

OP48

Single-center surgical experience with the frameless Robotized Stereotactic Assistant (ROSA) system

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Introduction: Robotized assistants have been designed for minimally invasive neurosurgery and allow the improvement of surgical accuracy and postoperative outcome. Although their use is still limited to a small number of Centers, this technology appears promising not only for a clinical use but also for research purposes.

Methods: This prospective study includes 51 pediatric patients (age range: 18 months - 18 years) operated between January 2011-2014 and assisted by a frameless stereotactic robot (ROSA, Medtech) that is equipped by a six degrees of freedom arm and advanced haptic capabilities. The whole series includes the following procedures: a) electrodes placement for epilepsy or movements disorder surgery; b) endoscopy; c) stereotactic biopsy. The accuracy of each procedure was evaluated and any hardware or software failure recorded.

Results: An accuracy test (phantom) was carried out before starting surgery (1,2 mm; SD: 0,4 mm). The 51 patients underwent 58 surgical procedures: endoscopic disconnection of hypothalamic hamartomas (12 patients, 17 procedures), endoscopic treatment of multiple forms of obstructive hydrocephalus (11 patients, 13 procedures) combined with tumor biopsy (3 cases) and intracystic catheter positioning (1 case), frameless stereotactic procedures for sEEG electrodes placement (8 patients), deep-seated brain tumors needle biopsy (13 patients), bilateral pallidotomy (7 patients). All procedures but one were uneventful.

Conclusion: These preliminary data confirm the safety and accuracy of the robotized surgical assistant. Further data analyses together with larger surgical series are needed to draw definitive conclusions.