Pediatric Meningiomas in Southwestern Nigeria: A Single-Institutional Experience

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■ BACKGROUND: **Meningiomas are the second commonest intracranial tumors in many places worldwide. They are rare in the pediatric age group, however, and most studies have been able to document only a few patients. Meningiomas in pediatric patients have also been shown to behave differently from those in the adult population. This study was done to examine histologic types of meningiomas seen in pediatric patients from a predominantly African population using the 2016 World Health Organization (WHO) grading system for intracranial tumors.**

■ METHODS: **Data from the operating logs of patients and histology reports of the samples sent to the pathology department during the study period were extracted. The data obtained were the age, sex, location of the intracranial tumor, histologic diagnosis, WHO grade, and tumor recurrence.**

■ RESULTS: **Nine pediatric age patients were found among the 166 surgically excised meningiomas received at the pathology department in our institution over a 19-year period. The age range was from 8 months to 17 years. There was a male-to-female ratio of 1:2 with a female predominance. Six tumors were basally located. All tumors were WHO grade I with transitional meningiomas being the commonest followed by meningothelial. There was no history of recurrence in any of the tumors after complete surgical excisions.**

■ CONCLUSIONS: **Our study showed the rarity of meningiomas in the study population, and there was a predominance of basally located tumors.**

INTRODUCTION

Meningiomas are among the commonest intracranial tumors worldwide and are believed to arise from the arachnoidal cap cells.[1] The tumor is more common in the adult population, and the median age group of the tumor is 65 years, with increasing risk with age.[2] Meningiomas are rare in the pediatric age group and are said to constitute about 0.4%–4.6% of pediatric central nervous system tumors.[3,4] Meningiomas are commoner in females as compared with males, although tumors in males are said to be more aggressive.[2]

The World Health Organization (WHO) has classified meningiomas into 3 grades on the basis of their biological behavior and prognosis, with grade III being the most malignant.[2] Studies suggest that pediatric meningiomas behave differently than the adult types with more aggressive variants seen in pediatric patients.[2,3,5] Due to the rarity of the tumor in this age group, there are no large studies in this area and most work done involved small numbers of patients.[1,5] As such, the behavioral characteristic of this tumor type in the pediatric age group has not been fully elucidated.[1,6]

Meningiomas are said to be more common in blacks compared with Caucasians, and the tumor types seen in blacks are more aggressive.[2,7] Previous studies done in this environment have shown a paucity of meningiomas in the pediatric age group.[8-13] However, none of these studies has examined the histologic

Key words
- Basal
- Grade
- Histology
- Intracranial
- Meningioma

Abbreviations and Acronyms
WHO: World Health Organization

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Table 1. Demography of Patients with Presenting Symptoms, Radiologic Findings, and Histologic Diagnosis

Age	Sex	Clinical Findings	Radiologic Findings	Histologic Diagnosis
8	Male		Frontoparietal	Meningioma
4	Female	Bilateral proptosis with right eye blindness and headaches	Suprasellar mass with orbital and interpeduncular fossa extension	Angioblastic Meningioma
4	Female	Recurrent vomiting with hemiparesis	Left frontoparietal solid and cystic hyperdense lesion	Meningothelial meningioma
14	Female	Proptosis, no visual impairment	Right frontobasal lesion	Transitional meningioma
14	Female	Progressive visual impairment, headaches	Suprasellar	Psammomatous Meningioma
17	Female	Left hemiparesis, tinnitus, headaches and impaired mental status	Left sphenoidal ridge lesion	Transitional meningioma
11	Female	Left proptosis, left total ophthalmoplegia, progressive visual impairment	Left orbital lesion with enlarged left optic canal and intracranial extension	Transitional meningioma
1	Male		Sellar/Suprasellar	Meningothelial meningioma
3	Male	Recurrent seizure, progressive visual impairment, headaches, tinnitus, bilateral plantar extension	Right parietal, brilliantly enhancing tumor with bone hyperostosis	Transitional meningioma

characteristics of meningiomas seen in the pediatric age group. This study aims to determine the histologic characteristics of this tumor, using the WHO grading system, with a review of the literature.

MATERIALS AND METHODS

We did a retrospective study of surgically treated pediatric meningioma biopsies reported over a period of 19 years in the pathology department. The data included were for patients aged 18 years and younger. The data were obtained from the operating logs and histology reports of the samples sent to the pathology department during the study period. The data obtained were the age, sex, location of the intracranial tumor, histologic diagnosis, WHO grade, and tumor recurrence.

Cases that were not graded or the histologic types that were not mentioned in the final diagnosis had their slides retrieved. Two pathologists independently examined the histology slides, and the missing information was included in the study data. The histologic grading was done according to recommendations from the 2016 WHO working group.[2] The data were analyzed by simple frequency percentages using the statistical package for the social sciences 20 statistical software.

RESULTS

A total of 642 intracranial tumor biopsies were received in the department during the study period. Only nine (5.4%) of the 166 histologically diagnosed meningiomas occurred in the pediatric age group, constituting 1.4% of all intracranial tumors. The age range of the patients was from 8 months to 17 years. There were 6 females and 3 males with a male-to-female ratio of 1:2.

The symptom duration ranged from 2 months to 4 years. The most common symptom seen was visual impairment, which was noted in 5 of the children. One of these patients had total blindness of an eye at presentation, while another had total ophthalmoplegia in 1 eye. Three of the patients had proptosis, and 4 had features of raised intracranial pressure. One of the patients with tinnitus had the tumor located at the sphenoid ridge, but the second one had a parietal convexity-based tumor. All of the patients with visual symptoms had basally located tumors. Interestingly, seizure was quite uncommon in this group of patients, affecting only 1 (Table 1). None of the patients had any record of previous irradiation.

Six tumors were located at the basal part of the brain with 3 of these basal tumors arising from the sellar area. The remaining 3 meningiomas were located at the brain convexities. The transitional meningioma variant is the commonest seen followed by the meningothelial (Figure 1). There was relatively equal distribution of the tumors in various locations with respect to age and sex. However, all tumors were WHO grade I.

The follow-up period ranged from 8 months to 4 years, and none of them had clinical history of recurrence as at the time of last clinical review. Post surgery, there was good clinical recovery in the patients, particularly in those with short symptom duration. One of the patients with impaired visual acuity had partial recovery of vision. The only patient in this series who presented with seizure had a marked reduction in seizure frequency as at the time of the last follow-up visit.

DISCUSSION

Meningiomas are the second commonest tumors after gliomas in the central nervous system.[2,10] The occurrence of this tumor in the pediatric and adolescent age groups is quite rare, unlike gliomas.[14] Many studies have shown pediatric meningiomas to constitute about 1.5%–5% of central nervous system tumors and only about 2% of meningiomas.[4,5,12,15,16] The volume of pediatric meningiomas in our series is small, although the 1.4% of intracranial neoplasms seen in this study is in agreement with previously reported studies in the western population.[15,17] However, our series showed pediatric meningiomas to constitute 5% of all intracranial meningiomas, a figure that is in agreement with the report by Hatef et al[12] in Uganda and is higher than the 2% seen in Caucasian populations.[4]

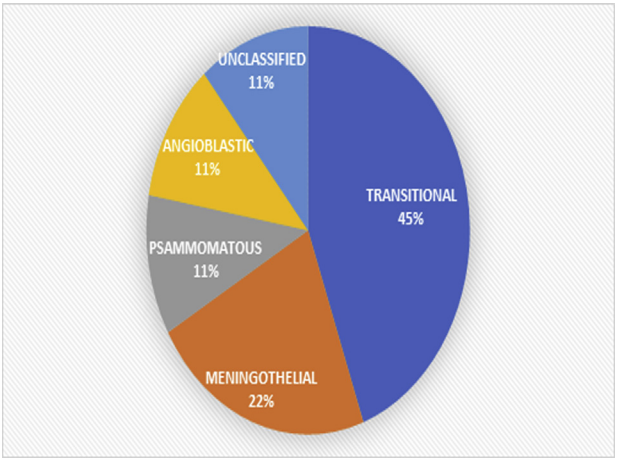

Figure 1. Meningioma variants seen in the study.

Although many studies have demonstrated that, in the general population, skull base meningiomas are less common compared with convexity-based meningiomas, the study by Cornelius et al[19] was the reverse of the general trend.[1,19] Pediatric meningiomas have also shown a higher propensity for the supratentorial region just like in adults in some studies, but Dudley et al[16] found a higher percentage of spinal-based meningiomas in pediatric patients compared with adults.[15] Mezue et al[11,20] in their study of a predominantly black population showed a higher incidence of olfactory groove meningiomas, a finding similar to the index study, which showed a higher number of skull base meningiomas compared with convexity-based meningiomas in this pediatric population.

Cornelius et al[19] in their study showed a reduced frequency of malignant tumors in the skull base. This finding has been shown to be largely true by several other workers and may partly explain the lack of high-grade tumors in our series that were mainly skull base tumors.[6,18] Mezue et al[11] suggested that skull-based meningiomas are often smaller and present to the hospital much earlier, facilitating early detection, a finding corroborated by Dudley et al,[16] who showed that pediatric patients had more surgical interventions than adults. This may reduce the chances of a malignant transformation in the tumor over the course of time. Another possibility for the reduced frequency of malignant tumors in the skull base may be due to their smaller sizes; that is, the tumors are often totally resected. Complete excision has been shown by several workers as a major determinant of recurrence.[3,6] This may explain the finding of Dudley et al[16] in their series of much higher gross total resection and significantly lower mortality in pediatric patients than in the adult counterparts. According to Gump, the planes of the pediatric brain are better defined, which may allow easier visualization of the tumor borders in the skull base and resection, although blood loss is said to be higher.[6]

Most meningiomas in the general population are WHO grade I tumors and are benign in nature, while only about 10% show atypical or malignant features and are graded as WHO grade II and III tumors.[2] There has been disagreement in studies on pediatric meningiomas with respect to the incidence of higher-grade tumors in this population. Several studies have demonstrated a higher percentage of high-grade tumors in pediatric patients while others have shown the reverse.[1,3,6,14,15,21] The rarity of this tumor in the pediatric age group has not allowed for the thorough definition of behavioral characteristics in this group of tumors. A significant number of meningiomas occur in patients with known genetic mutations, such as neurofibromatosis-2 and Gorlin syndrome, but many such tumors have not been associated with higher grades.[15] However, occurrence of irradiation therapy for other tumors is higher in the pediatric population, particularly in those with genetic mutations, and this has been associated with higher-grade tumors.[14] All of the tumors in our series were grade I neoplasms, and there was no history of recurrence in any of them.

Typically, the most common tumor variants seen are the meningothelial, fibroblastic, and transitional meningiomas.[2] These variants are benign in nature and are classified as grade I tumors. The commonest variant seen in our study was the transitional variant and, interestingly, there was no fibroblastic variant seen in this series. There was no association of the tumor types with sex or age in this study. No difference in prognosis has been found in WHO grade I tumors, although location could dictate completeness of tumor resection and thus possible tumor recurrence.[2,22]

Decreased visual acuity, headaches, and hemiparesis have been shown to be a common feature in pediatric meningiomas in several studies.[14,23] This finding was also seen in our study, although seizure was a rare symptom in our group of patients unlike earlier mentioned studies that recorded a significant number of patients with this symptom.[14,23] Optic nerve atrophy is an important consequence of basally located meningiomas in patients with a long duration of symptoms.[14,23] This often results in partial or lack of recovery of vision in patients, as was seen in 1 of our patients who had a 4-year duration of symptoms before presentation.

Pediatric meningiomas are said to show a reversal of gender ratio from that seen in the adult population, although the study by Hatef et al[12] showed equal gender distribution of meningiomas in pediatric patients.[3,5,6] Our series was not in agreement with either of these findings as a higher percentage of the patients were females, similar to findings in the adult population. The reason for this is uncertain, as our finding is also in contrast to the typical picture seen in meningiomas occurring in the African population, which have shown equal gender distribution.[11,12,23] The effect of estrogen and progesterone has been postulated to account for the increased incidence of meningioma in females.[2,5] However, Korhonen et al[24] have shown that there is no difference in the expression of sex steroid receptors in tumors from both male and female patients, suggesting that differences in steroid receptors may not account for the higher incidence of meningiomas in females.

CONCLUSION

Our study has shown that pediatric meningiomas are rare in the study population, a finding that is in agreement with observations from other parts of the world. Yet our study showed no occurrence of higher-grade tumors in the pediatric population, as seen in some other studies. More female patients are affected compared with males, and more tumors are located at the basal part of the brain. A much larger study is needed to determine possible racial differences in the behavior of this tumor in the pediatric population.

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