

Utility of arthroscopic measurements during patellofemoral instability surgery

Miho J. Tanaka, MD, PhD
Maria V. Velasquez Hammerle, MD
Reinoud Brower, MD
Hugo van der Veen, MD, PhD

Disclosures

Tanaka

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Background

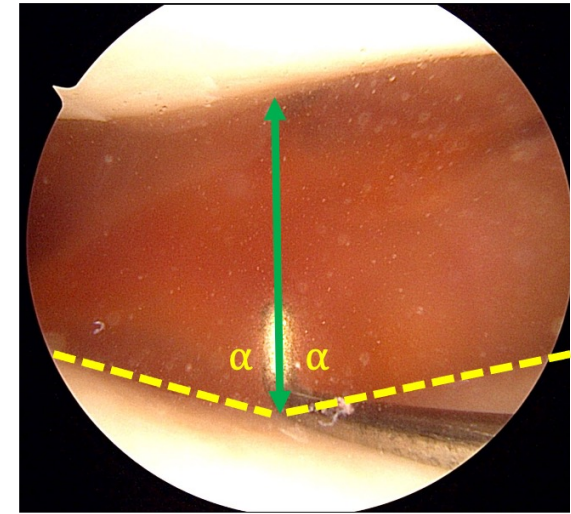
- One of the primary challenges of medial patellofemoral complex (MPFC) reconstruction is creating optimal tension in the graft (1)
- Abnormal graft length can lead to recurrence or graft failure, medial patellar instability, increased patellofemoral contact pressures, or loss of range of motion.(2-5)
- Currently there is no method allowing for intraoperative evaluation of MPFC function. (6)
- We previously demonstrated in a cadaveric model that arthroscopic measurements of patellar position can accurately assess the status of the MPFC, with the following cutoff values indicating MPFC insufficiency: (7)
 - >7mm of lateral patellar overhang over the lateral border of the lateral femoral condyle at 20-30° knee flexion
 - >6mm of patellotrochlear distance at 10-20° knee flexion

Objective

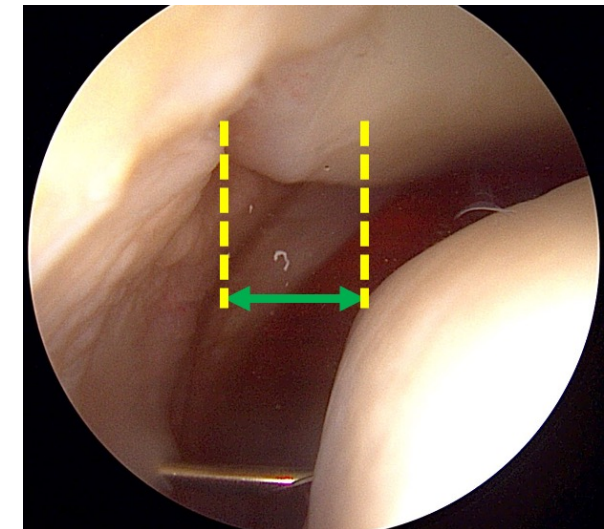
- To identify the role of arthroscopic measurements of patellar position in a clinical series and describe the relationship of arthroscopic measurements to clinical and morphologic risk factors for patellar instability

Methods

- Patients who were undergoing surgical stabilization for patellar instability included
 - Arthroscopy was performed through a standard anterolateral portal using a 30° arthroscope, with the pump pressure set at 40 mmHg
 - Patellotrochlear distance was measured as previously described, as the distance between the patella and trochlea at 20° knee flexion as a measure of engagement
 - Lateral overhang was measured as the length of the patella (in mm) overhanging the lateral border of the lateral femoral condyle



Patellotrochlear distance

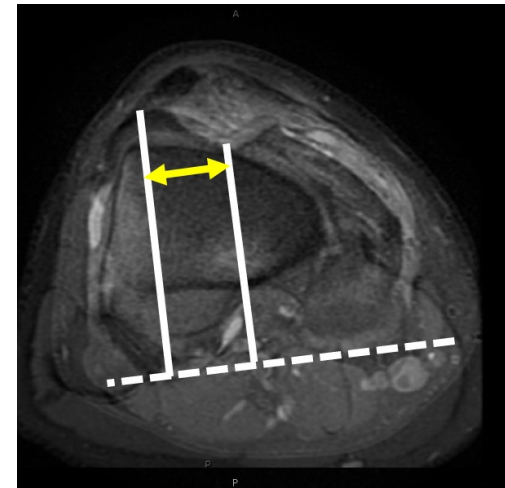


Lateral overhang

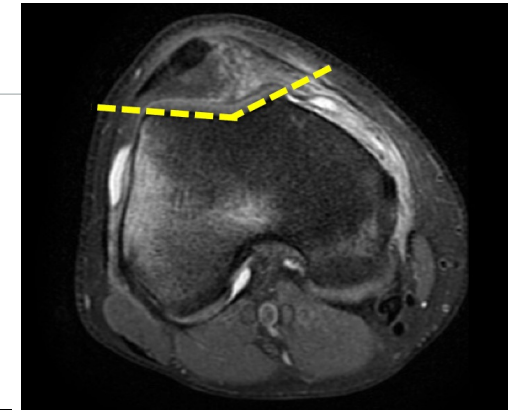
Methods

■ The following additional patient data was collected:

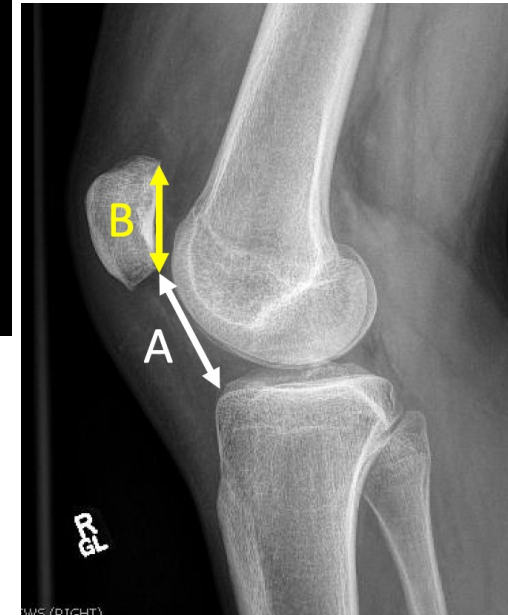
- Sex
- Height
- Weight
- Age
- Beighton score
- TTTG distance
- Bony sulcus angle
- Caton Deschamps Index



TTTG Distance



Bony sulcus angle



CDI= B/A

Methods

- Measurements were compared between pre and postoperative states
- Linear regression analysis was performed to determine the relationship between measurements and clinical and radiographic risk factors
- Stepwise multiple regression analysis was performed to assess for relationships between preoperative arthroscopic measurements and demographic and clinical factors
- Receiver operating characteristic (ROC) curve analysis was performed
- Youden's J statistic was calculated for each sensitivity/specificity pair ($J = \text{sensitivity} + \text{specificity} - 1$) to determine the optimal cutoff values to distinguish between symptomatic vs MPFC-reconstructed states

Results

- 15 knees from 15 patients were included in this pilot study (8 male, 7 female).
- Demographic and clinical data of the study group is listed in Table 1.
- All patients underwent MPFC reconstruction
 - 4 patients underwent additional anteromedializing tibial tubercle osteotomy (3 male, 1 female)
 - 1 patient (male) underwent concurrent MCL reconstruction

	Total (N=15)	Male (N=8)	Female (N=7)
Age	24+/-9	20+/-5	28+/-11
Height	173.1+/-11.2	180.5+/-9.6	164.7+/-5.4
Weight	79.8+/-27.2	92.5+/-30.8	65.2+/-12.5
# Dislocations	3.4+/-7.1	2.6+/-1.8	10.8+/-8.4
KOOS Global	57.3+/-19.0	55.0+/-18.5	60.5+/-23.5
PROMIS PF	49.5+/-7.8	47.4+/-2.6	52.4+/-11.7
TTTG Distance	18.5+/-4.1	19.6+/-4.8	17.3+/-3.3
Sulcus Angle	149.5+/-16.2	147.8+/-17.7	151.2+/-15.7
CDI	1.1+/-0.1	1.1+/-0.1	1.2+/-1.1
Beighton Score	3.5+/-2.8	1.5+/-1.4	5.3+/-2.4

Table 1 demonstrates demographic and clinical data of the study group.

Results

- Patellotrochlear distance decreased from 12.4+/-3.8mm to 4.7+/-1.5mm postoperatively (p<0.001) (Figure 3a, 3b)
- Lateral overhang measurements decreased from 10.8+/-4.7mm to 7.5+/-1.7mm (p=0.029) (Figure 4a, 4b)

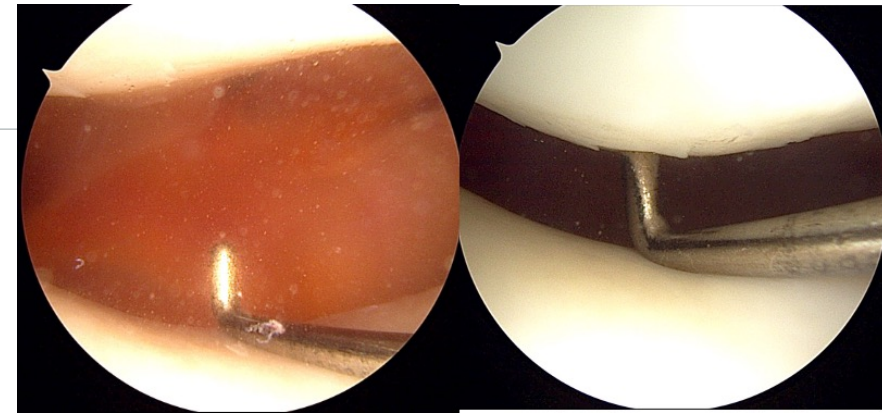


Figure 3a and 3b show changes in patellotrochlear distance from the preoperative (3a) state and the postoperative (3b) state.

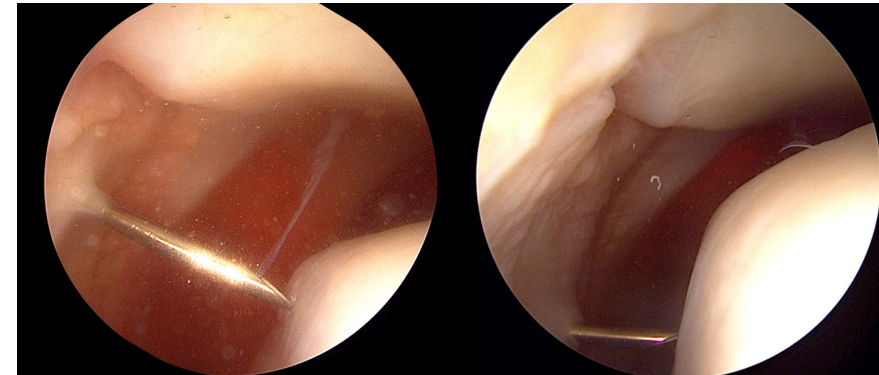


Figure 4a and 4b show changes in lateral overhang distance from the preoperative (4a) state and

	PTD preop	PTD postop	Significance	LO Preop	LO Postop	Significance
Total (N=15)	12.4+/-3.8	4.7+/-1.5	<0.001	10.8+/-4.7	7.5+/-1.7	0.029
Male (N=8)	12.1+/-4.3	5.1+/-1.2	0.004	11.6+/-6.0	7.8+/-1.5	0.122
Female (N=7)	12.7+/-3.5	4.1+/-1.7	<0.001	10.0+/-3.2	7.2+/-2.1	0.114

Results

- Stepwise multiple regression analysis demonstrated a moderate relationship between patellochlear distance and sulcus angle ($r=0.67$, $R^2=0.45$, $p=0.008$)
- For lateral overhang, stepwise multiple regression analysis demonstrated an independent relationship with TTTG distance and # of dislocations ($R=0.72$, $R^2=0.51$, $p=0.019$).
- Area under the curve (AUC) calculations
 - Patellochlear distance $>6\text{mm}$ indicated an unstable knee with an AUC of 1.0 (Figure 5a).
 - Sensitivity was 100%, specificity 92.6%, PPV 93.8%, NPV 100%.
 - Lateral overhang, a measurement $>10\text{mm}$ indicated patellar instability with AUC 0.82
 - Sensitivity was 100%, specificity 53.3%, PPV 100% and NPV 63.1%. (Figure 5b)

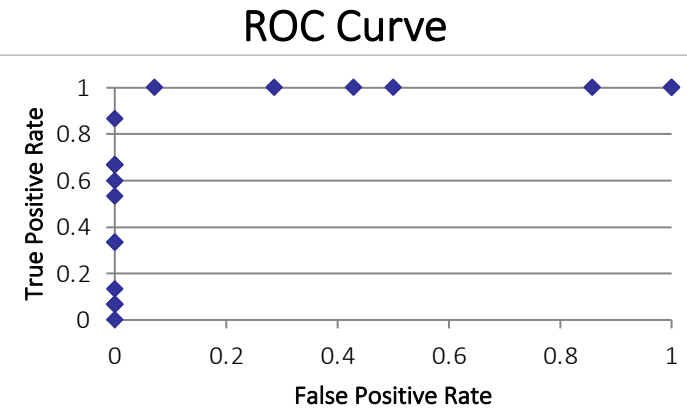


Figure 5a) ROC curve analysis of patellochlear measurements demonstrates AUC of 1.0, with patellochlear distance $>6\text{mm}$ indicating patellar instability.

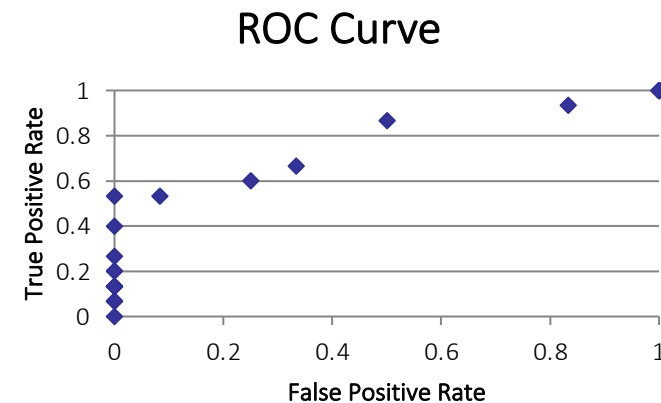


Figure 5b) ROC curve analysis of lateral overhang measurements demonstrates AUC of 0.82, with lateral overhang $>10\text{mm}$ indicating patellar instability.

Conclusions

- Utilizing previously described arthroscopic measurement techniques, this clinical pilot study demonstrated that both patellotrochlear distance and lateral overhang could differentiate between knees before and after patellar stabilization surgery
- Patellotrochlear distance measurements were found to correlate with sulcus angle, while lateral overhang correlated with TTTG distance
- Further studies with a larger series and correlating patient outcomes will help identify the optimal thresholds that can be used during intraoperative assessment during patellar stabilization surgery

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