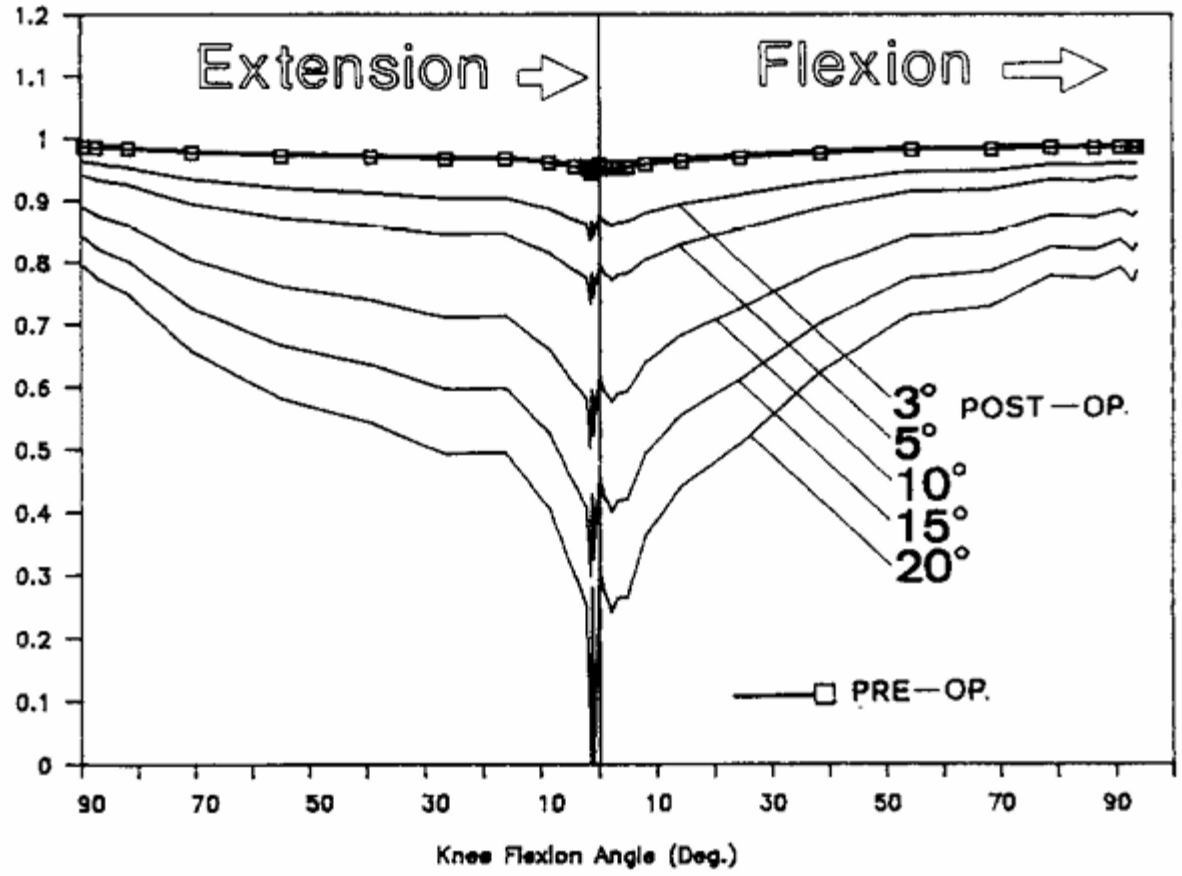
*W. J. Morshuis, et al. Clin Orthop Relat Res. 1990*

# Discussion　TT anterior advancement

**Reduction of patellofemoral joint contact force：PFJR**

**PFJR**



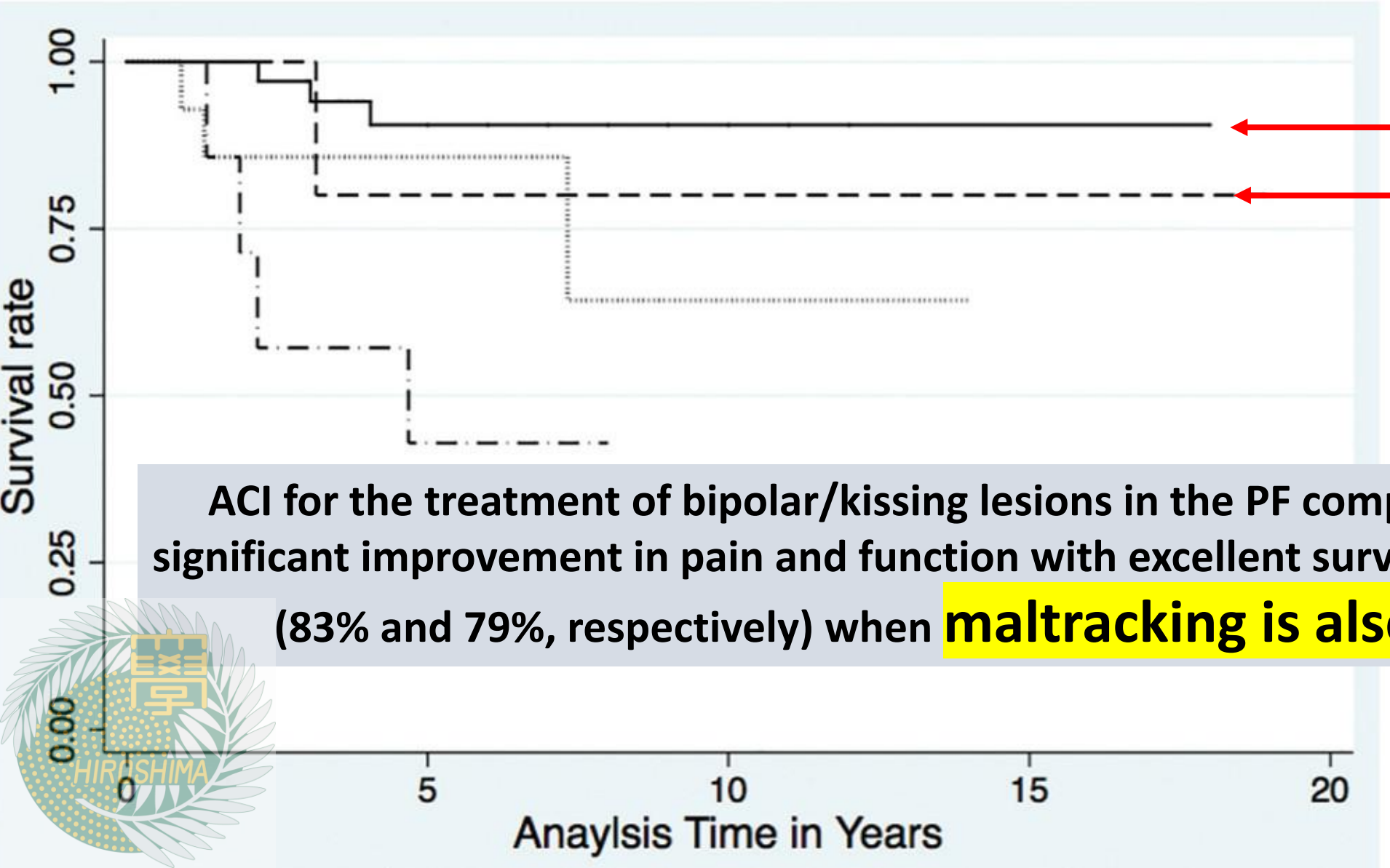




*Cheng-Kung Cheng, et al. Clin.Biomech. 1995.*

***Anterior advancement of TT improves maltracking and leads to PFJR.***

# Discussion

## TTO + ACI for PF cartilage injury ; long term outcomes




**ACI for the treatment of bipolar/kissing lesions in the PF compartment provides significant improvement in pain and function with excellent survival at 5 and 10 years (83% and 79%, respectively) when maltracking is also corrected**

*T Ogura, et al. Am J Sports Med. 2019.*

# Discussion

## TTO + ACI for PF cartilage injury ; long term outcomes

| Treatment Groups | Lysholm Score | | |
|---|---|---|---|
| | Preoperative | Follow-up | $P^b$ |
| Isolated femoral condyle (no OCD or ACL) | 60.1 (13) | 72.6 | .02 (2-sample *t* test)<br>.03 (paired *t* test) |
| Multiple lesions | 50.9 (8) | 67.7 | .05 (2-sample *t* test)<br>.15 (paired *t* test) |
| OCD | 56.2 (12) | 67.4 | .1 (2-sample *t* test)<br>.3 (paired *t* test) |
| Patellar lesions with realignment | 69 (6) | 66 | .8 (2-sample *t* test)<br>.3 (paired *t* test) |
| Femoral lesions with ACL reconstruction | 59.1 (16) | 69.2 | .05 (2-sample *t* test)<br>.1 (paired *t* test) |

| Treatment Groups | KOOS | | | | |
|---|---|---|---|---|---|
| | Pain | Symptoms | ADL | Sports | QOL |
| Isolated femoral condyle (no OCD or ACL) | 77.3 | 65 | 83.1 | 45.1 | 51 |
| Multiple lesions | 71.3 | 61.5 | 77.8 | 37.4 | 47.2 |
| OCD | 78 | 65.2 | 85.6 | 46.9 | 54.3 |
| Patellar lesions with realignment | 69.7 | 57.9 | 75 | 34.4 | 44.1 |
| Femoral lesions with ACL reconstruction | 72.8 | 67.5 | 81.3 | 41.1 | 48.2 |

***91.2% seem to benefit from the surgery for PF cartilage defect***

***(Benefit means they would have it again when they have the same symptom of the other side)***

*Peterson L, et al. Am J Sports Med. 2010.*

**Although there are no obvious significant differences in the score itself approximately 90% of patients were satisfied with the results**

# Conclusion

**There are no significant differences in postoperative clinic outcomes without IKDC between the tibial tuberosity lateralization group and not tibial tuberosity lateralization group in Maquet procedure with ACI for PF cartilage injury**