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Navigation and Surgical Guides to Measure the Patient 3D Printed for Unicortical Resection of Metaphyseal Tumors of Distal Femur. Cadaveric Validation Study

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Background: Surgical navigation has notably improved the accuracy and quality of orthopedic cancer surgery. Allowing to obtain tumor resections with better tumor-free margins, achieving anatomical reconstruction and preservation of the extremities.

Purposes: To determine, in three cadaveric models, the accuracy achieved in metaphyseal osteotomies of the distal femur through the use of custom cutting and registration surgical guides manufactured by 3D printing.

Patients and Methods: High-resolution tomography of the 3 pieces were performed, processing the images using software for engineering design on anatomy (Materialize NV), which allowed generating three-dimensional models. On these models, the cuts were planned in the metaphyseal region, simulating the resection of a tumor located in this area. This information was later entered into the intra-surgical navigation system (Stryker). Subsequently, the registration and positioning of the corresponding cutting guide was carried out on each cadaveric piece, which was assisted by navigation. The next step was to make the cuts. Subsequently, new high-resolution tomography and the processing of these images were carried out in order to determine the accuracy achieved through digital comparison of the planned cutting planes versus those actually achieved in the pieces.

Results: the average accuracy of the analyzed cutting planes gives an accuracy of 1 mm; with a standard dispersion of 0.5 mm.

Conclusions: The resection technique with tailored cutting and registration guides assisted by intra-surgical navigation allows high accuracy, broadening the spectrum of cases in which it is possible to perform conservative resection surgery of the joint and with an adequate oncological margin.

Keywords: Surgical Navigation, Registration, Custom Surgical Guides, 3D Printing