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Preoperative and postoperative neurological, neuropsychological and behavioral impairment in children with posterior cranial fossa astrocytomas and medulloblastomas: the role of the tumor and the impact of the surgical treatment.

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Abstract

INTRODUCTION: The aim of the present study was to prospectively investigate if a correlation might exist between preoperative and postoperative neurological conditions, neuroradiological/intraoperative findings and results of a complete neuropsychological evaluation in children with posterior fossa medulloblastomas and astrocytomas. **MATERIALS AND METHODS:** Of the 65 children admitted at the Pediatric Neurosurgery of the UCSC of Rome between January 2005 and October 2009, 41 were selected; the only two exclusion criteria were represented by age under 24 months and severe neurological conditions, seen that in both cases it would not have been a possible reliable evaluation. All children underwent a preoperative and immediate postoperative complete MR study. Hydrocephalus was graded on the Evans score; brainstem infiltration was defined on intraoperative findings. Neuropsychological assessment consisted of a battery of tests tailored on the patient's age, cognitive level, and level of cooperation. Post operative neuropsychological evaluation was performed at a mean time of 2.5 min (2 mos, max 4.5 mos) from the operation, before any eventually needed adjuvant treatment (i.e., chemotherapy, radiotherapy). **RESULTS:** Concerning neurological status, we found a statistically significant relation between the presence of oculomotor impairment and both verbal fluency deficits ($p = 0.044$) and imagery disorders ($p = 0.03$); also, the presence of ataxia/dysmetria was significantly correlated to attention dysfunction ($p = 0.01$) and, more tightly, to planning dysfunction ($p = 0.006$). For neuroradiological/intraoperative features, Intelligence Quotient (IQ) impairment was significantly correlated to the intraoperative evidence of tumor infiltration of the brainstem ($p = 0.003$), a severe hydrocephalus at diagnosis ($p = 0.001$) and the histological diagnosis of medulloblastoma (MB) ($p = 0.002$). For selective skills, a significant correlation was found between linguistic processing deficits and the evidence of dentate nuclei infiltration (blindly defined on MR); procedural memory defects and imagery disorders related to the severity of the hydrocephalus ($p = 0.02$), infiltration of the brain stem ($p = 0.01$) and a histological diagnosis of MB ($p = 0.01$). After surgery no patient showed a worsening of his/her cognitive profile; the relationships between clinical, intraoperative, and radiological findings were substantially confirmed. **DISCUSSION:** Our results support the hypothesis that when present, neuropsychological impairment is already present at diagnosis and that the most statistically significant factors, which might be related with cognitive deficits in the preoperative as well as in the postoperative period, are tumor infiltration of the brainstem, the severity of hydrocephalus, and a histological diagnosis of MB.

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