JMSCR Vol||05||Issue||01||Page 15398-15402||January 2017

www.jmscr.igmpublication.org
Impact Factor 5.244
Index Copernicus Value: 83.27
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v5i1.34

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Prospective MRI Evaluation in Typical Meningiomas - A Tertiary Centre Experience

Authors
Beenamol S, Sharmad M S, Meer Chisthy
Medical College Trivandrum Kerala
Corresponding Author
Beenamol S
Associate Professor, Dept of Radiodiagnosis, Medical College Trivandrum Kerala

Abstract
Background: *Meningiomas are the most common nonglial brain tumours and are characterised by rather distinct natural history as well as outcome. Pre-operative distinction of typical and atypical meningiomas can help in planning the surgical management..*
Methods: *This was a Prospective Observation study, done at Government Medical College, Trivandrum over a 3 year period. Study population included the patients with meningiomas evaluated with Magnetic Resonance Imaging, after a previous CT scan. Final pathological diagnosis in all patients was confirmed with biopsy followed by histo-pathological examination.*
Results: *Of the 183 cases studied, 165 cases were found to be typical meningiomas, 15 were found to be atypical while 3 were found to be anaplastic.*
Conclusions: *MR imaging is effective in detecting the salient features of meningiomas as well as in differentiating between typical and atypical meningiomas. This makes conventional and advanced MRI the imaging of choice in all cases of meningiomas.*
Keywords: *Brain tumours; Meningiomas; Magnetic Resonance Imaging.*

Introduction

Meningiomas are the most common non-glial intracranial neoplasms. 75% of meningiomas are benign and are classified as grade I according to World Health Organization (WHO) criteria. The prognosis of grade 1 tumors is excellent whereas grades 2 and 3 meningiomas display less favourable clinical outcomes. Malignant and atypical meningiomas are found to be more prone to recurrence and rapid growth. This study analysed the MRI characteristics of typical meningiomas

Materials and Methods

The study setting was Government Medical College hospital, which is the largest public sector health care institution in the state of Kerala and caters to the largest number of patients from the southern districts of Kerala and Tamil nadu. This was a Prospective study, done on diagnosed cases of meningiomas at our institution. 50 cases of histologically proven grade 1 meningiomas, who were treated surgically in our hospital between January 2010 and December 2013 were prospectively analysed. The patients comprised of

12 males and 38 females, ranging in age from 26 to 70 years.

Imaging Technique and Protocol: MR imaging was done with 1.5.Tesla Magnetom Avanto MRI machine manufactured by Siemens. Imaging included pre- and post contrast T1 and T2 fast spin-echo (FSE), T2 FLAIR, Susceptibility weighted imaging (SWI). Advanced MR imaging features like Diffusion weighted Imaging (DWI) using b value of 0 and 1000, ADC mapping, and Perfusion imaging and MR spectroscopy were performed in all cases. A rapid bolus injection of 0.1mmol/L of Gd DTPA per kilogram of body was delivered through an indwelling intra venous catheter. Image acquisition started after contrast material injection and saline bolus. Multivoxel Chemical shift MR spectroscopic imaging using short TE(30ms) and intermediate TE(135ms) were performed.

Morphologic and Enhancement Criteria

On MRI, variables like signal intensity of the tumour on T1 characteristics (isointense/hypointense/hyperintense) were compared to normal gray matter, T2 characteristics (isointense/hypointense/ hyperintense), tumour margin (well defined/ lobulated/ mushrooming/ill-defined), peritumoural band (absent/partial/complete) and extent of surrounding oedema. Perifocal oedema was graded as absent (0), less than the size of tumour (+) and more than the size of tumour (++). Pattern of contrast enhancement (none/homogenyeous /heterogeneous/intense vessel like) and the dural tail sign(absent/present) were analyzed. Presence of calcifications was assessed by blooming in Susceptibility weighted imaging. Other findings as cystic areas and bone changes (hyperostosis) were also assessed. Advanced MR Imaging techniques like Diffusion weighted imaging/ Perfusion weighted imaging and MR spectroscopy were studied for all the tumours.

Results

On T1W images, most of the lesions: 31 lesions (62%) appeared hypointense (Fig.1) compared to the grey matter. 36% of the lesions were found to be isointense and 2 lesions were hyperintense. On the T2-weighted images and FLAIR sequences, hyperintense signals were observed in 64% cases. Rest of the lesions showed hypointense signals. 20% lesions showed cystic areas (Fig.3) appearing markedly hyper intense in T2W images. Majority of the lesions appeared nonhomogeneous on T1 and T2 W images.

Blooming noted in Susceptibility weighted images suggesting calcifications or haemorrhage. Peritumoural band showed a hypointense rim on T1W and a hyperintense rim on T2W. Presence of the peritumoural band was evaluated. Peritumoural band was completely present in 20% of cases; it was partially apparent in 60% of tumours and absent in 20% of cases.

On contrast administration 80% of the tumours showed intense heterogeneous enhancement, while 20% showed moderate enhancement. The contrast enhancement was heterogeneous in most of the tumours. Presence of the dural tail sign (Fig.2) with thickened enhancing dura extending from the tumour on post-contrast T1W was also assessed. Dural tail sign was seen in 64% of the tumours. Dural tail was absent in 36% of cases.

No Perifocal oedema was seen in 60% of the cases. 10% of the cases displayed oedema larger than the tumour. 30% cases showed oedema less than the size of the tumour

In Diffusion weighted imaging 60% of the tumours showed hyperintensity (Fig.5) and hypointensity in ADC maps suggesting diffusion restriction. All the tumours showed increased perfusion. In MRS, raised Choline and Reduced NAA were consistently seen in all the masses. However, alanine was not been found to be increased in any of the meningiomas.

While assessing the histopathology, 60% of the tumours were meningothelial (Fig.6) variety. 30% were Transitional and 6% were Fibroblastic (Most of these tumours were hypointense to grey matter). Angiomatous (Fig.7) type comprised 2% of all tumours. These tumours appeared hyperintense to grey matter in T2WI. 2 lesions were of the Psammomatous (Fig.8) variety, which were hypointense to grey matter in T1WI.

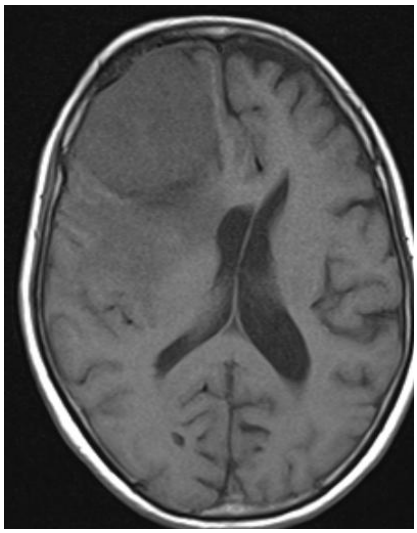

Fig 1.TIWI-hypointense mass in the right frontal region

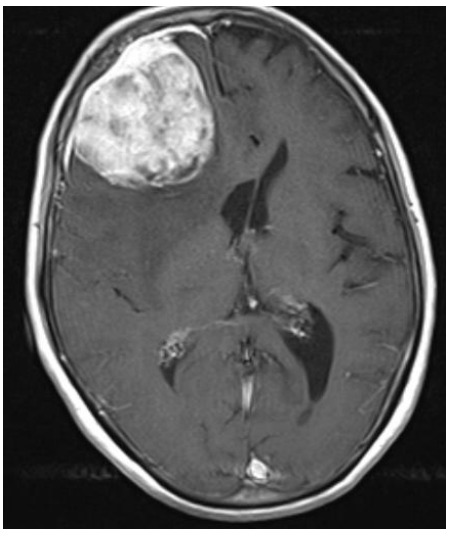

Fig 2: Enhancing dural tail

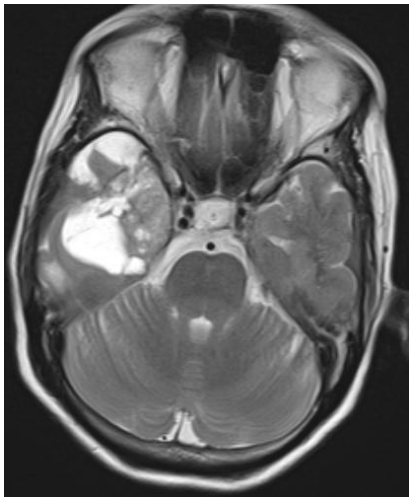

Fig 3.T2WI cystic spaces within right temporal meningioma

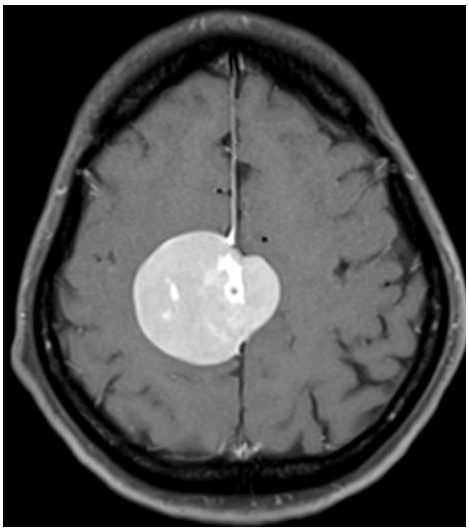

Fig 4.Parafalcine meningioma

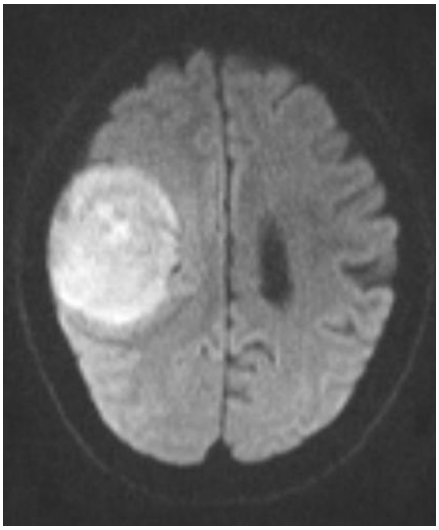

Fig 5.DWI restricted diffusion

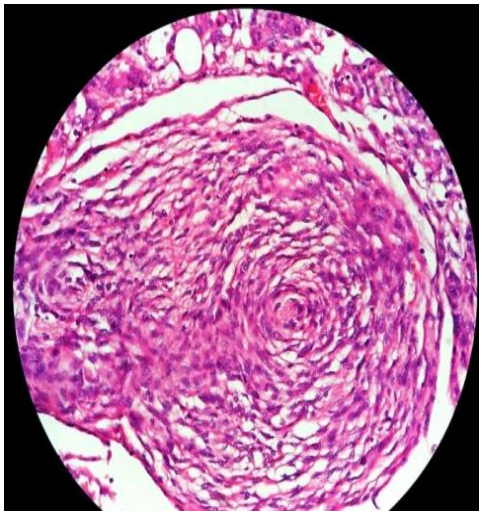

Fig 6 Photomicrograph Menigothelial meningioma

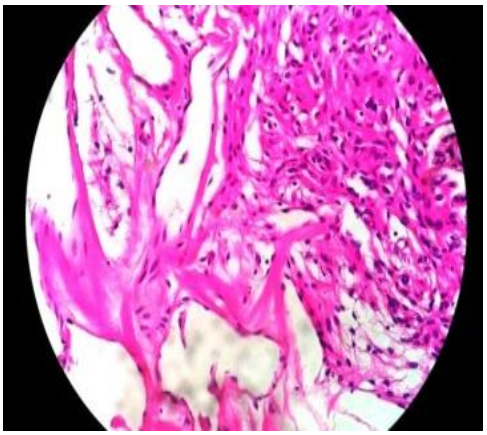

Fig 7 Photomicrograph Angiomatous meningioma

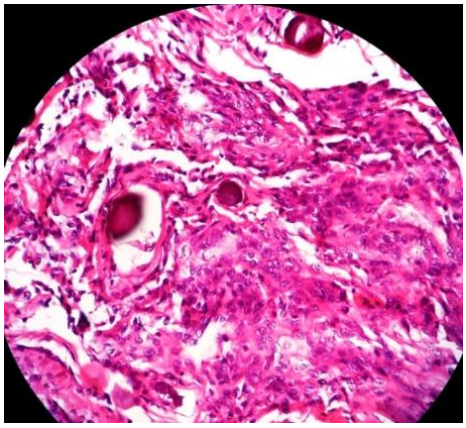

Fig 8. Photomicrograph Psammomatous

Discussion

The signal characteristics of meningiomas in T1W and T2W images vary considerably. It is summarised that meningiomas are characteristically hypointense to isointense with T1-weighted pulse sequences and isointense to hyperintense with T2-weighted pulse sequences[2]. In our study on T1W images, most of the lesions (62%) appeared hypointense compared to the gray matter, 36% of the lesions were isointense and 2 lesions were hyperintense. On the T2-weighted images and FLAIR sequences, hyperintense signals were observed in 64% cases. Rest of the lesions showed hypointense signals. 20% lesions showed cystic areas appearing markedly hyperintense in T2W images. Majority of the lesions appeared nonhomogeneous on T1 and T2 W images.

Intense enhancement is seen in meningiomas owing to rich vascularity. The post contrast images help in delineating the tumour margins clearly. On contrast administration, 80% of the tumours showed intense heterogeneous enhancement. 20% showed moderate enhancement. The contrast enhancement was heterogeneous in most of the tumours.

Even though the dural tail sign[3] is not pathognomonic of meningiomas, its presence is highly predictive of meningiomas. The criteria regarding dural tail (Fig.2) is that the tail should be identified in two successive sections, the focal thickening should taper smoothly away from the mass and the intensity of enhancement should be the same or more than the mass. Almost 60% of the patients with meningiomas may present the dural tail signal on post-contrast T1-weighted images[1]. As summarized in the study by RD Tien, PJ Yang, PK Chu et al,[3] dural tail sign was a found in all typical meningiomas. In our study dural tail was present in 64% of cases.

Heterogeneity due to the presence of calcifications, cystic areas and haemorrhage can be seen in meningiomas. 20% lesions showed cystic areas appearing markedly hyperintense in T2W images. Peri-tumoural brain edema[6,7] is found in more than half of all meningiomas cases. No Perifocal oedema was seen in 60% of the cases. 10% of the cases displayed oedema larger than the tumour. 30% cases showed oedema less than the size of the tumour.

In Diffusion weighted imaging 60% of the tumours showed hyperintensity and hypointensity in ADC maps suggesting diffusion restriction. All the tumours showed increased perfusion. Perfusion MR imaging provides useful information on measuring the degree of tumor angiogenesis and capillary permeability, both of which are important biologic markers of malignancy.

Raised Choline and reduced NAA were consistently seen in all the masses. Raised alanine peak (occurs between 1.3 and 1.4 ppm) is characteristic for meningiomas. In our study alanine was found to be increased in all the tumours. Histopathologically Grade 1 meningiomas fall into Meningiothelial, Fibrous (fibroblastic), Transitional (mixed), Psammomatous, Angiomatous, Microcystic, Secretory, Lymphoplasmacyte-rich and Metaplastic types.

Conclusions

The present study attempted to predict the histological nature of meningiomas and thus aid in surgical and treatment planning. If accurate preoperative grading of the tumours can be done the surgery can be planned accordingly as MR imaging can provide crucial information like the proximity to a vessel, dural and osseous involvement of the mass apart from the morphologic and enhancement characteristics

Acknowledgements

Our sincere thanks to Dr Anil Peethambaran, Head of the Department of Neurosurgery, Govt. Medical College, Trivandrum and Dr, Krishna Balachandran, Head of the Department of Pathology, Govt. Medical College, Trivandrum.

References

1. J Jääskeläinen, M Haltia, A Servo. Atypical and anaplastic meningiomas: radiology, surgery, radiotherapy, and outcome. *Surg Neurol*, 25 (1986), pp. 233–242
2. Typical, atypical, and misleading features in meningioma. - *RSNA*. pubs.rsna. org/doi/pdf/ 10.1148/radiographics.11.6.1749851
3. R.D Tien, P.J Yang, P.K Chu'Dural tail sign' a specific MR sign of meningioma? *J Comput Assist Tomogr*, 15 (1991), pp. 64–66
4. Update on Brain Tumor Imaging: From Anatomy to Physiology. *American Journal of Neuroradiology*. www.ajnr.org. AJNR March, 2006 27: 475-487
5. Y Tanaka, M Matsuo Role of MR imaging in the differentiation of benign and non benign intracranial meningiomas: the utility of contrast-enhanced T1-weighted images. *Nippon Acta Radiol*, 56 (1996), pp. 1–8
6. Nakano T, Asanoa K, Miura H, Itoh S, Suzuki S (2002), Meningiomas with brain oedema: radiological characteristics on MRI and review of the literature. *Clin Imaging* 26:243–249
7. Peritumoral Brain Edema in Meningiomas : Correlation of Radiologic and Pathologic Features. *J Korean Neurosurg Soc*. 2011 Jan; 49(1): 26–30.Published online 2011 Jan 31. doi: 10.3340/jkns.2011.49.1.26 PMCID: PMC3070891.