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Magnetic Resonance Presentation of Intracranial Meningiomas

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Abstract

Magnetic resonance (MR) has become the most important imaging method in the diagnosis of intracranial meningeomas. The aim of this study was to present the characteristics of meningiomas. Thirty patients with histologically proven intracranial meningiomas were studied. There were 20 female and 10 male patients (median=53±15 years). All MR examinations were performed on the MR apparatus, the strength of which is 1.5T. All patients were scanned with T1, T2-weighted imaging (T1WI, T2WI), FLAIR and contrast-enhanced T1WI. Most of the tumors showed on T1WI the isointense signal (80

Index terms— MR, meningioma

1 INTRODUCTION

eningiomas are common intracranial tumors that arise from the cells covering the external arachnoid layer (1) compressing the brain (2). Meningiomas represent 20-26% of all primary intracranial neoplasms. They represent 20% of all intracranial tumors in men and 38% in women. 94% of meningiomas are benign, 4% are atypical and 1% is anaplastic. Benign meningiomas are more common in women, whereas atypical and anaplastic forms are frequent in men (3).

They also present as primary intracranial neoplasms, together with astrocytomas, that produce distant metastases in the lung and breast (4,5). They appear in the middle decades of life with a female predominance in incidence M:F=1:1.5 to 1:3. They show the geographic (includes 30% of intracranial tumors in Africa) and ethnic predominance (Caucuses, Spanish, African-Americans (6,4). Meningioma has estrogenic (0-94%) and progesterone receptors (40-100%).

Besides these receptors, the expression of androgen receptors can be found in meningiomas with approximately equal frequency, so that 69% present in males and 31% in women (6).

The beginning of magnetic resonance application (MR imaging -MRI) in the early 1980s radically changed the routine radiological diagnosis of primary and secondary brain tumors. Today, MRI is a key modality not only for diagnosis of lesions, but also for the assessment of type and grade of the tumor and degree of spreading into the surrounding tissue (7). On MR imaging, meningiomas are presented with various signals depending on the sequence. On T1WI, they show isointense signal and hypointense signal, and on T2WI they show hyperintense signal. After the application of gadolinium, on contrast-enhanced T1WI sequences, meningiomas show intense staining, which can be heterogeneous in some cases (7,8). We presented MR imaging findings of 30 patients with meningeoma.

2 II. METHOD

A prospective study involved a group of 30 patients with histologically proven intracranial meningiomas in the period 2004-2009. The study included 20 women (66.66%) and 10 men (44.44%), with mean age 53±15 years. All patients underwent surgical resection of the tumor; histological diagnosis of tumors was determined according to WHO classification.

DW MRI method was performed in the Center for Radiology Ni?, on the Siemens Avanto MR device, whit magnetic fields of 1.5T. The examinations were performed in all patients, up to seven days before surgery, according to the standard protocol with the following sequence: T1WI, T2WI, FLAIR and post contrast T1W.

Comparison of representation of certain findings by the level of T sequences between patients with different histological diagnoses was performed by Fisher exact probability test of the null hypothesis (Fisher's exact test).

3 M

4 III. RESULTS

MR imaging was performed in 30 patients in the period **??**2004] **??**2005] **??**2006] **??**2007] **??**2008] **??**2009] From the total number of patients (30), meningothelial meningiomas were diagnosed in 15 (50%) patients, 66.66% of women and 33.34% of men. Fibroblastic meningiomas were found in 10 (33.33%) patients, 70% of women and 30% of men. Cystic meningiomas were diagnosed in 5 (16.67%) patients, 60% of women and 40% of men.

According to the results obtained in our study, there is a female predominance in the incidence M:F=1:2. In our study, all patients had a solitary lesion before surgery. Supratentorial localization was reported in 25 (83.34%) patients. The tumor was localized in the cerebral convexity in 13 (43.33%) patients, parasagital region in 5 (16.66%)patients, parafalcine in 2 (6.66%) patients, occipital diploe in 1 (3.33%) patient, anterior fossa in 1 (3.33%) patient, middle fossa in 1 (3.33%) patient, tentorium in 2 (6.66%) patients.

Infratentorial localization was confirmed in 5 (16.66%) patients. The cerebellopontine angle in 3 (10%) patients, and petrous apex in 2 (6.66%) patients.

According to the results obtained in our study, taking into account the localization of tumors, meningiomas have statistically significantly more supratentorial localization -83.34%, compared to infratentorial localization in 16.66%.

5 a) Radiologic Finding

The frequency of isointense findings on T1WI (80%) was significantly higher (p<0,05 0,01) than the frequency hypointense finds 20%. Hyperintense and mixed findings were not recorded in patients examined.

The frequency of isointense findings on T2WI (80%) was significantly higher (p<0,05 0,01) than the frequency hyperintense finds 20%. Hypointense and mixed findings were not recorded in patients examined.

The frequency of isointense findings on FLAIR (80%) was significantly higher (p<0,05 0,01) than the frequency hyperintense finds 20%. Hypointense and mixed findings were not recorded in patients examined.

The frequency of intensive findings on postcontrast T1WI (90%) was significantly higher (p<0,05 0,01) than the frequency of moderate discoloration (20%). All patients had negative findings on postcontrast T1WI sequences. Given the intensity of the signal, according to data obtained in our study, the majority of tumors on T1WI show isointense (80%) and hypointense signals (20%). On T2WI, the majority of tumors (80%) show isointense and the hyperintense signals (20%). On FLAIR sequence, the majority of tumors show isointense (80%) and hyperintense signals (20%). After contrast application, on post-contrast T1WI sequences, 90% of tumors showed extensive staining, and 10% of the tumors moderate staining, which is a statistically significant difference (p<0.01) (Table 6).

IV.

6 DISCUSSION

Meningiomas represent 20-26% of all primary intracranial neoplasms (3), i.e. 14-20% (9). They appear in the middle decades of life with a female predominance in incidence 2:1 (4,6,10-13), and 2.2:1 based on the data available in the reference literature (14), which is in agreement with the results obtained in our study, where the average age is 53±15 years, with a female predominance in incidence 2:1.

Meningiomas present as solitary lesions. Multiple meningiomas are rare lesions. Only 1-9% of intracranial meningiomas had multiple lesions (15), or 4.4% according to literature data (14). In our study, all lesions were solitary. Extracranial metastasis of malignant meningiomas are rare, occurring in less than 0.1% of all meningiomas (16). In our study, all patients with no extracranial metastases. **??**3) on the basis of his researches and literature data show the distribution of meningioma: parasagittal and parafalcine 25%, convexity 19%, sphenoidal ridge 17%, supra sella (tuberculum) 9%, posterior pit 8%, olfactory groove 8%, middle fossa (Meckel's cave) 4%, tentorium 3%, peritorcular region 3%, 1-2% lateral ventricles, foramen magnum 1-2%, 1-2% optical path.

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8 Histopathological diagnosis

9 Results

10 Iso

Based on the research by Monroe (17) et al., the convexity and parasagittal region are the most common localizations of meningioma in more than 50%. However, studies by other researchers provide data on 23.5%

of para-sagittal, parafalcine and convex localizations, intraventricular (23.5%) in the Sylvian fissure (8.8%), petroclival (8.8%), CPA (5,9%), and foramen magnum, tuberculum sellae, cavernous sinus, sphenoidal ridge in 32.3% of cases (18). According to Huang et al. (19) the most common site of meningiomas is convexity, while Hadidy et al. (14) in their study reported the para-sagittal one in 23.3% of cases.

According to the results obtained in our study and taking into account the localization of tumors, meningiomas statistically significantly occupy supratentorial localization in 83.34% of cases, compared to infratentorial localization in 16.66% of cases.

11 b) Radiologic Findings

There are several studies that have considered the signal characteristics of meningioma on MR imaging. Signal intensity of the tumor mass is variable on T1WI, T2WI and FLAIR sequences (20)(21)(22). On T1WI, most tumors are isointense in respect to gray matter (56-94%), while hypointense ones occur in 20-48% of cases and hyperintense are very rare. On T2WI, about 50% meningiomas are isointense, 4-18% hypointense, while 35-44% are hyperintense (20,21).

According to the results obtained in our study and taking into account the localization of tumors, meningiomas statistically significantly occupy supratentorial localization in 83.34% of cases, compared to infratentorial localization in 16.66%.

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In our study, with respect to signal intensities, the majority of tumors on T1WI show isointense (80%) and hypointense (20%) signals. On T2WI, the majority of tumors show isointense (80%) and hyperintense (20%) signals. On FLAIR sequence, most of the tumors show isointense (80%) and hyperintense (20%) signals.

Meningiomas show intense staining after contrast applications on post-contrast T1WI sequences (20,21,23). Tumor staining in patients with meningiomas can help to identify anatomical boundaries of larger lesions that can be isointense on T1WI.

In our study, after contrast application on the post-contrast T1WI sequences, 90% of the tumors show extensively staining, and 10% of tumors have moderate staining of tumor.

Hadidy et al. (14) reported that the majority of meningiomas presented with isointense signal on T1WI and T2WI, hyperintense signal on FLAIR and intense staining. Yao et al. (24) in their study reported that meningiomas on T1WI had predominantly hypointense signal on T2WI and hyperintense signal on FLAIR sequences. Huang et al. (14) in their study of 76 patients concluded that isointense or hyperintense signals on T2WI were reported in 70.6% of cases, while a study of 106 patients on post-contrast T1WI showed significant intense staining in 82.5% of patients. [1] [2] [3]

Figure 1:

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Figure 2: Table 1 :

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Histopathological diagnosis	Woman	Sex	Man	Total
Meningothelial meningiomas	10 (66,66%)	5 (33,34%)	15 (50%)	
Fibroblastic meningiomas	7 (70%)	3 (30%)	10 (33,33%)	
Cystic meningiomas	3 (60%)	2 (40%)	5 (16,67%)	
Total number of meningiomas	20 (66,66%)	10 (44,44%)	30 (100%)	

Histopathological diagnosis	Xsr	SD	Parameter	Min	Max
			Med		
Meningothelial meningiomas	64,00	6,25	62,00	59,00	71,00
Fibroblastic meningiomas	48,67	17,05	48,00	26,00	72,00
Cystic meningiomas	46,00	.	46,00		
			46,00		
			46,00		
Total number of meningiomas	53,00	15,11	54,00	26,00	72,00

According to the results obtained in our study, meningiomas occur in the middle decades of life, with mean age 53±15 years.
The anatomic distribution of tumors

Figure 3: Table 2 :

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Supratentorial	Infratentorial
Convexity 13 (43,33%)	Cerebellopontine angle 3 (10%)
Parasagittal region 5 (16,66%)	Petrous apex 2 (6,66%)
Parafalcine 2 (6,66%)	
Occipital diploe 1 (3,33%)	
Anterior fossa 1 (3,33%)	
Middle fossa 1 (3,33%)	
Tentorium 2 (6,66%)	
25 (83,34%)	5 (16,66%)

Figure 4: Table 3 :

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Histopathological diagnosis	Results
Iso Meningothelial meningiomas 15 (100,0%)	-Hypo Fibroblastic meningiomas 9 (90%) -Cystic meningiomas
Total number of meningiomas 24 (80,0%)	- 6 (20,0%)

[Note: © 2011 Global Journals Inc. (US) 2011 December]

Figure 5: Table 5 :

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Histopathological diagnosis	Iso	Results Hypo	Hyper	Mixed
Meningothelial meningiomas	15 (100,0%)	-	-	-
Fibroblastic meningiomas	9 (90%)	1 (10%)	-	-
Cystic meningiomas	-	5 (100,0%)	-	-
Total number of meningiomas	24 (80,0%)	6 (20,0%)	-	-

Figure 6: Table 4 :

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Figure 7: Table 6 :

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Figure 8: Table 7 :

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