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Intraoperative low-field MRI for pediatric brain surgery: our initial experience with the PoleStar N-30

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Introduction: Intraoperative imaging is a rapidly developing technology. The introduction of the intraoperative magnetic resonance imaging (ioMRI) in the mid-1990s by Black et al. significantly improved image quality to optimize tumor resection. Brain tumors are a major cause of mortality and morbidity in pediatric population and the degree of surgical resection is a major prognostic factor. The use of low-field ioMRI has been widely documented in adults, with limited published pediatric series. We describe our initial experience with the use of the low-field PoleStar N-30 ioMRI for pediatric brain surgery.

Methods: At Cruces University Hospital, ioMRI system is the 0.15-T PoleStar N-30. For intraoperative use, the magnet is placed under the operating table and it can be easily operated by the surgeon. Contrary to high-field ioMRI systems, standard surgical instruments can be used.

Results: Between June 2012 and December 2013, four children (mean age 8.5 years, range 2-15) were operated on for brain tumors using the PoleStar N-30 ioMRI (29% of all pediatric brain tumor surgeries performed in the same period). Procedures included two suboccipital craniotomies (1 ependymoma and 1 pilocytic astrocytoma), one transsphenoidal endoscopic approach for pituitary adenoma and one presigmoid approach for brainstem cavernoma. Patient positioning was prone, supine and park bench, respectively. The number of intraoperative images obtained ranged from 3 to 5. Complete tumor removal was the goal in all cases and in the 4 patients ioMRI revealed no additional tumor after the resection. Post-operative 1.5-T MRI confirmed the findings of the final intraoperative image. After a mean follow-up of 12.25 months, one patient experienced distant tumor recurrence and three patients are free of disease.

Conclusion: IoMRI is a valuable tool to optimize tumor resection. Pediatric patients may benefit from it and, compared to adults, the set-up is easier. Wider experience will lead us to optimize the surgery and the daily flow in the theatre.