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Itinerary: Clinical and Therapeutic Profile of Brain Tumors

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Abstract:-

➢ ***Introduction***

Brain tumors, defined by the abnormal proliferation of anaplastic cells within the brain meninges or cranial nerves, remain significant contributors to morbidity and mortality despite advances in imaging techniques like MRI, PET, and SPECT, and neuro-oncological therapies. Histological types of these tumors vary by age. This study aims to outline the epidemiological and histological profiles of central nervous system (CNS) tumors at the National Institute of Oncology in Rabat, Morocco.

➢ ***Materials and Methods***

A retrospective descriptive study was conducted on patients treated at the radiotherapy department from November 2018 to October 2021. Parameters such as age, sex, primary clinical signs, tumor origin for secondary lesions, tumor location, and histological types were analyzed.

➢ ***Results***

182 cases of CNS tumors were recorded, with a median patient age of 43 years (range 8-73 years). Women represented 73.2% of the cases, and children made up 8.5% of the study population. The most common symptoms at diagnosis were headaches (68.3%), decreased visual acuity (28%), and nausea/vomiting (24.4%). Tumors were mostly located above the tentorium (80%). Of the tumors, 49% were secondary, primarily originating from the breast (58.6%) and lungs (46%). Glioblastoma was the most common primary tumor (39.1%), with a mortality rate of 55%. Multidisciplinary care is crucial for addressing the challenges posed by this serious prognosis.

➢ ***Conclusion***

CNS tumors are uncommon in Morocco and are generally observed in adults, mainly secondary to breast cancer. Glioblastoma is the most frequent primary tumor. Effective multidisciplinary approaches are necessary to manage these complex cases.

Keywords:- *Epidemiology, Tumor, Central Nervous System.*

I. INTRODUCTION

In 2020, 308,102 new CNS tumor cases were reported globally, constituting 1.6% of all cancers. In West Africa, these tumors accounted for 1.5% of new cancer cases and 2.1% of cancer deaths in Morocco. They are significant causes of morbidity and mortality, especially among children and young adults. The discovery often involves various symptoms like intracranial hypertension, cerebellar syndrome, and motor deficits. In adults, glioblastoma and meningioma are the most common malignant and benign tumors, respectively, while children frequently have pilocytic astrocytoma and embryonic tumors.

II. MATERIALS AND METHODS

➢ *Patient Characteristics:*

We carried out a retrospective descriptive study within the Radiotherapy Department at the National Institute of Oncology in Rabat. The study encompassed all patients treated for CNS tumors between November 2018 and October 2021, who had either histological confirmation or were strongly suspected based on radiological assessment and clinical context.

➢ *Data Studied:*

Patients were identified using the computer recording system, and data were extracted from medical records using a specifically designed data collection form. The data for each patient included:

- Socio-demographic characteristics: Age (categorized according to the Central Brain Tumor Registry of the United States (CBTRUS)) and sex.
- Clinical history: WHO performance status, neurological and extra-neurological clinical signs, and the interval between the diagnosis of the primary tumor and the detection of metastases.
- Radiological characteristics: The location and number of lesions.
- Histological data: The histological types of brain tumors and the primary extra-cerebral lesions.
- Radiotherapy course: The time between surgical removal and the start of radiotherapy for operated tumors, total dose, and fractionation.

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➢ *Statistical Analysis:*

The statistical analysis was performed using SPSS 23 software. Categorical variables were described using frequencies (n) and percentages (%).

III. RESULTS

Table I presents the demographic data. Over the course of three years, we documented 182 cases of CNS tumors, constituting 10% of all cancers treated with radiotherapy in our department during this period. Patient ages ranged from eight to 73 years, with a median age of 43 years. The sex ratio was 0.36.

In this study, the pediatric group (patients aged 19 years or younger) comprised 9.8% of the total cases, while adults accounted for 90.2%. Additionally, 48.8% of patients had a World Health Organization performance status of 1.

Table I: Demographic data

Variable	Number	Percentage (%)
Sex		
Male	82	45%
Feminine	100	55%
Age :		
0-14 years	17	9%
15 – 39 years old	56	30%
≥40 years old	109	59%
P.S.		
0	15	8%
1	80	44%
2	37	20%
3	10	5%

PS: WHO Performance Status

At the time of diagnosis, the most common symptoms included intracranial hypertension indicators: headaches were reported by 68.3% of patients, decreased visual acuity by 28%, and nausea/vomiting by 24.4%. Additionally, dizziness was present in 22% of cases, and motor deficits were noted in 20.7% of patients (Figure 1).

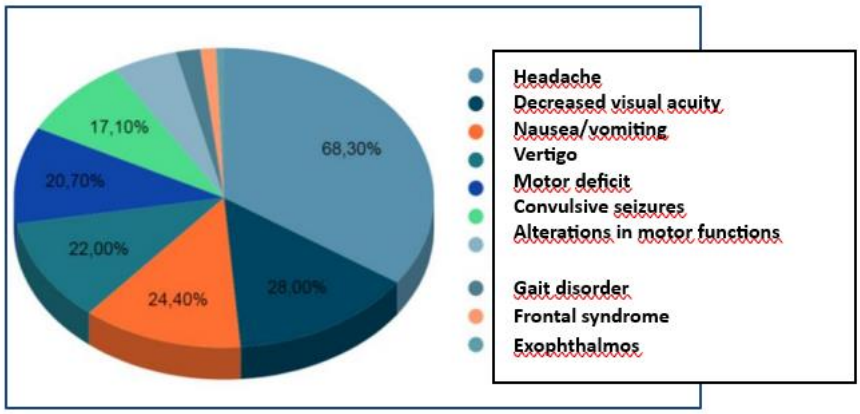

Figure 1: Clinical signs at diagnosis

All patients underwent a brain CT scan, and 87% also had a brain MRI. Tumor locations were supratentorial in 80% of cases and subtentorial in 20%.

For histological types, 28% were primary tumors. Of these, 39.1% were glioblastomas, 17.3% were meningiomas, and 13% were craniopharyngiomas (Figure 2). Secondary tumors constituted 72% of the cases, primarily originating from breast cancer (58.6%), followed by lung cancer and sarcomas (5.2%). Esophageal, rectal, and ovarian cancers each accounted for 3.4%, with other primary cancers representing 1.7% of cases each (Figure 3).

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The time from surgical excision to the start of radiotherapy ranged from four to eight weeks, averaging four weeks. Secondary brain lesions were diagnosed between one month and eleven years after the primary tumor, typically identified through imaging due to clinical suspicion.

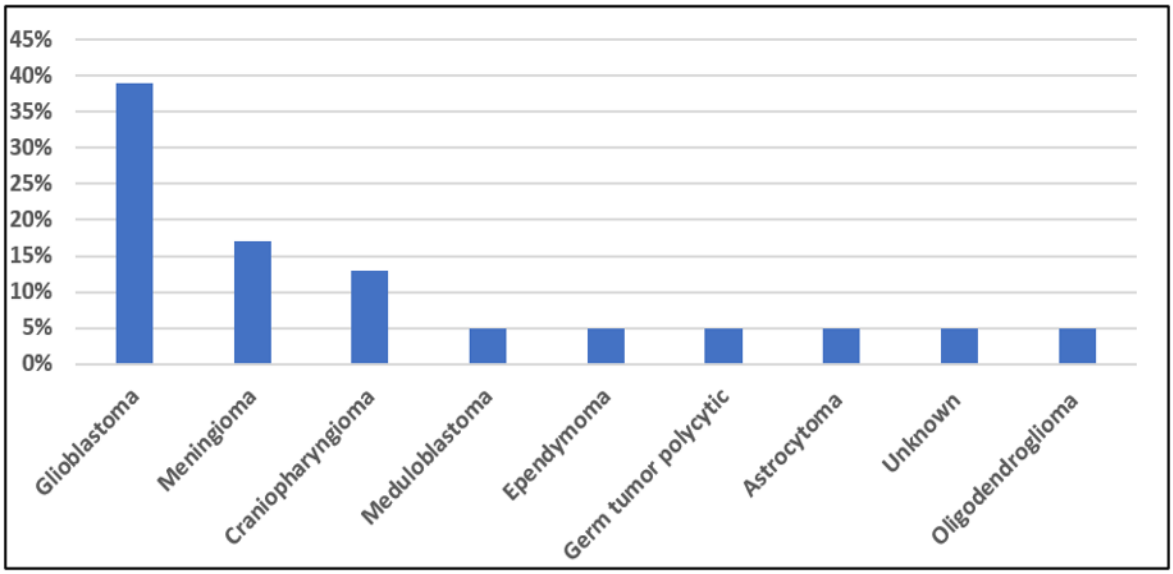

Figure 2 : Distribution of primary tumors of the central nervous system

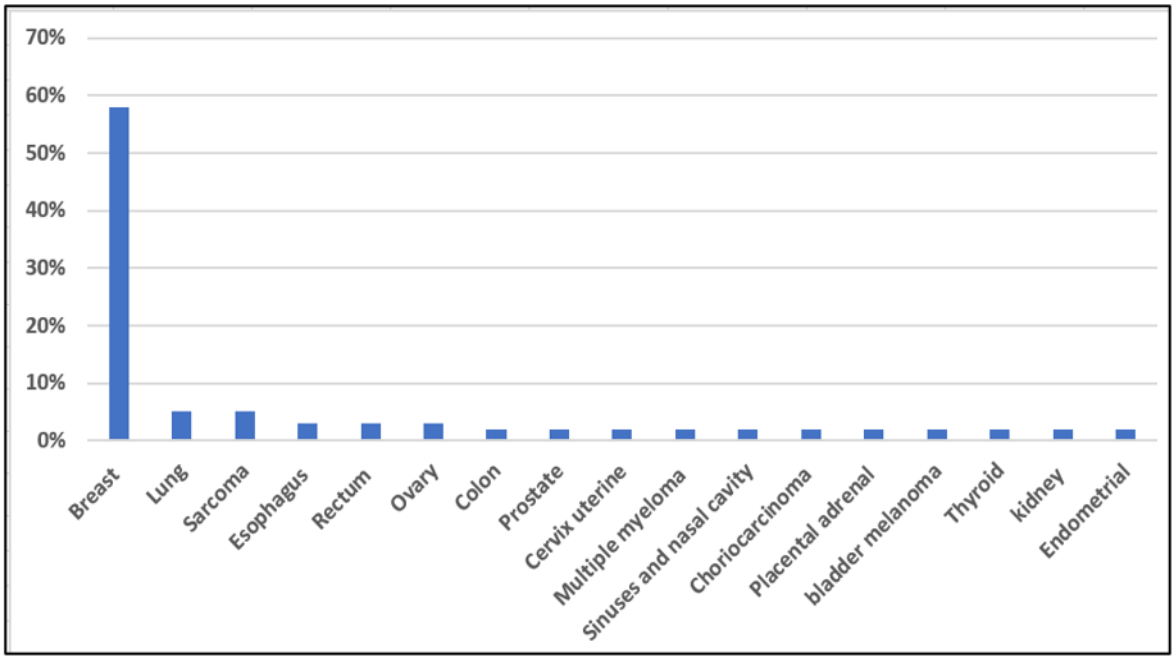

Figure 3: Distribution of secondary tumors of the central nervous system according to their origin.

For patients with secondary brain tumors, a total dose of 20 to 30 Gy was administered, with each dose given in 3 Gy fractions, five days a week. This treatment typically involved irradiating the entire brain. In contrast, patients with primary brain tumors received a higher total dose, ranging from 30 to 60 Gy, with each fraction being 2 to 3 Gy, also given five days a week.(Table III)

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Table III: Distribution of patients according to the dose of radiotherapy received

Dose received (Gy) / Number of Fractions	Number	Percentage (%)
30/10	80	43%
20/5	20	10%
50.4/28	10	5%
54/27	10	5%
60/30	62	34%
Total	182	100%

IV. DISCUSSION

➢ *Incidence and Demographic Characteristics:*

In our department, brain tumors represent 2.7% of hospital cases, which suggests a significant prevalence. However, this data is limited to a single department, and without a comprehensive national registry, the true incidence of brain tumors in the country remains uncertain. Establishing such a registry would provide more precise information on the prevalence of this condition.

According to the 2018 Canadian registry, the incidence rate for brain tumors was 21 per 100,000 people (7). This figure is comparable to rates reported in the USA and France, where incidence ranges from approximately 20.72 to 22.4 per 100,000 people annually (8-9).

Our study found a median patient age of 43 years, which is consistent with existing literature that shows a higher prevalence of CNS tumors in individuals aged 40 and older (5,10–11). Additionally, we observed a higher incidence of brain tumors in females, with a sex ratio of 0.66, aligning with findings from Darlix et al., who reported a ratio of 0.87 (12). The literature suggests that hormonal factors may contribute to the development of some brain tumors, as Bauchet et al. noted a higher prevalence of certain meningiomas in women, with a sex ratio of nearly one-third (13). On the other hand, Perkins and Liu found that the overall incidence of brain tumors is slightly higher in men than in women (14).

➢ *Clinical Presentation :*

At the time of diagnosis, patients most commonly exhibited symptoms of increased intracranial pressure, such as headaches, reduced visual acuity, and nausea/vomiting. These symptoms are typically attributed to the presence of peri-tumoral brain swelling and elevated cranial pressure (14,15). Our results showed that 48 to 71% of patients experienced headaches, aligning with what is generally reported in the literature (16). Convulsive seizures were present in 17.1% of our patients, which is lower than the 40 to 60% range observed by Vecht et al. (17). Tumor-associated seizures have a complex etiology and tend to be less frequent in high-grade gliomas and secondary tumors (18). This may account for the lower seizure rate in our study, where secondary tumors were more common and glioblastomas

➢ *Histological Types:*

Our study found that secondary tumors were the most common, though the reported frequency of primary tumors may be underestimated due to several factors. These include the study's focus on an oncology department, the exclusion of patients with benign or slowly progressing tumors who may not receive radiotherapy, and the potential loss of patients after surgery but before receiving pathological results. Additionally, limited access to treatment due to financial constraints and lack of health insurance may also contribute.

Globally, metastatic lesions are frequently observed in CNS tumors (23–24), which may be related to advancements in treatment options and imaging techniques leading to improved survival rates. In our series, secondary tumors predominantly originated from breast cancer, followed by lung cancer. This pattern might be influenced by the lower smoking rates in Africa compared to Western countries, as smoking is a major risk factor for lung cancer. As a result, breast cancer is more common in Africa, whereas lung cancer, which often metastasizes to the brain, is less prevalent and usually diagnosed at a later stage (1.25–26).

Gliomas, particularly astrocytomas, are the most prevalent primary tumors in adults, with glioblastomas being the most frequently encountered subtype (27,28–29). Our findings align with these observations.

The study also underscores issues such as inadequate coordination between care services, the lack of centralized data management, and limited access to high-quality diagnostic resources, all of which can contribute to delays in treatment.

V. CONCLUSION

Brain tumors represent 2.7% of hospital cases and are typically diagnosed in individuals over 40 years old. Most patients exhibit symptoms of increased intracranial pressure. Secondary tumors, especially those originating from breast cancer, are the most prevalent, while glioblastomas are the

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most common among primary tumors. The creation of a multidisciplinary team—comprising neurologists, radiologists, neurosurgeons, pathologists, oncologists, psychologists, and radiation therapists—could effectively address the complex challenges posed by brain tumors and enhance the management of cases with diverse prognoses.

CONFLICTS OF INTEREST :

The authors have declared no conflict of interest.

DECLARATIONS :

Legal guardians' consent and approval was obtained for publication of these cases.

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