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Clinical presentation of supratentorial and infratentorial intracranial tumors in pediatric patients

Luz María Sánchez-Sánchez, Javier Vázquez-Moreno, José Antonio Heredia-Delgado and Ricardo Sevilla-Castillo*
Department of Pediatrics, UMAE No. 25, Monterrey, N.L., Mexico

Abstract

Background*: Brain tumors are the second most common malignancy in childhood and they are also the most common solid tumors in children and the most frequent cause of morbidity and mortality associated with cancer in this age.* **Objective:** *To determine the clinical presentation of supratentorial and infratentorial intracranial tumors in pediatric patients.* **Material and Methods:** *An observational, retrospective, cross-sectional comparative study in which records the clinical manifestations of 51 pediatric patients diagnosed with intracranial tumor, according with its location, supra- or infratentorial.* **Results***: 51 patients were analyzed. Tumor location was infratentorial in 32 patients (62.7%) and supratentorial in 19 (37.3%). Cerebellar syndrome occurred in 21 patients (65.6 %) with infratentorial tumor compared with six (31.5 %) with supratentorial tumor (p = 0.04; OR: 3.2; 95% CI: 1.1-12.8). Nystagmus was significantly more common in patients with infratentorial tumors (p = 0.029). Endocrine manifestations were present in four patients (21%) with supratentorial tumor and none of the infratentorial group (p = 0.03).* **Conclusions:** *Cerebellar syndrome was statistically significantly more common in patients with infratentorial when compared with patients with supratentorial. Nystagmus is one of the most common visual impairments in patients with infratentorial tumor. Endocrine disorders are significantly more frequent in patients with supratentorial tumor. The interval between onset of symptoms and diagnosis of intracranial tumor is significantly longer in children with supratentorial tumor because the symptoms are more insidious in onset and are mistaken for other benign conditions.* (Gac Med Mex. 2016;152:138-42)
Corresponding author: *Luz María Sánchez-Sánchez, luzsanchez68@hotmail.com*

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Introduction

Intracranial tumors are the second most common neoplasm in childhood, and their occurrence and potential causes have been the subject of debate. They comprise between 16.6 and 21% of all malignancies in children. In addition, they are the most common solid tumors at pediatric age and the most frequent cause of cancer-related morbidity and mortality in this group of patients[1,3].

Intracranial tumors location differs considerably in percentage according to the studied population: infratentorial (IT) tumors range from 21 to 67%; supratentorial (ST) tumors, from 30 to 64%, and those invading both spaces, from 2 to 15%, according to conducted studies[4,5].

Correspondence:
*Luz María Sánchez-Sánchez
Departamento de Pediatría
UMAE No. 25
Salamanca, 5907
Col. Cumbres Santa Clara
C.P. 64346, Monterrey, N.L., México
E-mail: luzsanchez68@hotmail.com

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In children, most intracranial tumors are of unknown origin. Some risk factors are the following: being first-born, having an adolescent or aged mother, high weight for gestational age, dystocic deliveries, prior abortions, in general, without most these factors being statistically significant[6-7].

In a study conducted with 451 patients with intracranial-origin primary tumors, presentation characteristics were the following: intracranial hypertension (ICH), with symptoms such as vomiting, headache, macrocephaly and altered consciousness, which occurred in up to 49.3% ST and 83% IT tumors. Visual disturbances, clinically apparent by decreased visual acuity (VA), ptosis, ophthalmoplegia, exophthalmos and Parinaud syndrome, have been reported in up to 30.9% of ST and 24.9% of IT tumors. Ataxia is more commonly reported in IT that ST tumors (33 vs. 2.4%). Seizures are usually more common in ST than in IT tumors (26.6 vs. 10.4%). Cranial nerves involvement occurs in IT-origin tumors. Other manifestations, such as endocrine disturbances, have been found in similar percentage on both locations: 5.3 (ST) versus 3.6% (IT)[8].

The treatment of intracranial tumors depends on the size and type of tumor, as well as on the child's general health status. The goal of treatment is total resolution of the tumor, symptom cessation and function improvement. Surgical intervention is necessary in most tumors and some can be completely removed. Chemotherapy and radiotherapy can be used for certain tumors[9,10].

In this study, a thesis on intracranial tumors and their clinical manifestations is used with the purpose to obtain useful and applicable information to establish clinical diagnosis of patients affected by symptoms consistent with neurological involvement that drive to the suspicion of ST or IT tumors-related intracranial involvement, on any of their initial presentations, in order to help accelerating opportune diagnosis and treatment.

Material and methods

A retrospective, cross-sectional, comparative, observational study was carried out at the UMAE No. 25 of the Mexican Institute of Social Security, in Monterrey (Nuevo León, Mexico). Pediatric patients of 0-15 years of age, diagnosed with ST or IT intracranial tumors at the UMAE 25 of Monterrey during the period comprised between January 2012 and October 2014 were studied.

Pediatric patients aged 0-15 years, with a diagnosis of supra- or infratentorial tumor, diagnosed at the UMAE 25 of Monterrey within the period encompassed from January 2013 and June 2014 were included; patients with intracranial tumors whose location was not well defined as being supra- or infratentorial were excluded. Those patients whose medical record was lost o did not contain the medical history or initial admission note were eliminated.

Results

Fifty one pediatric patients, diagnosed with endocranial tumors, with a mean age of 7.8 ± 3.7 years were included; there were 23 patients (45%) of the female and 28 (55%) of the male gender. Tumor location was IT in 32 patients (62.7%) and ST in 19 (37.3%).

For IT tumors, histological varieties with confirmed pathological report were the following: brain stem glioma 11 (34.3%), astrocytoma (7 [21.8%]), medulloblastoma (6 [18.7%]), ependymoma (4 [12.5%]) and other 4 (12.5%). Histological varieties in patients with IT tumors were: astrocytoma (5 [26%]), germinoma (3 [15.7%]), thalamic glioma (2 [10.5%]), craniopharyngioma (1 [5.2%]), teratoid rhabdoid tumor (1 [5.2%]) and others (6 [31.5%]).

The patients were divided to be studied according to tumor location. The age of the patients with IT tumors was 7.3 ± 3.2 years, and in patients with ST tumors, 8.7 ± 4.3 (p = 0.152). Of these, 19 patients (59.4%) with IT tumors and 9 (47.4%) with ST tumors were from the male sex.

The time elapsed between the onset of symptoms and the intracranial tumor diagnosis was 2.7 ± 2.7 months for patients with IT tumors and 22.7 ± 7.6 months for those with ST tumors (p = 0.00).

Headache occurred in 22 patients (68.7%) with IT tumors and in 8 (42.1%) with ST tumors (p = 0.06). The most common type of headache was holocranial in both groups, with percentages of 75 and 87%, respectively. Cerebellar syndrome was characterized by ataxia, dysmetria, dysdiadochokinesia or all these symptoms, and occurred in 21 patients (65.6%) with IT tumors and 6 (31.5%) with ST tumors (p = 0.04; odds ratio [OR]: 3.2; 95% confidence interval [CI]: 1.1-12.8). Seizures occurred in 3 patients (9.3%) with IT tumors and 4 (21%) with ST tumors (p = 0.245). Partial seizures were more common in patients with ST tumors, but there was no statistically significant difference. Visual disturbances were present in 11 patients (34.3%) with IT tumors and 6 (31.5%) with ST tumors (p = 0.839). However, nystagmus was significantly predominant in the group with IT tumors (p = 0.029). Cranial

Table 1. Clinical characteristics of 51 pediatric patients with intracranial tumors, classified according to their location, IT or ST*

	Total (n = 51)	IT (n = 32)	ST (n = 19)	p
Age (years)	7.8 ± 3.7	7.3 ± 3.2	8.7 ± 4.3	0.152
Sex				
Female	23 (45%)	13 (40.6%)	10 (52.6%)	0.400
Male	28 (54.9%)	19 (59.4%)	09 (47.4%)	
Headache	30 (58.5%)	22 (68.7%)	8 (42.1%)	0.400
Holocranial	23 (76%)	16 (72.7%)	7 (87.5%)	
Localized	7 (23.4%)	6 (27.3%)	1 (12.5%)	
Cerebellar syndrome	27 (52.9%)	21 (65.6%)	6 (31.5%)	0.049
Ataxia	12 (44.4%)	9 (42.8%)	3 (50%)	
D+D	3 (11.2%)	2 (9.5%)	1 (16.6%)	
All	12 (44.4%)	10 (47.7%)	2 (33.4%)	
Seizures	7 (13.7%)	3 (9.3%)	4 (21%)	0.245
Partial	5 (71.4%)	1 (33.3%)	4 (100%)	
Generalized	2 (28.6%)	2 (66.7%)	0	
Visual disturbances	17 (33.3%)	11 (34.3%)	6 (31.5%)	0.839
Nystagmus	6 (35.3%)	6 (54.5%)	0	0.029
Strabismus	2 (11.7%)	2 (18.2%)	0	
Diplopia	5 (29.4%)	2 (18.2%)	3 (50%)	
Amaurosis	1 (5.9%)	1 (9.1%)	0	
Decreased VA	3 (17.6%)	0	3 (50%)	
CNP	16 (31.3%)	12 (37.5%)	4 (21%)	0.225
Endocrine	4 (7.8%)	0	4 (21%)	0.030
ICH	36 (70.5%)	25 (78.1%)	11 (57.8%)	0.194
Vomiting	28 (77.7%)	21 (84%)	7 (63.6%)	
Somnolence	6 (16.6%)	3 (12%)	3 (27.2%)	
Papilledema	2 (5.5%)	1 (4%)	1 (9.2%)	
Hydrocephalus	31 (60.7%)	22 (68.7%)	9 (47.4%)	0.134
TSD	2.5 ± 9.9	2.7 ± 2.7	22.7 ± 7.6	0.000
DEC 1	9 (17.6%)	7 (21.8%)	2 (10.5%)	0.300

*Values presented as mean ± standard deviation o absolute frequency (percentage).
D+D: dysmetria and dysdiadochokinesia; CNP: cranial nerve palsy; TSD: time from symptoms onset to diagnosis; DEC 1: decease during the first year after diagnosis

nerve palsies occurred in 12 patients (37.5%) with IT tumors and 4 (21%) with ST tumors (p = 0.225). In patients with IT tumors, cranial nerves VI and VII palsy was predominant (66%), although no statistically significant different was found when compared with those with ST tumors. Endocrine anomalies, characterized by hypothyroidism, hypocortisolism, and anti-diuretic hormone and growth hormone deficit, occurred in 4 patients (21%) with ST tumors, but in none with IT tumors (p = 0.03). Endocranial hypertension manifested mainly as vomiting, somnolence and papilledema in 25 patients (78.1%) with IT tumors and 11 (57.8%) with ST tumors (p = 0.194). Hydrocephalus was detected in 22 patients (68.7%) with IT tumors and 9 (47.4%) with ST tumors (p = 0.134). Only one of the 51 patients showed an important failure to thrive, resulting from growth hormone deficit, in the group of ST tumors. Other less common manifestations were: monoparesis, which progressed to hemiparesis in 8 patients (25%) with IT tumors and 4 (21%) with ST tumors, and neck pain in 4 patients (12.5%) with IT tumors and 1 (5.2%) with a ST tumor.

Hydrocephalus was documented in 22 patients (68.7%) with IT tumors and 9 (47.4%) with ST tumors.

The number of patients who were deceased within the first year after diagnosis was 7 (21.8%) in the group with IT tumors versus 2 (10.5%) in the group of ST tumors (p = 0.300) (Table 1).

Discussion

Intracranial tumors are the second most common neoplasm in childhood; they account for 16.6 to 21% of all malignant neoplasms in children. In addition, they are the most common solid tumors at pediatric age and the most frequent cause of cancer-related morbidity and mortality in this group of patients[11,12].

Intracranial tumors location differs considerably according to the studied population: IT tumors account for 21 to 67%; ST tumors for 30 to 64%, and those invading both spaces, for 2 to 15%, according to several studies[13,14]. In this study, 62.7% of examined patients had IT tumors and 37.3%, ST tumors, very similar to reports in previous studies.

Lacour et al. conducted a study in France with 8,473 children included in the national registry of children with cancer, with data from 2000 to 2004, where children with malignant hematological disorders and solid tumors were evaluated, and found coincidence with the second most common type of tumors being those of the central nervous system, regardless of the children's age. The most common histological variant in this study was astrocytoma (37.6%), followed by medulloblastoma (15%) and gliomas of different histological lineages (13.6%)[15]. In this case series, astrocytomas were found in 23.5% of patients, medulloblastomas in 11.7%, and gliomas of different lineages in 25.4%, which is consistent with reports of the aforementioned authors, with the exception that there were a lower percentage of astrocytomas.

With regard to gender, no factor associated with the presence of intracranial tumors at any specific location, or risk factor for the development of the tumor have been considered[6,7]. In this study, there was no clear predominance of any gender, which is consistent with reports by other authors.

In a study conducted in 451 patients with intracranial-origin primary tumors, presentation characteristics were the following; ICH, manifesting as vomiting, headache, macrocephaly and altered consciousness, which occurred in up to 49.3% of ST and 83% of IT tumors[5]. In our study, similar percentages to those previously reported were found, but with no statistically significant differences between both locations.

Visual disturbances, with symptoms such as decreased VA, ptosis, ophthalmoplegia, exophthalmos and Parinaud syndrome, have been reported in up to 30.9% of ST and 24.9% of IT tumors[8,16-18]. In this study, visual disturbances were found to occur in a third part of patients with IT or ST intracranial tumors, just as described in other studies.

Ataxia is more commonly reported in IT than in ST tumors (33 vs. 2.4%). In this case series, ataxia occurred in 28.1% of children with IT, consistent with findings reported by El-Gaidi[8], but it also occurred in 15.7% of patients with ST, which is a much higher figure than that reported by El-Gaidi.

Seizures are usually more frequent in ST than IT tumors (26.6 vs. 10.4%). In our study, no statistically significant difference was found; however, the percentages found in this case series are similar to those reported by other authors.

Cranial nerves involvement is usually more common in those patients with IT-located tumors. The study we carried out is consistent with these findings, but with no statistically significant differences.

Other manifestations, such as endocrine abnormalities, have been found at similar percentage for both locations: 5.3 (ST) versus 3.6% (IT)[19,20]. Conversely, in this case series we only found endocrine anomalies in patients with ST-located tumors, but in none with IT tumors, with a statistically significant difference.

Ansell et al., in a comparative study conducted between patients with intracranial tumors and patients with symptoms but without an intracranial tumor diagnosis, found an up to 60-month diagnostic delay, due to the atypical, heterogeneous and insidious presentation of some tumors[19]. In this case series, we found that patients with ST tumors had more prolonged evolution, and the time elapsed since the onset of symptoms and definitive diagnosis was longer than in those with IT location, although no statistically significant difference was found.

Worldwide, the mortality rate due to malignant tumors of the brain is 2.8 for each 100-thousand in males and 2.0 for each 100-thousand in females. Five-year relative survival is quite varied, according to ethnicities and races: on average, in Caucasians it is 33.5%, a figure that discretely increases to up to 37% for African-Americans. In children, the 5-year relative survival rate is considered to be lower, especially in the case of the glioblastoma multiforme and ependymoma histological varieties[20-22]. In this study, mortality was 17.6% during the first year after diagnosis, in both locations, with no statistically significant differences.

Conclusions

Cerebellar syndrome is more frequently observed in patients with IT tumors, with a statistically significant difference when compared with patients with ST tumors.

Nystagmus is one of the most common visual disturbances in patients with IT tumors.

Endocrine alterations are significantly more frequent in patients with ST tumors.

The time elapsed between the onset of symptoms and the intracranial tumor diagnosis is significantly longer in children with ST tumors, since symptoms have a more insidious onset and are confused with other benign conditions.

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