

Device for guided surgery of deviations in long bones

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CEU-UCH Cardenal Herrera University patented a device for surgeries to correct deviations in long bones. The research team used the 3D simulation of an affected bone to determine the mathematical formula that for designing such a device, which is adjusted to a specific deviated bone and enables a surgeon to set the best cutting angle and the location and orientation of holes that accept the future addition of a corrective

prosthesis. While realigning the affected limb, it also increases precision, shortens the time required for the operation, and improves the operation's functional results. The device has already been used with success in operations on animals and could have applications in orthopedic surgery on humans.

Angular deviations in the bones of body extremities cause physical overload that, in the case of dogs and other animals that develop those deviations in the course of only a few months, can only be corrected through a surgical intervention. After mandatory medical criteria have been met, the device could have applications in adult humans, such as treatment of fractures and other pathologies that cause [bone](#) deviations.

Mathematical model

Luis Doménech, professor of Industrial Design Engineering and Product Development at CEU-UCH, conceived the [mathematical model](#) used to determine the dimensions of a wedge form to realign a specific deviated bone through surgery. To determine the formula, the affected bone is first simulated in 3D via CT scanning, and reproduced in plastic with a 3D printer. Then, using the same procedure, a personalized device is designed and produced to find the optimal points and cutting angles for surgery. It takes only two days to design the [device](#), and the process is low-cost. It is applied to the bone with pressure.

The device has been used in seven orthopaedic surgical interventions on dogs in which Iván Serra, professor of Veterinary Medicine at the Valencia Catholic University Saint Vincent Martyr (UCV), participated. These surgeries corrected three-dimensional deviations in bones, yielding some very satisfying results. The surgeries provide examples of translational research in which knowledge from applied investigation to the field of clinical practice was very rapid.

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