Utilization of Neuro-endoscopic Techniques in the Management of Pediatric Brain and Skull Base Tumors

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INTRODUCTION

Over the past few decades, neuro-endoscopy has become a powerful, minimally invasive tool in the management of pediatric brain tumors. Several intracranial neuro-endoscopic techniques have been used increasingly, from diagnosis to treatment of primary disease or secondary sequelae. This article reports on the utilization of endoscopic techniques in the contemporary management of pediatric brain tumors and provides representative case examples to illustrate the role and versatility of neuro-endoscopy.
METHODS

Our institutional review board approved the retrospective study of pediatric patients (≤ 18 years) who had undergone neuro-endoscopic procedures for brain tumors at the University of Florida – Jacksonville and Wolfson Children’s Hospital between 2008 and 2018. The authors reviewed the neuro-endoscopic procedures employed and analyzed their indications, technique and complications. In addition to patient and tumor characteristics, we reviewed in detail the neuro-endoscopic procedures employed and examined their indications, technique and complications. Descriptive statistics were used to summarize data when appropriate.
RESULTS

A total of 50 pediatric patients underwent 54 neuro-endoscopic procedures for the management of brain tumors. Mean age at time of surgery was 10.3 years old (range 1.3 - 18.8 years) and 66% were male. Almost all the cases (94.4%) had intra-operative imaging guidance, consisting mostly of frameless neuro-navigation system, but in some cases also ultrasound imaging. All procedures were performed with a rigid endoscope, except for one tumor biopsy, in which a flexible endoscope was used. All endoscopic procedures achieved their goals, with exception of a biopsy in which not enough tissue was obtained.
RESULTS

The main indication for neuro-endoscopy was tumor biopsy (38.9%), followed by tumor cyst management (25.9%), treatment of hydrocephalus (18.5%) and tumor resection (16.7%). The most common types of tumor were craniopharyngiomas (30.2%), astrocytomas (26.4%) and pineal region tumors (20.8%), with the majority (31.5%) located in the suprasellar area. In 32 cases, the tumor was accompanied by obstructive hydrocephalus. Four minor complications were observed, including 2 superficial wound infections and 2 CSF leakage. There were no major complications related to the use of the neuro-endoscope.
DISCUSSION

Tumors located intraventricular, periventricular and in the skull base are frequent in the pediatric population. These lesions are known to have an increased procedure-related risk due to their deep location and proximity to critical neurovascular structures. Neuro-endoscopy is an effective minimally invasive approach for diagnostic and therapeutic purposes that plays a significant role in the management of these tumors. One of the main advantages of this procedure is the ability to manage concomitant hydrocephalus via ETV or septostomy during the same operation, thus avoiding the need of ventriculoperitoneal shunt with its associated complications, such as neoplasm dissemination.
SUMMARY POINTS

- Neuro-endoscopy is an important minimally invasive tool for both diagnosis and treatment of pediatric patients with brain tumors.

- Guided neuro-navigation has become essential to reduce procedure-related risks in this population.

- Its versatility allows its use in tumor biopsy, tumor resection, treatment of hydrocephalus and management of cysts.