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Cranial Meningioma in Sudanese Patients: Clinical and Pathological Characteristics

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Abstract

Purpose

This study aimed to study the clinical and pathological characteristics of cranial meningioma among Sudanese patients.

Patients and methods

It is a prospective hospital based study. All Sudanese patients operated upon for cranial meningioma during seven years' period were included in the study. Detailed demographic data and clinical assessment was conducted. The surgical tumor specimens were processed for histologic verification and graded according to WHO grading scale 2007. Data were analyzed and displayed in tables.

Results

Four hundred and five patients were operated upon for cranial meningioma during the study period. The Afro-Asiatic linguistic affiliated tribes were the mostly affected with female to male ratio of 2:1. WHO grade I meningioma constituted 80.5% of the cases mostly the fibrous subtype. Total resection of the tumor was attained in 71% of cases while in 24% subtotal resection of the tumor was done. Good post-operative outcome, WHO performance scores of 0 and 1 was achieved in 81% of the patients. Tumor recurrence was reported in 9.5% of the cases mainly the WHO grade I meningioma.

Conclusion

Meningioma is the most encountered primary cranial neoplasm in Sudan. The Afro Asiatic linguistic affiliated tribes were mainly involved. WHO grade I is the commonest histologic type with domination of fibrous subtype. Total or subtotal surgical resection with good outcome was achieved in 84% of cases. Tumor recurrence was mostly WHO grade I meningioma.

Key words; cranial meningioma, linguistic affiliated tribes, histologic types, surgical outcome.

Introduction

Meningioma is the second most common central nervous system tumor in adults, accounting for 15-30% of all primary intracranial neoplasms [1, 2,3,4,5]. They grow slowly and a number of this tumor gives little or no symptoms that make them under-diagnosed. The incidence is about 6 cases per 1000000 of population per year or even much higher in African countries including Sudan [6, 7, 8, 9, 10,]. The etiology behind the disease is not yet fully understood, however, many genetic events have been found to be associated with meningioma. Loss of genetic material from the long arm of chromosome 22 in most cases may suggest a loss of an important tumor suppressor gene. Two candidate tumor suppressor genes (*NF2* and *INI1*) in the 22q region were extensively investigated worldwide [11, 12, 13]. Almost all studies have indicated a common mutation of *NF2* gene, and extremely rare *INI1* mutation in meningioma.

Epidemiologic approach to study the characteristics of meningioma [14] will enhance our standing about the disease and subsequent development of further management of the disease. The present study, the first large scale report in Sudan aimed to characterize the clinical and the histopathological aspects of cranial meningioma in Sudanese patients.

Clinical Material and Methods

This is a hospital based study conducted at the National Center of Neurological Sciences (NCNS)-Khartoum, Sudan during the period May 2005- May 2012. All patients who have been diagnosed as having cranial meningioma were included in the study. A detailed pre-structured data sheet was filled for every patient. Demographical and clinical data were obtained. Tumor specimens were fixed in 10% formalin. Paraffin embedded blocks were sectioned and stained with hematoxyline and eosin. In certain cases immunohistochemical stains for epithelial membrane antigen (EMA) and progesterone receptor (PR) was performed for further confirmation of the diagnosis. The histological grades and types were determined according to the WHO (2007) classification system. Follow up of the patients was done over 1-5 years. During the above period regular CT and\or MRI images were obtained at an early stage within 3 months post-surgery and there after every year or as necessitated by emergence of new symptoms suggestive of tumor recurrence. Patients with grade WHO III and II plus patients who underwent partial or subtotal surgical resection were subjected to post-operative radiotherapy. The data were analyzed using SPSS version 18 package.

Results

During the period May 2005-May 2012 a total of 405 patients were operated upon and diagnosed as having cranial meningioma. Males were 134 patients (33.1%) and females were 271 (66.9%), with male: female ratio of 1:2. The age ranged between 2 and 95 years with mean age of 47.05 and median age 46.50 (Table 1). Of the affected patients, 65.9% were aged 31-60 years, while 21 patients (5.2%) were aged below 20 years. The Afro-Asiatic linguistic affiliated Sudanese tribes were the most affected, 273 patients (67.4%). followed by Nilo-Saharan 23.5% and Niger-Congo 5.9%. (Table 2).

The clinical history revealed headache as the main presenting symptom in 98.1% of the patients, followed by personality change (82.4%), and convulsions in 68.5% of the patients. The anatomic location of the tumors showed convexity tumors in 32.2% of the patients, followed by falx in 19.1%, olfactory groove in 11.5% and temporal region in 8.4% of patients

(Table 3). The histopathological classification of the specimens revealed Grade I meningioma in 80.5% of the cases followed by Grade II in 16.0% and Grade III in 3.5% of the patients (Table 4). Histological examination identified 15 histological types. Fibrous meningioma constituted 45.5%; meningothelial 15.6% and atypical 13.1 % (Table 5). Among the meningothelial variant 2 cases were cystic and one was intraosseous. Total resection of the tumor was attained in 273 (70%) of patients while subtotal resection was attained in 93 (24%), the remaining 22 patients were subjected to either debulking or simple biopsy. Good postoperative outcome (0 and 1) WHO performance status scores was achieved in 87.5% of the patients who underwent total tumor resection, while 77.4% of the cases who underwent subtotal resection achieved the same outcome. Thirty of the patients died of causes related to associate medical diseases (Table 6).

True tumor recurrence was reported in 26 patients, while in 19 patients regrowth of residual tumor was encountered. The true tumor recurrence was mostly WHO grade 1, however within the WHO grades the rate of recurrence is higher in WHO grade II (22.2%), followed by WHO grade III (18.2%).

Discussion

In this study a total of 405 patients were diagnosed as having cranial meningioma during a period of 7 years. In this same period a total of 602 patients were operated upon for primary cerebral neoplasms. This accounts for 65.9/% of all primary brain tumours. In a previous communication from Sudan, Abu Salih and Ali A Rahman reported predominance of meningioma in a total of 127 cerebral tumours operated upon during 10 years' time [7]. The true incidence is expected to be much higher since the investigative facilities and neurosurgical service is still scarce in a wide country like Sudan. Reports from other African countries showed increased incidence of meningioma among blacks in contrast to the increase incidence of gliomas in western communities [6, 8,9,10] . This discrepancy has been attributed by some researchers to ethnic and\or geographical predisposition. In the present study we report distinct tribal vulnerability to meningioma. The Afro-Asiatic affiliated Sudanese tribes [15, 16] are the most affected (69.8 %). Among all patients with meningioma reported in this study, there was no patient with southern ethnic origin, although more than two million southerners had lived in the northern states during the period of the study and a good number of southerners had presented to the neurologic clinics with other diseases. The geographic impact on the incidence of the disease could be disclaimed since meningioma was reported in members from the same tribe who resided in distant geographical locations in Sudan. It seems justifiable to claim genetic predisposition to meningioma.

Females constituted 66.9% of the meningioma cases. This preponderance has been suggested to be hormone dependent.

The affected age group in this study was mostly middle age however, the number of meningioma cases among children and early adulthood (5.2%) is remarkable and it's noticeable in this series that 15.1% of the patients are below 30 years. In the literature childhood meningioma has been considered as rare [17,18,19,20].

It is of considerable importance that the volumes of the meningioma in all paediatric cases reported in this study were large and the histological types were all WHO grade 1 (unpublished data). This distinct morphological

and histopathological behaviour warrant further study.

The clinical presentation was dominated by headache in 98% of patients, followed by personality change and convulsions. Headache is a common symptom in a number of diseases, furthermore, it is a common complaint in the community and limited numbers of headache complainers seek medical advice. While convulsions is a worrying symptom that forces patients to seek help, however, in the Sudanese community there is still a number of people who consider epilepsy as social stigma and seek advice from traditional healers. The association of behaviour change and convulsions could further add to the miss concept of spiritual illness. These could add to the unnecessary delay to seek medical advice and hence the rather advanced stage of the clinical presentation.

Though the postoperative outcome correlates well with the surgical resection, yet the tumour recurrence within the grade 1 meningioma calls for special attention. In spite of total resection of reasonable accessible tumours, still recurrence had been reported in some cases. In previous studies we have reported on the possible correlation between fibrous meningioma recurrence and Ki 67 immunoreactivity as indicator of invasiveness [21]. While regrowth of residual tumours was anticipated in critically located tumours where total resection posed real risks to the patients [22].

Conclusions

In conclusion the results of the present study showed meningioma as the commonest primary brain tumor in Sudan, the most affected categories are females and the Afro-Asiatic tribes. The clinical characteristics of the tumors showed a distinct profile with regard to presenting symptoms, age of the patient and the outcome of surgery. In addition the histopathological examination revealed all known 15 histological variants. WHO grade I meningioma being the most common with domination of the fibrous variant.

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Results

Table 1.

Age range of 405 patients with cranial meningioma.

Age in years		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-10	8	2.0	2.0	2.0
	11-20	13	3.2	3.2	5.2
	21-30	40	9.9	9.9	15.1
	31-40	82	20.2	20.2	35.3
	41-50	95	23.5	23.5	58.8
	51-60	88	21.7	21.7	80.5
	61-70	66	16.3	16.3	96.8
	71-80	12	3.0	3.0	99.8
	91-100	1	0.2	0.2	100.0
	Total	405	100.0	100.0	

Table 2.

Tribal linguistic affiliation of the meningioma cases.

Linguistic affiliation		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Afro - Asiatic	273	67.4	69.8	69.8
	Nilo-Saharan	95	23.5	24.3	94.1
	Niger- Congo	23	5.7	5.9	100.0
	Total	391	96.5	100.0	
Missing	System	14	3.5		
Total		405	100.0		

Table 3

Anatomical sites of the resected cranial meningioma.

Anatomical site		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Convexity Frontal	56	13.9	14.2	14.2
	Convexity parietal	52	12.8	13.2	27.7
	Convexity occipital	20	4.9	5.1	32.6
	Temporal	34	8.4	8.7	41.2
	Parasagittal	14	3.5	3.5	44.8
	Bilateral parasagittal	6	1.5	1.5	46.3
	Falx anterior	15	3.7	3.8	50.1
	Falx middle	34	8.4	8.7	58.8

	Falx posterior	3	0.7	0.8	59.5	
	CPA	18	4.4	4.6	64.1	
	Olfactory groove	44	10.9	11.2		75.3
	Suprasellar	26	6.4	6.6	81.9	
	Sylivian	11	2.7	2.8	84.7	
	Tentorial	9	2.2	2.3	87.5	
	Intra orbital	4	0.9	1.1	88.5	
	Multiple meningiomas	13	3.2	3.3	90.8	
	Sphenoid wing	31	7.6	7.9	98.7	
	Foramen magnum	3	0.7	0.8	100.0	
	Total	393	97.0	100.0		
Missing	System	12	3.0			
Total		405	100.0			

Table 4

WHO-2007 histological grading of the meningioma specimens.

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		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	GI	326	80.5	80.5	80.5
	GII	65	16.0	16.0	96.5
	GIII	14	3.5	3.5	100.0
	Total	405	100.0	100.0	

Table 5

Histological sub types of the meningioma specimens.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Meningiothelial	62	15.3	15.6	15.6
	Fibrous	181	44.7	45.5	61.1
	Transitional (mixed)	35	8.6	8.8	69.8
	Psammomatuos	19	4.7	4.8	74.6
	Angiomatus	7	1.7	1.8	76.4
	Microcystic	4	1.0	1.0	77.4
	Secretory	5	1.2	1.3	78.6
	Lymphoplasmacyte	2	0.5	0.5	79.1
	Metaplastic	2	0.5	0.5	79.6
	Atypical	52	12.8	13.1	92.7
	Clear cell	14	3.5	3.5	96.2
	Chordoid	1	0.2	0.3	96.5
	Papillary	5	1.2	1.3	97.7
	Anaplastic	8	2.0	2.0	99.7
	Rhabdoid	1	0.2	0.3	100.0
	Total	398	98.3	100.0	
Missing	System	7	1.7		
Total		405	100.0		

Table 6

Surgical outcome and tumor recurrence or regrowth among cranial meningioma patients.

** True recurrence after complete resection of the tumor.

			OUT COME				
			WHO Performance Status Score				
RECURRENCE			**0-1**	**2**	**5**	**4**	Total
Yes	Operation	Total resection **	21	5	0	0	26
		Subtotal resection	7	2	2	0	11
		Debulking	2	5	1	1	9
		Total	30	12	3	1	46
NO	Operation	Total resection	218	14	15		247
		Subtotal resection	65	5	12		82
		Debulking	2	4	0		6
		Biopsy	0	1	0		1
		Total	285	24	27		336