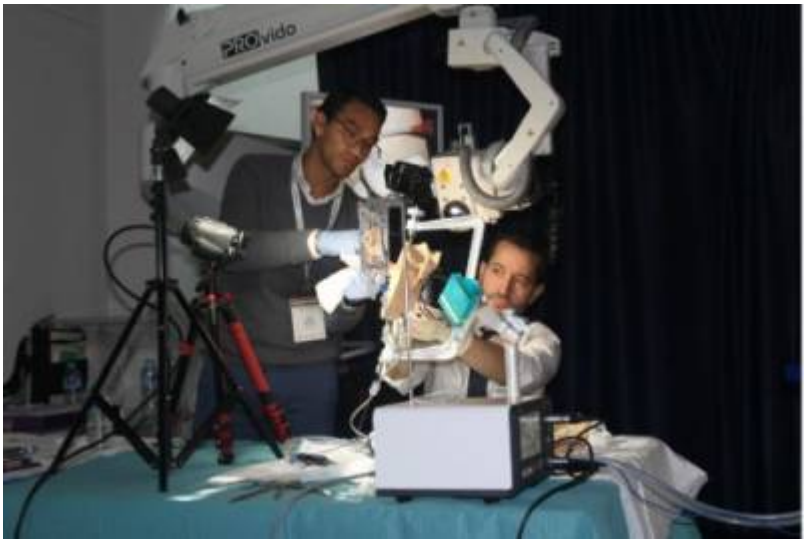
3D Neurotrainer



The joint work of neurosurgeons of the University General Hospital of Alicante and a toy company of Onil has resulted in a pioneering advance in the treatment of tumors at the base of the brain. This is a 3D printed surgical simulation model, presented in the framework of the XIV National Congress of the Spanish Society of Skull Base Pathology that took place in the hospital. Those responsible said that, after being improved and implemented, it will also be announced next November at a medical meeting in Orlando.

According to Pablo González, neurosurgeon of the Hospital and member of the Neurosciences Group of the Institute of Sanitary and Biomedical Research of Alicante (Isabial), the main advance of this model is that it allows to simulate a surgery in real conditions, not only seeing the anatomy of the area but the distortion caused by that injury at the base of the brain. They started from a few models developed three years ago together with the Bioengineering department of the Miguel Hernández University (UMH) of Elche, to which the German toy company Sempere de Onil has now been incorporated, which has made the technology available to medicine impression they use to make dolls. The novelty lies, above all, in the choice of the materials used, which perfectly reproduce the real organs and even the textures of the tumor to be treated.

One of the advantages of this system is that it allows planning the surgical activity, carrying it out in the most realistic conditions possible. In addition, a system of detection of nerves and more important neural structures has been incorporated, which guides the surgeon. “When we are 10 millimeters from the nerves, it emits intermittent beeps, similar to the assistant to park the car, and when the distance is two, the frequency of the sound is continued,” said Dr. González López, who also highlighted the help he gives to the surgeon in terms of anatomical orientation.

Dr. Javier Abarca, a neurosurgeon at the Skull Base Unit, said that so far these types of surgeries were performed by dissecting them in bodies, using virtual surgical planning models or synthetic prototypes. Now it has managed to combine all that and it has also improved, allowing to perform the surgery in the most realistic way possible. «In the models made with plastic, when we broke the part that simulated the bone with an engine it was burned. However, with the material used now, the material splinters forming chips with the same consistency. It looks like a real surgery, ”he said.

Now, the goal is to improve the model, reproducing even other anatomical regions. Although both the generation of the files used for three-dimensional reproduction and printing - which lasts between 90

and 100 hours - are complicated processes, the idea is to be able to “customize” each model to simulate real scenarios.

Dr. Irene Monjas, otolaryngologist at the Hospital de Alicante, stressed the progress of replacing anatomical specimens with this simulator, less and less available and at a much higher cost. “In addition, this makes it possible to reproduce exactly the pathologies to be treated, plan operations and even become a learning tool for residents,” he said.

In the General Hospital of Alicante about forty or fifty interventions are performed a year at the base of the brain, between vestibular schwannomas, meningiomas of the posterior fossa and epidermoid tumors. Although fortunately most tumors in this area are benign (95%), if they are not operated it can end up affecting the nerves and neural structures and even plugging a circuit of fluid circulation in the brain, causing hydrocephalus, which is potentially serious In addition, these tumors experience very slow growth, which helps to generate the model and plan the surgery with time until it is optimal. “The objective is to be able to operate these pathologies and above all without affecting the nervous structures,” said Dr. Gonzalez after the operating simulation performed before the leading figures in neurosurgery worldwide.

THE SECRETS OF '3D NEUROTRAINER'

Materials. For the first time, it has been possible to manufacture operable tumors, with materials that simulate the tissues with great precision, created individually for patients to be treated in the future.

Alarm system. Toy engineers have even included an acoustic and visual alarm system to save important nerve structures and make the approach safer.

Substitution. This training model will serve as a complement to the usual study of anatomy in corpses, since it provides benefits, such as availability, biosecurity and the ability to develop individual models, simulating with great precision the pathology of each patient.

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