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Three-dimensional CT bone model improves interobserver reliability of trochlea dysplasia using the Dejour classification in patients with patellar dislocation

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COI Disclosure Information

Presenter：Rika Shigemoto

I have no financial relationships to disclose.

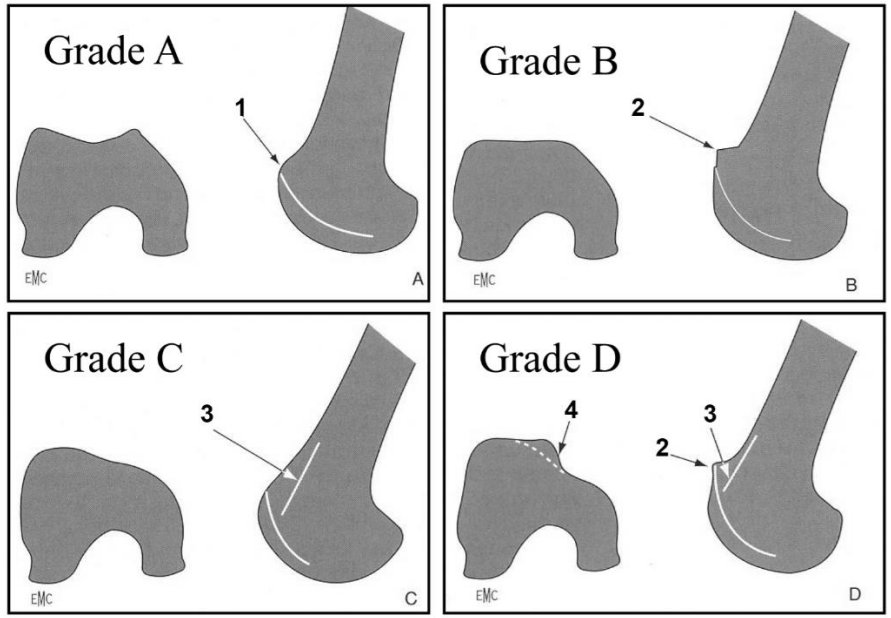
Background

Femoral trochlear dysplasia

- One of the key risk factors of patellar dislocation[1, 2]
- Dejour classification is commonly used for morphological assessment of trochlear dysplasia[3]

Dejour classification

- Interobserver reliability is not high[4, 5]



Purpose

To investigate the effect of high-resolution 3D-CT bone model on the interobserver reliability of the Dejour classification

Hypothesis

Interobserver reliability of Dejour classification would be higher when using 3D-CT bone model than using only a plain radiograph

Patients

Patients who underwent surgical treatment for patellar dislocation (2018/8 - 2022/10)

30 patients 30 knees
(24.6 years, M/F 9/21)

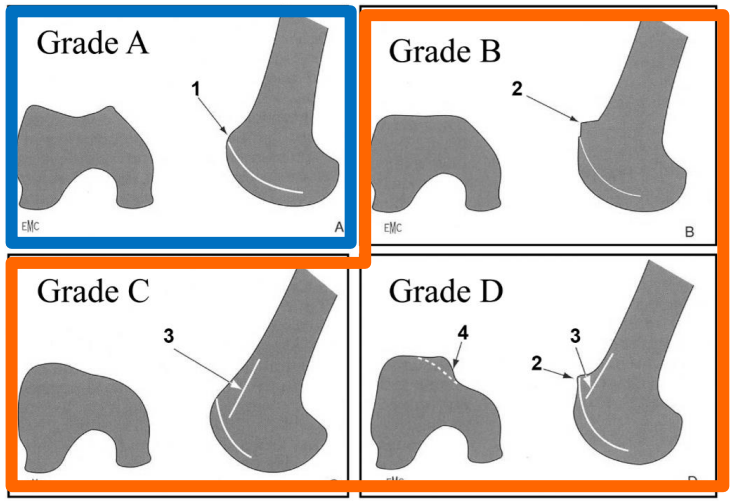
Exclusion criteria
- Incomplete plain lateral radiographs or CT images
- Plain lateral radiographs showing misalignment between the medial and lateral femoral posterior condyles : >5mm

Methods

- **Four** orthopedic surgeons classified the cases into four groups (A, B, C, D) according to the Dejour classification three times
- In addition, Dejour classification was simplified into **two grades** for evaluation[6, 7]: **"mild" (Grade A)** and **"severe" (Grade B-D)**

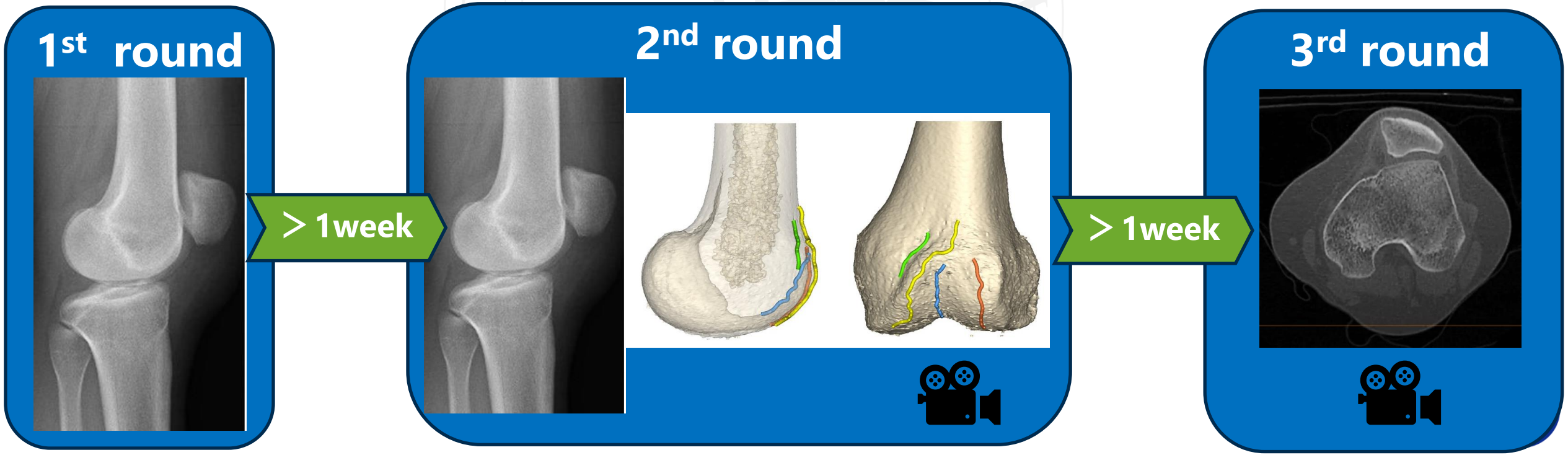
Statistical Analysis

- Interobserver reliability was assessed using Fleiss' kappa



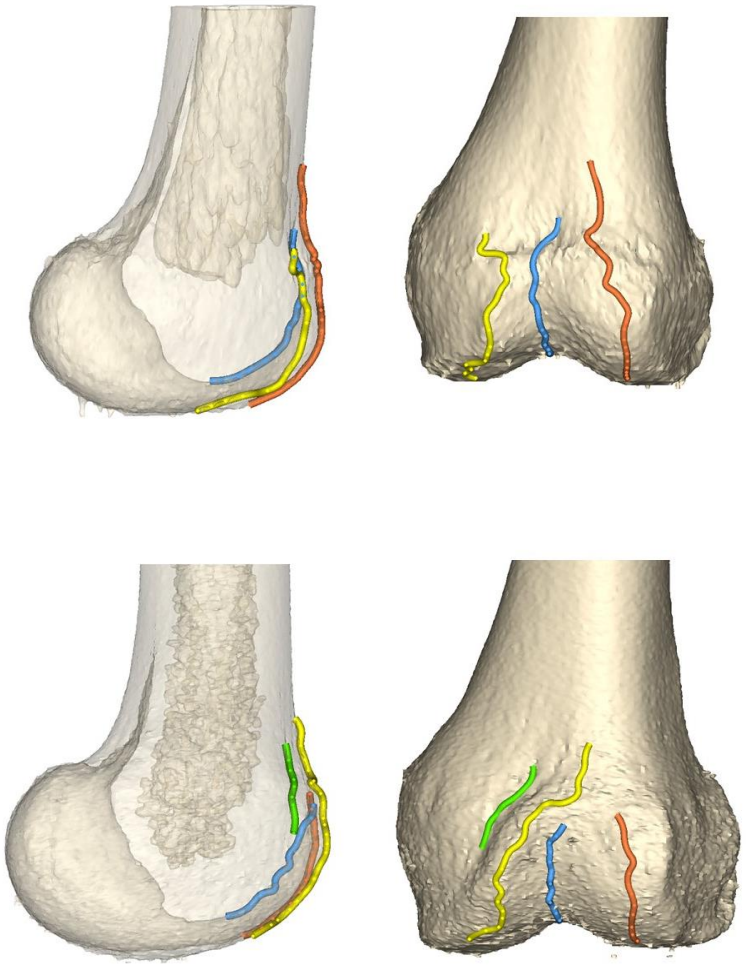
- 4 grade (A-D)
- 2 grade (**A**, **B-D**)

- **The first round** was based **solely on plain lateral radiographs**
- **The second round** was using **additional videos** that allowed for observation from all directions by rotating the **3D-CT model**
- **The third round** was using **only axial CT images** that allowed observation of all slices of the femoral trochlea
- All evaluations were performed by all orthopedic surgeons with at least one week between each evaluation



3D-CT modeling

- 3D distal femur model was created by using preop CT with a slice thickness of 0.5 mm
- The **highest points** of the **medial** and **lateral** articular surfaces of the **femoral trochlea**, as well as the **lowest point of the trochlear groove** relative to the posterior femoral condylar axis, were marked every 2-3 slices using **axial images**
- If there was a **lowest point in the anterior part of the distal femur other than the trochlear groove**, these points were also marked



Results

Interobserver scores for the Dejour Classification

Round	4-grade Kappa (agreement)	p-value	2-grade Kappa (agreement)	p-value
First	0.37 (fair)	<0.0001	0.31 (fair)	<0.005
Second	0.52 (moderate)	<0.0001	0.65 (substantial)	<0.0001
Third	0.37 (fair)	<0.0001	0.57 (moderate)	<0.0001

The categorization of Fleiss' kappa (0- 0.20, slight agreement; 0.21-0.40, fair; 0.41-0.60, moderate; 0.61-0.80, substantial; and 0.81-1.00, almost perfect)

Discussion

- **3D-CT bone model** improved interobserver reliability of the Dejour classification compared to the assessment using only plain radiograph or CT scan

- Because mild/severe assessment was changed in one-third of the cases, there is a possibility that the evaluation may be either overestimated or underestimated based solely on plain lateral radiographs

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Comparison with previous reports

Author	Journal & year	Image modality	Interobserver reliability
Moushinho et al.	Rev Bras Orthop, 2019	Xp	0.5
		Xp & CT	0.89
Fuchs et al.	KSSTA, 2022	MRI axial	0.48
		3D MRI	0.53
Yang et al.	KSSTA, 2023	CT axial	0.33 - 0.51
Martinez-Cano et al.	KSSTA, 2024	Xp	0.2
		MRI	0.13
		Xp & MRI	0.44
The present study		Xp	0.4
		Xp & 3D-CT	0.51

Interobserver reliability improved with evaluation using multiple images

Conclusion

3D-CT bone model of distal femur with marked bony landmarks appears to improve interobserver reliability of the Dejour classification compared to the assessment using only plain radiographs, suggesting the usefulness of 3D-CT model in evaluating trochlear dysplasia

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