

single-center study in CNS tumor patients managed with CSI from 1986–2018. Clinical details, and echocardiography including myocardial-strain-analysis were collected at T1=first echocardiogram after CSI, and T2=most recent echocardiogram. Data are mean±standard deviation. Echocardiograms were available in 44 patients (36%female, 14±8.0years) at T1 and 39 patients (38%female, 21.0±11.3years) at T2. Standard echocardiography was normal for all subjects. At T1, global longitudinal peak systolic strain (GLS) was $-16.3\pm3.7\%$ in CSI vs. $-21.6\pm3.5\%$ in controls ($p<0.0001$); global radial peak systolic strain (GRS) was $21.5\pm10.1\%$ in CSI vs. $26.5\pm7.4\%$ in controls, and global circumferential peak systolic strain (GCS) was $-19.5\pm6.0\%$ in CSI vs. $-21.4\pm3.4\%$ in controls ($p<0.05$, both comparisons). At T2, GLS was $-15.8\pm5.2\%$ in CSI vs. $-21.9\pm3.5\%$ in controls ($p<0.0001$); GRS was $22.6\pm10.4\%$ in CSI vs. $27.1\pm8.2\%$ in controls ($p<0.05$); GCS was $-20.5\pm6.9\%$ in CSI vs. $-21.8\pm3.5\%$ in controls ($p=0.10$). For 17 patients with myocardial-strain-analysis available for both time points: difference in GLS was $0.06\pm7.2\%$ ($p>0.95$); GRS was $5.5\pm9.5\%$ ($p<0.05$); GCS was $-3.4\pm4.9\%$ ($p<0.05$). Subclinical dysfunction is present at first echocardiogram after CSI. Myocardial impairment may recover with time, however further analysis is needed to identify risk factors and trends. These results argue for inclusion of baseline cardiovascular assessment and longitudinal follow-up in CNS tumor patients post CSI.

RONC-32. LOCAL CONTROL FOLLOWING PROTON THERAPY FOR PEDIATRIC CHORDOMA

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BACKGROUND: Due to the location and high dose required for disease control, pediatric chordomas are theoretically well-suited for treatment with proton therapy, but their low incidence limits the clinical outcome data available in the literature. **METHODS AND MATERIALS:** Between 2008 and 2019, 29 patients with a median age of 14.8 years (range, 3.8–21.8) received proton therapy for non-metastatic chordoma at a single institution. Twenty-four tumors arose in the clivus/cervical spine region and 5 in the lumbosacral spine. Twenty-six tumors demonstrated well-differentiated histology and 3 were dedifferentiated or not otherwise specified (NOS). Approximately half of the tumors underwent specialized testing: 14 were brachyury-positive and 10 retained INI-1. Seventeen patients had gross disease at the time of radiation. The median radiation dose was 73.8 GyRBE. **RESULTS:** With a median follow-up of 4.3 years (range, 1.0–10.7), the 5-year estimates of local control, progression-free survival, and overall survival rates were 85%, 82%, and 86%, respectively. Excluding 3 patients with dedifferentiated/NOS chordoma, the 5-year local control, progression-free survival, and overall survival rates were 92%, 92%, and 91%, respectively. Serious toxicities included 3 patients with hardware failure or related infection requiring revision surgery, 2 patients with hormone deficiency, and 2 patients with Eustachian tube dysfunction causing chronic otitis media. **CONCLUSION:** In pediatric patients with chordoma, proton therapy is associated with a low risk of serious toxicity and high efficacy, particularly in well-differentiated tumors. Complete resection may be unnecessary for local control and destabilizing operations requiring instrumentation may result in additional complications following therapy.

NEUROSURGERY

SURG-02. INITIAL MANAGEMENT OF HYDROCEPHALUS IN THE PEDIATRIC AND YOUNG-ADULT PATIENTS WITH BRAIN TUMORS; THE EFFICACY OF LONG-TERM INDWELLING EXTERNAL VENTRICULAR DRAINAGE

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BACKGROUND: Pediatric and Young-Adult (AYA) brain tumors often present with hydrocephalus. As temporary cerebrospinal fluid (CSF) diversion procedure, we perform long-term indwelling external ventricular drainage (EVD) in the case of the management of CSF diversion more than two weeks presumably. The aim of this study is to investigate the initial management for hydrocephalus in pediatric/AYA patients with brain tumor, especially about long-term EVD. **MATERIALS AND METHODS:** The patients less than 30 years of age diagnosed with brain tumor between 2005 and 2019 were retrospectively analyzed. Procedures of long-term EVD were similar to that of ventriculoperitoneal shunt (VPS) operation. Using flow-control VPS system, peritoneal catheter passed out of the body at the

anterior chest, and distal end of the catheter was connected to standard EVD system. **RESULTS:** In total of 345 patients with brain tumor, 109 had hydrocephalus at presentation. Among them, 25 patients (23%) underwent long-term EVD. The main reasons for selecting long-term EVD were to avoid intraperitoneal dissemination ($n=13$), and to maintain longer period of CSF diversion for the treatment of tumor ($n=12$). The median of long-term EVD was 38 days (range: 12 – 222 days). Although one case suffered from drainage tube occlusion at 59 days, there were no other complications such as infection or accidental evulsion. Eventually, 3 cases required permanent VPS for persistent hydrocephalus. **CONCLUSION:** Long-term EVD is safe and effective option for CSF diversion. This procedure should be taken into consideration if patients have a risk of dissemination and may elude permanent VPS.

SURG-03. IMMERSIVE VIRTUAL REALITY APPLICATIONS IN NEUROSURGICAL ONCOLOGY

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Tridimensional (3D) rendering of volumetric neuroimaging is increasingly being used to assist surgical management of brain tumors. New technologies allowing immersive virtual reality (VR) visualization of obtained models offer the opportunity to appreciate neuroanatomical details and spatial relationship between the tumor and normal neuroanatomical structures to a level never seen before. We present our preliminary experience with the Surgical Theatre, a commercially available 3D VR system, in 60 consecutive neurosurgical oncology cases. 3D models were developed from volumetric CT scans and MR standard and advanced sequences. The system allows the loading of 6 different layers at the same time, with the possibility to modulate opacity and threshold in real time. Use of the 3D VR was used during preoperative planning allowing a better definition of surgical strategy. A tailored craniotomy and brain dissection can be simulated in advanced and precisely performed in the OR, connecting the system to intraoperative neuronavigation. Smaller blood vessels are generally not included in the 3D rendering, however, real-time intraoperative threshold modulation of the 3D model assisted in their identification improving surgical confidence and safety during the procedure. VR was also used offline, both before and after surgery, in the setting of case discussion within the neurosurgical team and during MDT discussion. Finally, 3D VR was used during informed consent, improving communication with families and young patients. 3D VR allows to tailor surgical strategies to the single patient, contributing to procedural safety and efficacy and to the global improvement of neurosurgical oncology care.

SURG-04. THE APPLICATION OF EN BLOC RESECTION IN THE OPERATION OF PEDIATRIC POSTERIOR FOSSA TUMOR

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OBJECTIVE: To explore the efficacy and safety of en bloc resection therapy on posterior fossa tumor in children. **METHODS:** A retrospective analysis was conducted on the clinical data of 94 patients with posterior fossa tumor admitted to Department of Pediatric Neurosurgery, Xinhua Hospital Affiliated to Shanghai Jiaotong University School Of Medicine from January 2018 to December 2019. Among them, 35 cases were treated with traditional resection (control group) and 59 cases with en bloc resection (observation group). We counted the amount of blood loss and the time during tumor resection. We compare the symptoms and signs between the two groups and determine a extent of tumor resection based on microscopic observation and preoperative and postoperative imaging comparison. **RESULT:** The total tumor resection rate of the observation group (88.1%, 52 / 59) was significantly higher than that of the control group (62.85%, 22 / 35, $P < 0.05$). The average bleeding volume of 90.8ml in the observation group was significantly smaller than that of the control group (113.3ml, $P < 0.05$), and the average operation time of 38.6min in the observation group was shorter than that of the control group (57.4min, $P < 0.05$) only for tumor resection procedure. **CONCLUSION:** En bloc resection technique can effectively accelerate the resection time, reduce intraoperative bleeding and improve the total resection rate of tumors in children's posterior cranial fossa.

SURG-05. AN AWAKE SURGERY FOR A CHILD SUFFERING FROM EPILEPSY DUE TO DYSEMBRYPLASTIC NEUROEPITHELIAL TUMOR LOCATED IN THE LEFT PARIETAL LOBE

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