Frequency of central nervous tumors histological types in an university hospital: data from a four-year period

Frequência dos tipos histológicos de tumores no sistema nervoso central em um hospital universitário: levantamento de casos ao longo de quatro anos

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Abstract

Introduction: The achievement of an epidemiological pattern of central nervous system tumors (CNS) is hampered by their heterogeneity of presentations, causing a lack of data regarding the incidence of their various types. Therefore, it is necessary to carry out studies with the adoption of classification criteria. **Objective:** Develop a database of CNS tumors including primary cancers, primary benign tumors and metastases. **Methods:** A total of 1010 cases of biopsies were accessed in the Department of Pathological Anatomy's electronic archive system, 381 of which were included in the study, in accordance with the inclusion and exclusion criteria (benign and malignant CNS neoplasms). **Results:** The histological diagnoses analysis revealed a total of 212 female patients (55.64%) and 169 male patients (44.36%). Overall, 307 were primary CNS neoplasms (80.58%) and 74 CNS metastases (19.42%). The age distribution span ranged from 1 to 85 years of age, with a mean age of 48.953 and a median of 52 years of age. Gliomas were the most frequent histological group, corresponding to 30.45% (116 cases), with "diffuse gliomas" being the most frequent histological subtype (73%). **Conclusion:** The present study documents the frequency of histological types of CNS neoplasms in the Pathological Anatomy Service of a University Hospital between 2015 and 2018.

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Resumo

Introdução: A realização de um padrão epidemiológico das neoplasias do sistema nervoso central (SNC) é prejudicada pela sua heterogeneidade de apresentações, causando uma falta de dados a respeito da incidência de seus diversos tipos. É necessário, dessa forma, realizar estudos com a adoção de critérios de classificação. **Objetivo:** Desenvolver um banco de dados das neoplasias do SNC, incluindo além dos cânceres primários do SNC, os tumores benignos primários do SNC e as metástases. **Método:** Foram acessados 1010 casos de biópsias no sistema eletrônico de arquivos do Serviço de Anatomia Patológica, sendo incluídos 381 diagnósticos no estudo, em concordância com os critérios de inclusão e exclusão (neoplasias benignas e malignas do SNC). **Resultado:** A análise dos diagnósticos histológicos demonstrou um total de 212 pacientes do gênero feminino (55,64%) e 169 do gênero masculino (44,36%). Do total de neoplasias, 307 foram primárias do SNC (80,58%) e 74 metástases (19,42%). A distribuição etária variou de 1 a 85 anos, com uma média de idade de 48,953 e a mediana de 52 anos. Os gliomas foram o grupo histológico mais frequente, correspondendo a 30,45% (116 casos), sendo "gliomas difusos" o subtipo histológico mais frequente (73%). **Conclusão:** O presente estudo documenta a frequência dos tipos histológicos das neoplasias do SNC no Serviço de Anatomia Patológica em um Hospital Universitário entre os anos de 2015 e 2018.

Introduction

Central nervous system (CNS) tumors comprise a group of relatively rare and complex diseases with more than 50 entities that differ in location, morphology, molecular biology, and clinical behavior. The

global incidence of cancer has been increasing, and tumors located in the CNS also follow this trend. Annually, approximately 256,000 new cases of primary CNS cancer arise, representing approximately 3% of all new cancer cases. Despite being a relatively small percentage, its association with high morbidity and mortality makes it one of the most feared forms of this disease[1-2].

The worldwide incidence of age-standardized primary malignant CNS neoplasms in 2012 was 3.9 per 100,000 in men and 3.0 per 100,000 in women. As in other regions of the world, in Central and South America, central nervous system tumors represent a low proportion of cancers. The highest rates in South America are found in Brazil, with an age-standardized annual incidence of 5.7/100,000 and mortality of 4.6/100,000. Primary brain tumors constitute about 2.7% of all tumors diagnosed in Brazil. These numbers are comparable to those found in other regions, such as the USA, where the annual incidence standardized by age, in 2012, was 6.8/100,000 for men and 5.3/100,000 for women[3]. The epidemiological pattern of this disease is, however, hampered by its heterogeneity of presentations, causing a lack of data regarding the incidence of its different subtypes[1,4]. Therefore, it is necessary to carry out studies with the adoption of classification criteria, such as those published by the World Health Organization (WHO). The most recent international classification of CNS tumors encompasses for the first time molecular patterns, although the morphological characteristics are still relevant, which allow a didactic categorization of these tumors[5].

The documentation serves as an important resource evaluating national control programs and other prevention and treatment efforts. Hospital cancer records work as an integral part of population-based registries, which are crucial for estimating the incidence and patterns of tumors in population[6-8].

The materials and files used for this research came from the Pathology Department of the Hospital Santa Casa de São Paulo, a philanthropic, university, quaternary hospital, whose patients assisted are from the public system of Brazilian health.

It is important to survey this type of information to make more comprehensive and accurate data available to the literature, providing a greater understanding and visualization of its epidemiological profile. It also establish base to carry out the proportion of different types of treatments and prognoses, especially with regard to our institution. Its importance is, moreover, to serve as a basis for further research on CNS tumors.

Objective

The primary objective of this paper is to develop a database of CNS neoplasms, including primary CNS cancers, primary benign tumors of the CNS and metastases. The secondary objective is to compare the results obtained with similar surveys from other hospitals and regions.

Materials and method

- **Inclusion criteria:**
(1) Patients with CNS tumors diagnosed by anatomopathological examination performed between 2015 and 2018

- **Exclusion criteria:**
(1) Patients whose slides and blocks are not in the institution's files or are in poor condition.
(2) Cases in which it is not possible to confirm the nature of the neoplastic process on histological examination.

- **Variables:**
(1) Age;
(2) Gender;
(3) CNS topography;
(4) Histological types.

- **Research procedure:**
(1) Bibliographic research
(2) Research for CNS tumors in the pathology department data system.
(3) Creation of a table in Excel 16.0 (Office 2016) Microsoft with the study variables.
(4) Accessing slides from the pathological anatomy files.
(5) Excluding the materials in poor condition.
(6) Histopathology slide review by two pathologists and one medical student.
(7) Register tumors in the table according to the histological classification.
(8) Statistical analysis

Results

1010 biopsies were accessed in the electronic file, using the codes referring to the topography of "brain", "cerebellum", "nervous system", "spinal cord", "meninges", "pituitary", "pineal gland", which correspond to registers compatible with CNS, using the filter for the period between 2015 and 2018. A total of 660 cases accessed for analysis of blocks and slides corresponding to CNS neoplasms were counted. All slides referring to 660 cases were reviewed, and 381 diagnoses were included in the study in accordance with the inclusion and exclusion criteria. The analysis of histological diagnoses showed a total of 57.48%

primary malignant neoplasms, 23.1% primary benign neoplasms, and 19.47% metastases. 212 female patients (55.64%) and 169 male patients (44.36%). Of the total number of tumors, 307 were primary in the CNS (80.58%) and 74 were metastases (19.42%). The age distribution is represented in GRAPHS I and II, ranging from 1 to 85 years, with a mean age of 48.953 and a median of 52 years.

The result of the analysis was grouped according to the histological classification of the "WHO Classification of Tumors of the Central Nervous System" (GRAPH III), being classified in: gliomas, meningiomas, metastases, sellar tumors, spinal and cranial nerve tumors, mesenchymal tumors, embryonal tumors, lymphomas and others. The characteristics of the main histological subtypes are summarized in TABLE I[9].

Discussion

Our statistics are comparable to those observed in other hospitals, with a progressive increase in prevalence according to the older age group. Among the primary neoplasms, gliomas stood out, especially those with a high histological grade, and meningiomas.

Gliomas were the most frequent histological group, corresponding to 30.45% (116 cases) of all types studied, and 37.79% of primary neoplasms. Glial tumors were subdivided into diffuse gliomas, circumscribed gliomas and ependymal. Diffuse gliomas were the most frequent histological subtype (73%), and grade IV was the highlight, with 66 cases, corresponding to 56.9% of gliomas and 17.3% of all CNS neoplasms. (GRAPH IV AND GRAPH V)

A similar proportion of glioblastomas was found in the data of the Central Brain Tumor Registry of the United States (CBTRUS), which corresponded to 75.8% of the gliomas, with a predominantly supratentorial location. The CBTRUS data, however, reflect the incidence of types of cancer in the population, while the present paper counts data from biopsies and surgical specimens in a single center, which restricts the comparison between the types of study[10].
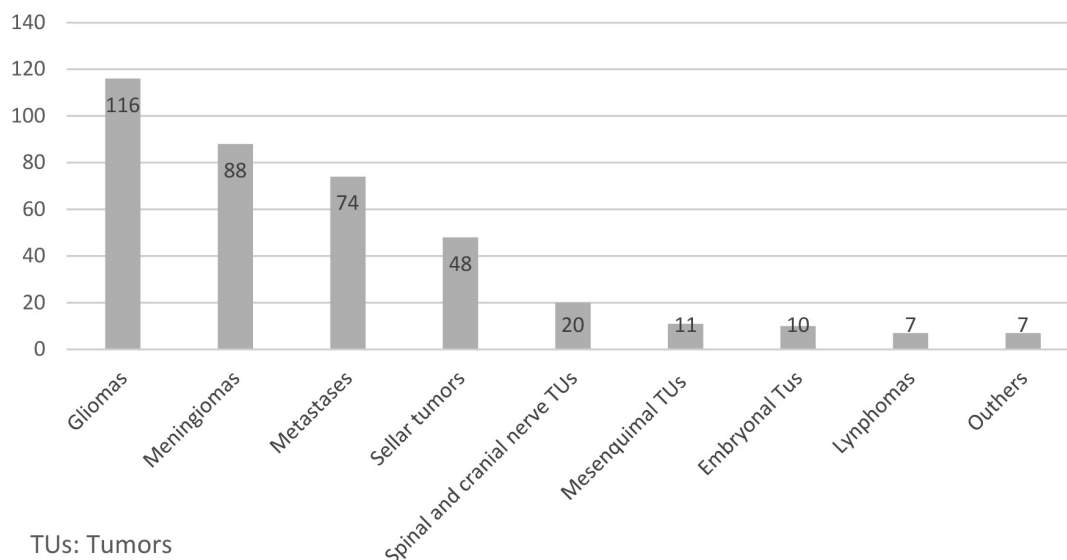
Meningiomas corresponded to the second highest incidence among histological types, representing
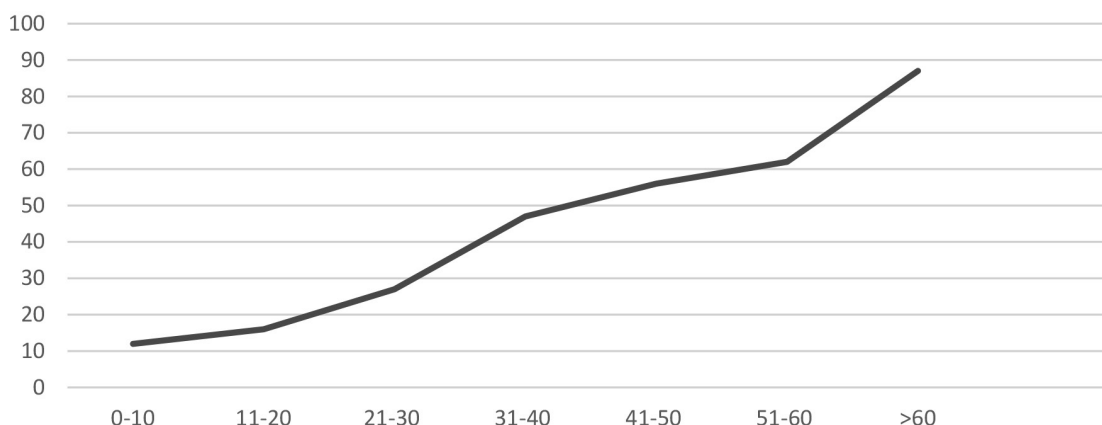
Graph I - Age distribution of primary CNS tumors
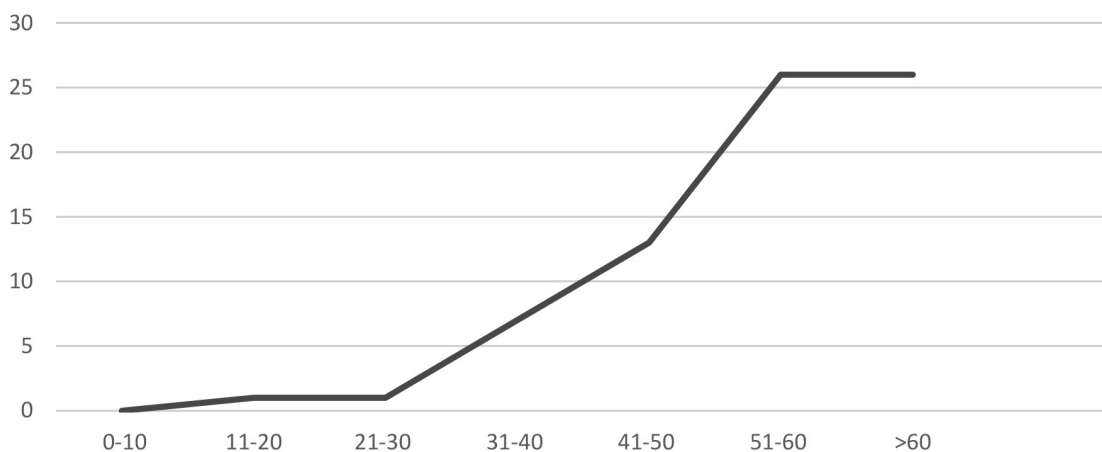

Graph II - Metastases age distribution.

TUs: Tumors

Graph III - Histological types

					Table I		
					Main histological subtypes		
Type of tumor	Grade	Nº	%	Age range	Decade of greatest incidence	Gender F:M	Main topography
Non Diffuse glioma	I	10	2,62	8 - 38	2	1:1	Posterior fossa
Diffuse glioma	II	12	3,15	7 - 60	4/5	1:1	Parietal Lobe
Anaplastic glioma	III	8	2,1	14 - 65	4	1:4	Frontal Lobe
Glioblastoma and others	IV	66	17,32	2 - 73	7	25:41	Frontal Lobe
Subependymoma and Myxopapillary ependymomas	I	4	1,05	27 - 66	4/5/6/7	1:3	Spinal cord
Ependymoma	II	8	2,1	1 - 53	5	5 - 3	Spinal cord
Anaplastic Ependymoma	III	8	2,1	1 - 65	1/7	5 - 3	Parietal Lobe
Metastases	-	74	19,42	20 - 80		53:21	Supratentorial
Meningioma	I	83	21,78	20 - 83	7	61:22	Extra-axial Frontal
Atypical Meningioma	II	4	1,05	26 - 58	5	1:3	Extra-axial Parietal
Rhabdoid meningioma	III	1	0,26	47	5	1:0	Frontal Lobe
Hypophysis adenoma	-	42	11,02	18 - 77	6	16:26	Sellar
Craniopharyngioma	I	6	1,57	3 - 76	4	1:1	Sellar
Schwannoma	I	18	4,72	25 - 85	4/5	11:7	Cerebellopontine angle
Medulloblastoma	IV	5	1,31	6 - 41	2	2:3	Cerebellum
Diffuse large B-cell lymphom	-	7	1,84	34 - 67	6/7	4:3	Frontal Lobe
Hemangioblastoma	IV	5	1,31	21 - 82	3/4	2:3	Cerebellum
Hemangiopericytoma	II	5	1,31	29 - 63	6[a]	2:3	Frontal Lobe

**The metastases were divided into supratentorial, infratentorial and medullary. The most affected lobe was the frontal (12 cases) and the cerebellum surpassed the incidence of each lobe (21 cases).

Graph IV - Gllioma grade (WHO)

■ Diffuse glioma   ■ Ependymal tumors   ■ Non diffuse glioma
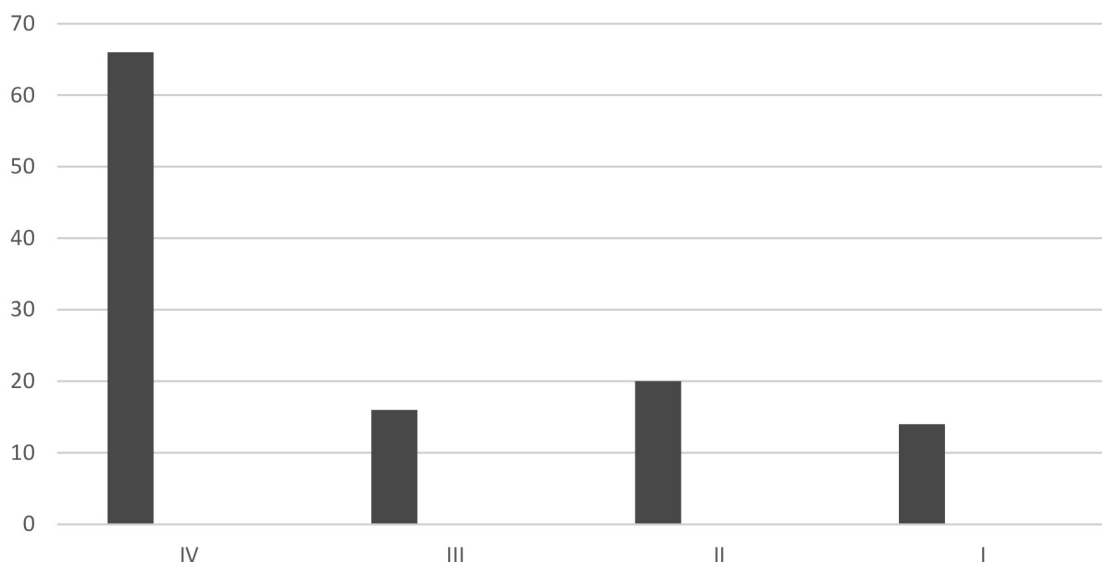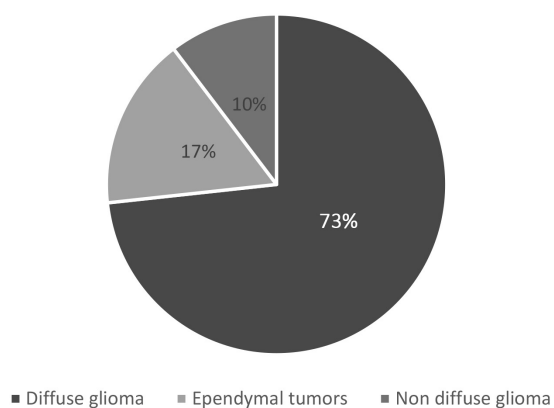
Graph V - Histological subtypes of gliomas

23.1% of the tumors. Grade I meningiomas were the predominant histological subtype in relation to all neoplasms (21.78%), with a ratio of 61 female patients to 22 male patients. North American statistics agreed regarding the main predominant histological subtype: meningiomas, which accounted for 37.1% of primary neoplasms. Also in agreement was the fact that meningiomas were presented as a histological group with the greatest predilection for gender, with more than twice as many cases in women. Regarding large histological groups, meningiomas continued to predominate in that study, in contrast to the present study, in which glial neoplasms led[10].

Regarding metastases, they accounted for 19.42% of all intracranial neoplasms (74 cases), corresponding to the third highest incidence group. Carcinomas accounted for 95.95% of tumors, with breast origin being the most common primary location (24 cases). The most frequent neoplasm in the cerebellum was metastasis. A study in a single center in the Amazon found similar results, with metastases being the third group of tumors most frequently found in the CNS, corresponding to 12% of these[11].

The present study has the limitations of a retrospective study (it is restricted to estimating the prevalence of the studied disease). Furthermore, it is a single-center study, which limits its ability to extrapolate from the data obtained. The fact that the data collection was carried out in a highly complex service may have generated the bias of registering more complex cases (rare histological types). Finally, recording only resected or biopsied tumors excluded from the sample neoplasms diagnosed by imaging exams and that were not submitted to invasive procedures, which underestimated the prevalence of CNS metastases (in many cases just the primary tumor has histopathologic analysis).

Conclusion

The present study documents the frequency of histological types of CNS neoplasms in the Pathology department of an university hospital between 2015 and 2018. This heterogeneous group of tumors has underreported statistical data, which makes the documentation of this information mandatory in the hospitals, as well as carrying out comparative regional and temporal analyses. Thus, the realization of the present series provides detailed data on CNS neoplasms based on histology, which provides important information for hospital, laboratory management and for clinical practice.

Finally, this paper allows the comparison of the frequency of histological types in a large São Paulo center with other large statistics from other services and regions, which were similar.

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