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Figure. Sup1. The size correlation measurements of human and rabbit femurs. (A) Human femur length measurements. (B) Rabbit femur length measurements. (C) Transverse diameter and the cortical bone thickness of human femur. (D) Transverse diameter and the cortical bone thickness of rabbit femur.
The human femur length was obtained from the fractured femur, the transverse diameter and the cortical bone thickness were obtained from the finite element model.

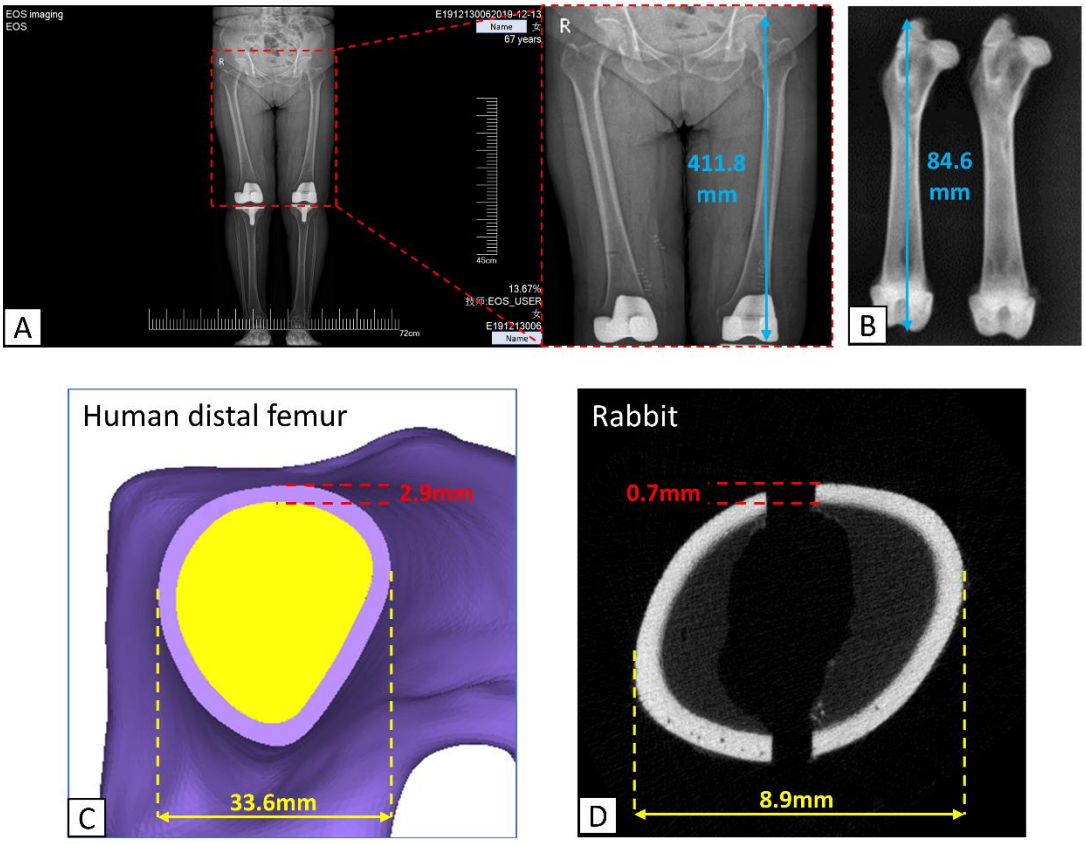

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Figure. Sup2. Embedding of proximal and distal femurs as pretreatment for torsional and axial compression test. (A) Alignment guiding device with inner diameter of 3.2mm. (B) Plastic embedding apparatus that match alignment guiding device in size. (C, D) Photographs of embedding process and samples after that.

Embedding methods. Both ends of the femurs were inserted into a plastic embedding apparatus (external diameter 32 mm, internal diameter 30 mm, depth 15 mm) using polymethylmethacrylate (PMMA). The potting was standardized with specially designed and processed alignment guiding tubes with an inner diameter of 32 mm (Fig. Sup2A, B). This guide device exposed the entire femoral shaft and ensured that both cylinders were aligned on the same central axis as the femur (Fig. Sup2C, D).

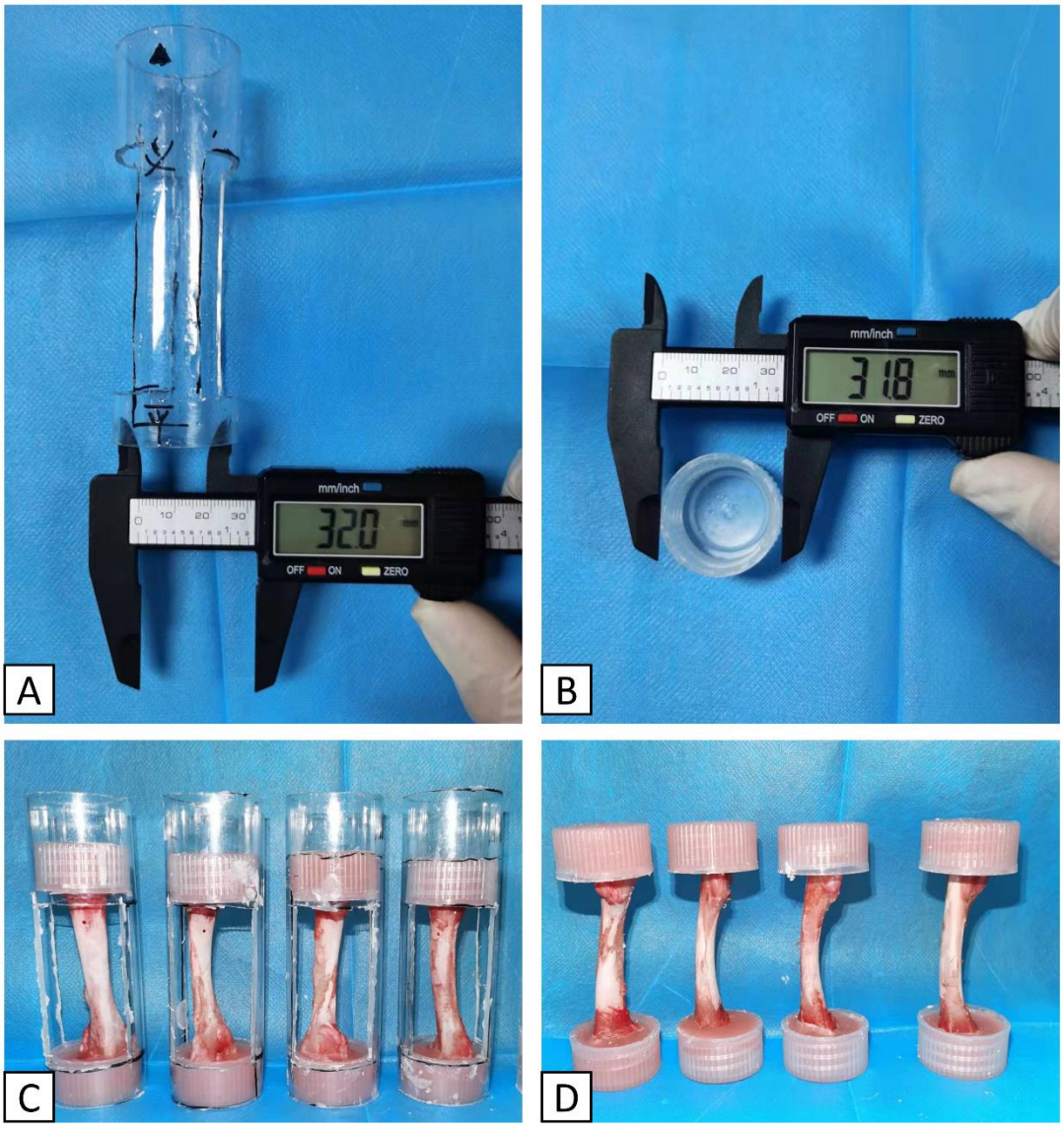

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Figure. Sup3. Drilling simulation for each group showing the direction and the eccentricity of pin tract.

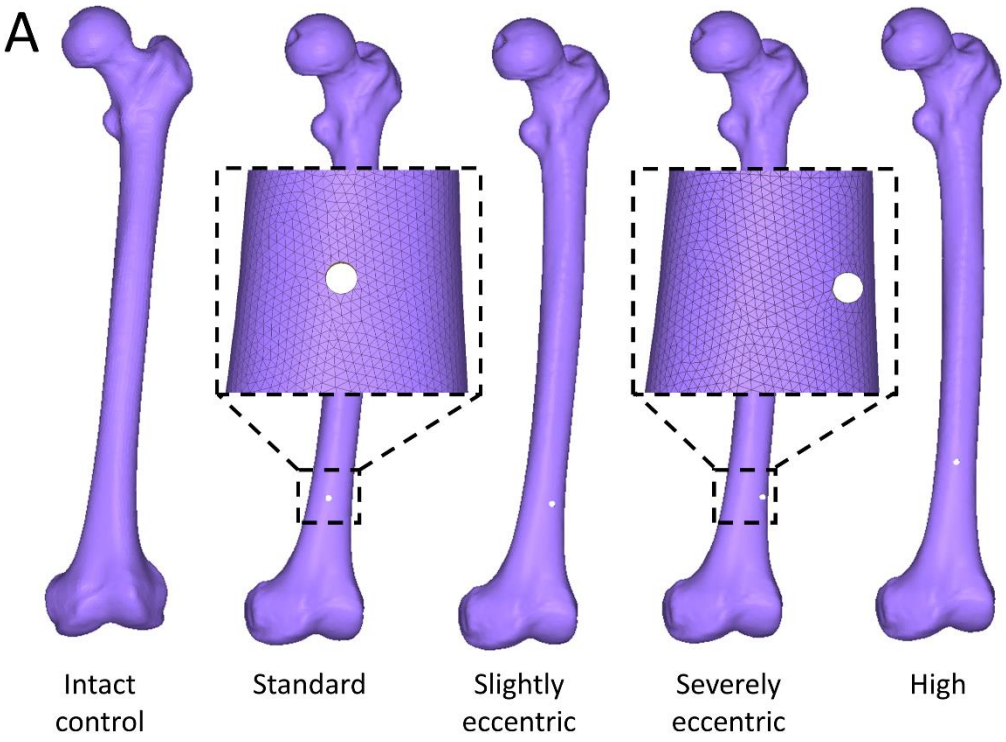

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Figure. Sup4. The von Mises stress distribution of additional torsion and compression analysis. (A, B) The von Mises stress distribution of torsion analysis. (C, D) The von Mises stress distribution of compression analysis.

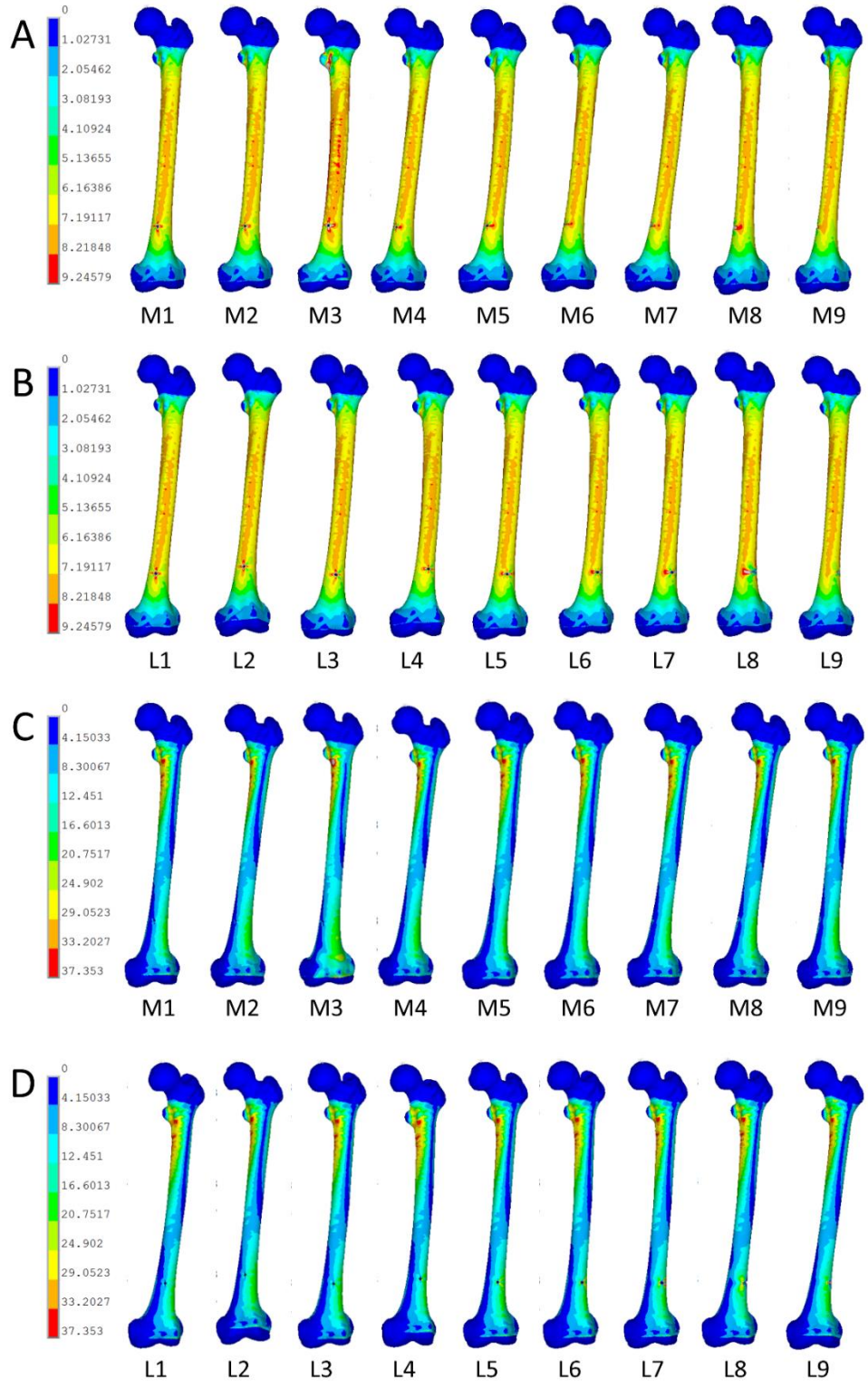

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Table. Sup1. Size correlation of human and rabbit femur drilling

	drilling diameter (mm)	femoral transverse diameter (mm)	drilling diameter/ femoral transverse diameter (%)	cortical bone thickness (mm)	drilling diameter/ cortical bone thickness	femur length (mm)	drilling diameter/ femur length (%)
human	4.5	33.6	13.39	2.9	1.55	411.8	1.09
rabbit	1.2	8.9	13.48	0.7	1.71	84.6	1.42
ratio	3.75	3.77	**0.99**	4.1	**0.90**	4.87	**0.76**