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Are femoral condyle volumes associated with the injury of the meniscus?

A 3D evaluation in a large cohort study of ACL-injured patients

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UNIVERSITÀ
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Faculty Disclosure Information

- Nothing to disclosure



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Context: Meniscal tears

- Meniscal tears occur in ~55–65% of ACL injuries
- Knee **morphology** has been studied as a risk factor for **ACL injuries**. **Few studies** have investigated anatomical risk factors for **meniscal tears**
- Previous research mostly based on **2D parameters**, with inherent limitations compared to 3D models

Research question: Are femoral condyle volumes associated with the injury of the meniscus?

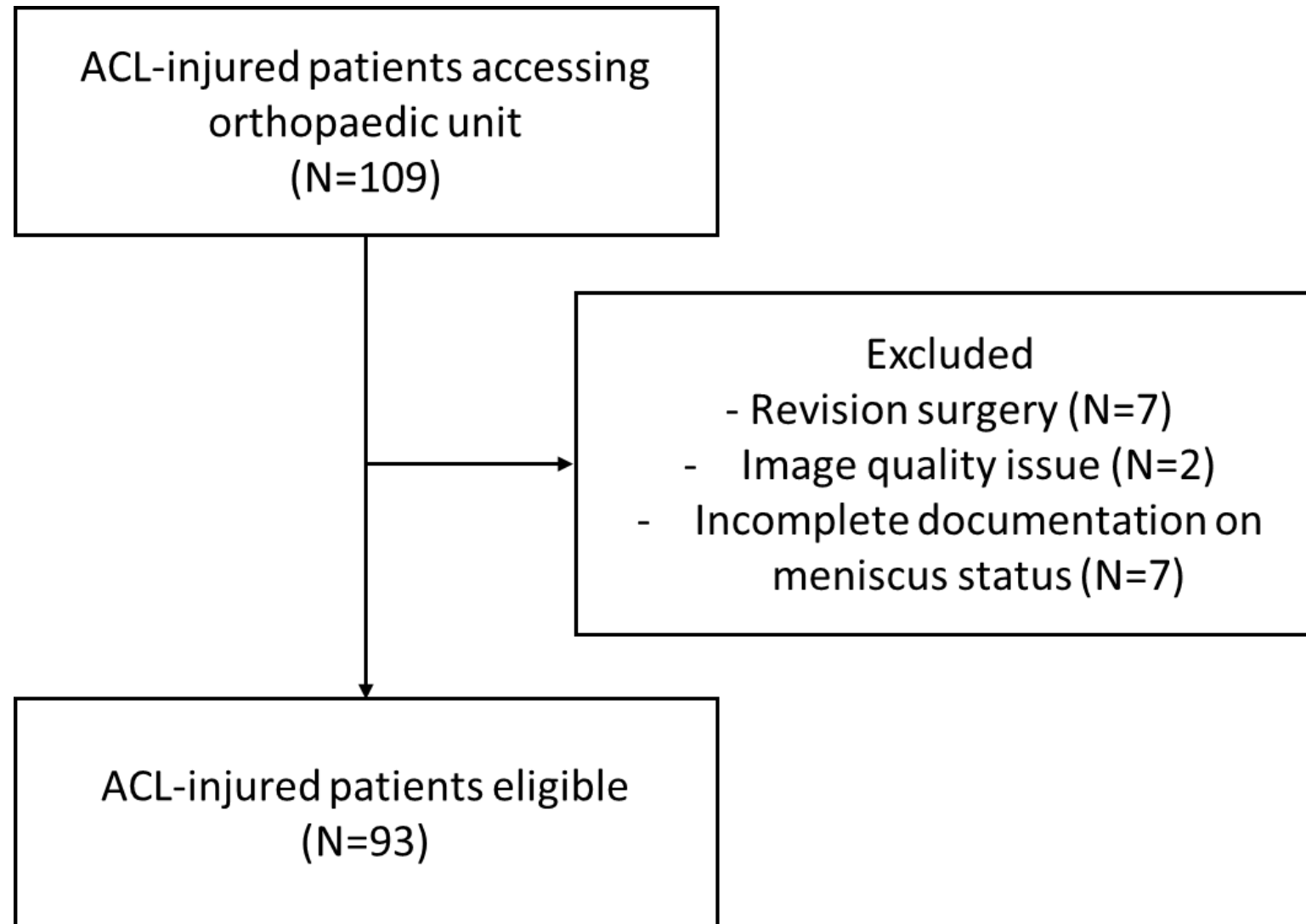


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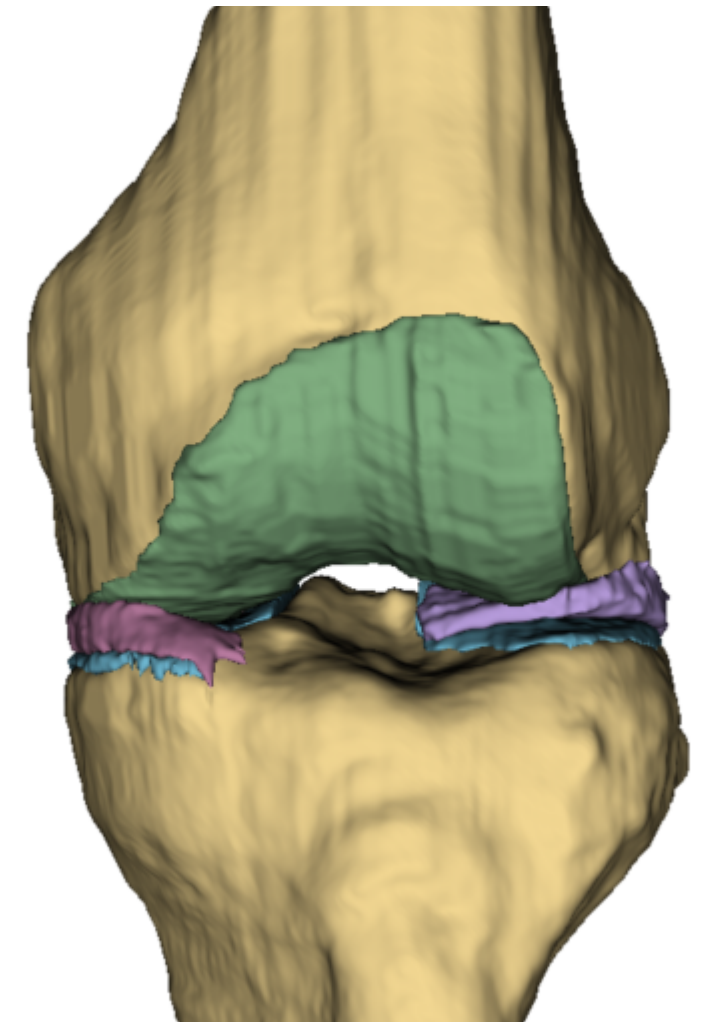
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Methods: Subject selection



Methods: 3D models reconstruction

- **MR images** acquired with PDW protocol
 - slice thickness: 0.55 mm
- **Deep learning** algorithms enabled fast and accurate 3D reconstruction



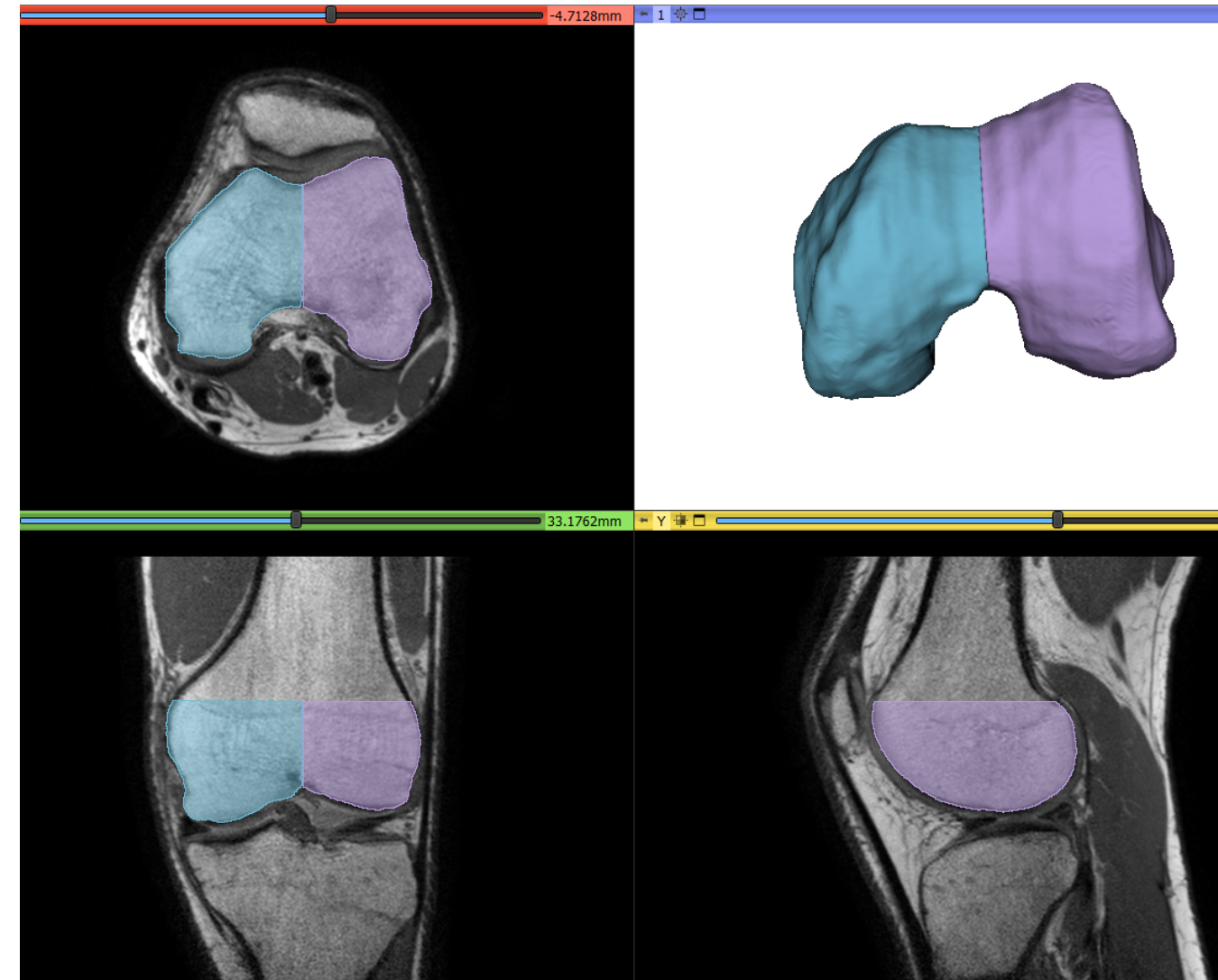
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Methods: Volume measurements

- 3D modeling techniques to measure **medial and lateral femoral condyle volumes**
 - Reference planes to delimit the region of interest
 - Reference points indicated by Voss et al.
- **Statistical tests** to compare the volumes of patients with and without meniscal lesions



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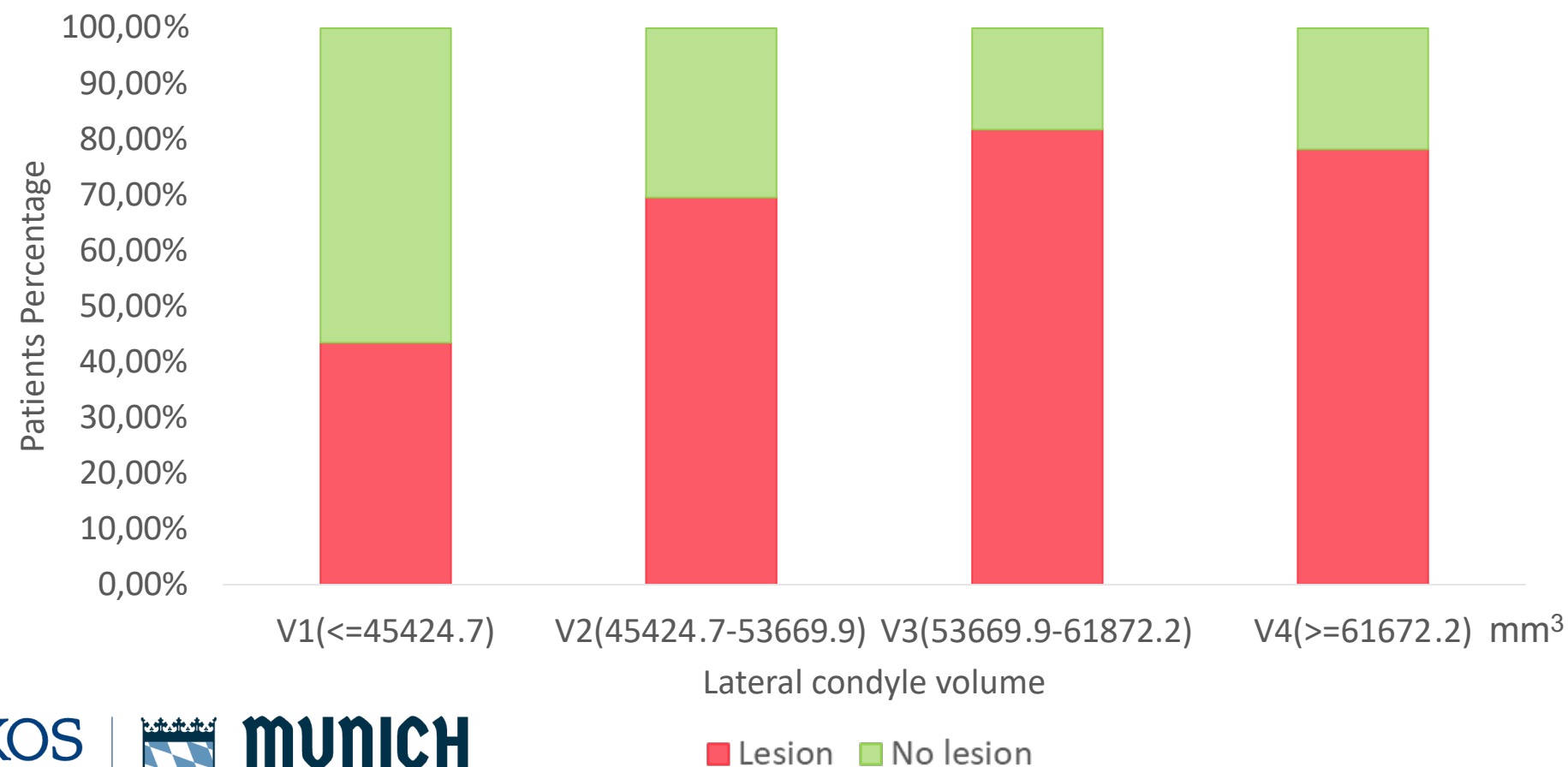
Results

In patients with meniscal lesions, the volumes of the lateral and medial femoral condyles were **statistically significantly different** from those of patients without meniscal lesions

	Meniscal Injury	No Meniscal Injury	p-value
Lateral condyle volume [cm ³]	56.185 ± 12.123	48.625 ± 11.113	0.006
Medial condyle volume [cm ³]	59.268 ± 11.253	50.291 ± 10.666	<0.001

Results: Lateral condyle volume

Patients with **meniscal injuries** have **higher femoral condyle volumes** compared to the patients without concomitant meniscal lesions



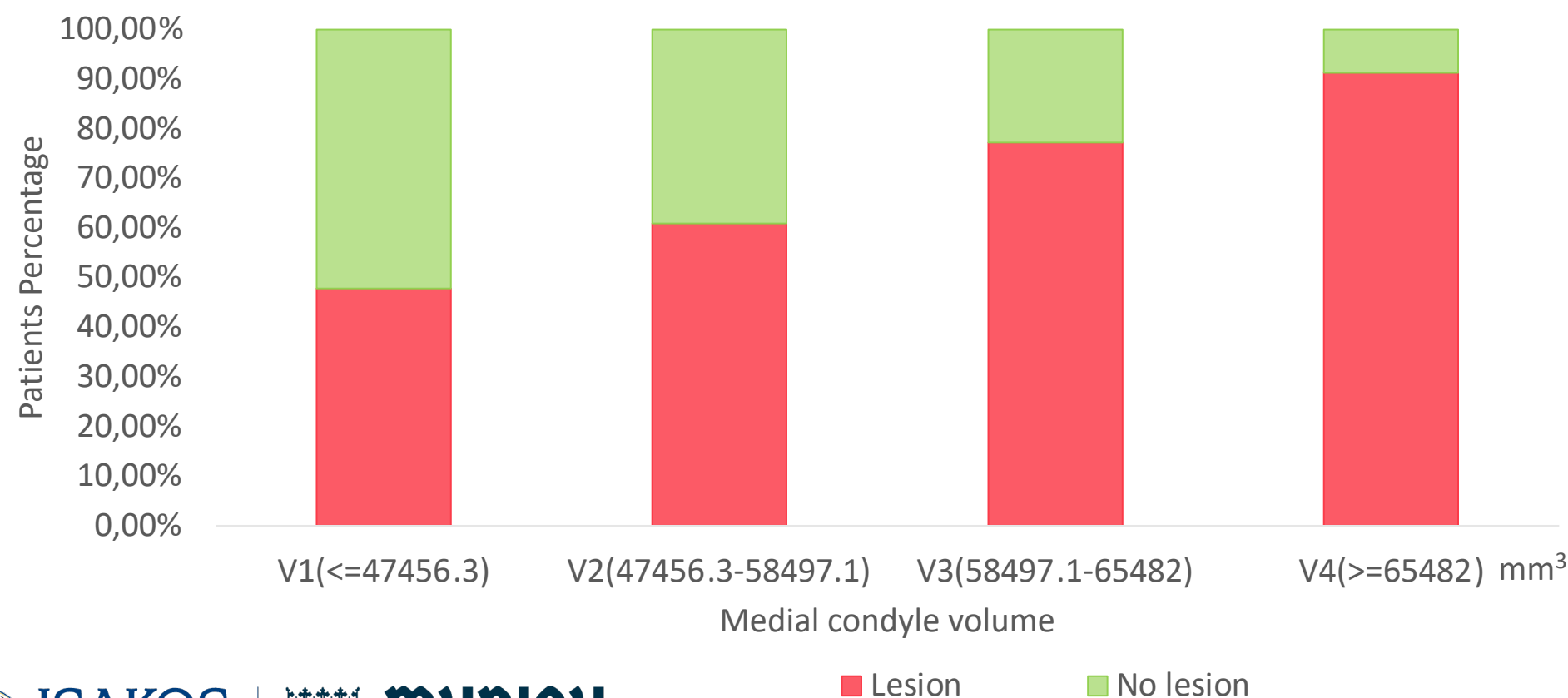
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Results: Medial condyle volume

Patients with meniscal injuries have **higher femoral condyle volumes** compared to the patients without concomitant meniscal lesions



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■ Lesion

■ No lesion



Conclusions

- First study using 3D modeling to assess condylar volume impact on meniscal injuries in ACL-deficient knees
- Femoral anatomy may influence risk of meniscal tears
- Condyle volumes potentially associated with type and presence of meniscal injury
- Findings support development of personalized prevention and treatment strategies



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