Stereotactic robot

A stereotactic robot refers to a type of robotic system used in medical procedures that require high precision and accuracy, such as neurosurgery. These robots use advanced imaging techniques, such as magnetic resonance imaging (MRI), computed tomography (CT), or positron emission tomography (PET), to create a three-dimensional map of the patient's anatomy. This map is then used to guide the robot to the exact location where the surgical procedure needs to be performed.

In neurosurgery, stereotactic robots are used for a variety of procedures, including biopsies, tumor resections, and deep brain stimulation. These robots can improve the accuracy and safety of the procedure, reduce the risk of complications, and minimize the patient's discomfort and recovery time.

Using a dedicated phantom device, Lefranc et al measured the accuracy of a stereotactic robot for 20 targets as a function of the registration method (frameless, FL, or frame-based, FB) and the reference imaging modality (3T magnetic resonance imaging, MRI, CT scanner or flat-panel CT, fpCT). We performed a retrospective study of the accuracy of the first 26 FB and 31 FL robotized stereotactic surgeries performed in our department.

In a phantom study, the mean target accuracy was 1.59 mm for 3T MRI-guided FL surgery, 0.3 mm for fpCT-guided FL surgery and 0.3 mm for CT-guided FB surgery. In our retrospective series, the mean accuracy was 0.81 mm for FB stereotactic surgery, 1.22 mm for our 24 stereotactic surgery procedures with FL (surface recognition) registration and 0.7 mm for our 7 stereotactic surgery procedures with FL fiducial marker registration. Intraoperative fpCT fully corrected all the registration errors.

The ROSA stereotactic robot is highly accurate. Robotized FB stereotactic surgery is more accurate than robotized FL stereotactic surgery [1].

see iSYS1 robot

see Frameless robotically targeted stereotactic brain biopsy

[1]
Lefranc M, Capel C, Pruvot AS, Fichten A, Desenclos C, Toussaint P, Le Gars D, Peltier J. The impact of the reference imaging modality, registration method and intraoperative flat-panel computed tomography on the accuracy of the ROSA® stereotactic robot. Stereotact Funct Neurosurg. 2014;92(4):242-50. doi: 10.1159/000362936. Epub 2014 Aug 20. PubMed PMID: 25170634.