

The role of diffusion tensor imaging and dynamic susceptibility perfusion MRI in the evaluation of meningioma grade and subtype



Anastasia Zikou^a, George A. Alexiou^{b,*}, Anna Goussia^c, Paraskevi Kosta^a, Vasileios Xydis^a, Spyridon Voulgaris^b, Athanasios P. Kyritsis^d, Maria I. Argyropoulou^a

^a Department of Radiology, Medical School, University of Ioannina, Greece

^b Department of Neurosurgery, Medical School, University of Ioannina, Greece

^c Department of Pathology, Medical School, University of Ioannina, Greece

^d Department of Neurology, Medical School, University of Ioannina, Greece

ARTICLE INFO

Article history:

Received 25 February 2016

Received in revised form 25 April 2016

Accepted 3 May 2016

Available online 6 May 2016

Keywords:

MRI

Diffusion tensor imaging

Perfusion imaging

Meningioma grades

ABSTRACT

Purpose: We prospectively investigated the relationship between diffusion tensor imaging (DTI), dynamic susceptibility perfusion (DSP) MRI metrics and grade, subtype and Ki-67 labelling index of meningiomas. **Materials and Methods:** Thirty-nine patients operated for meningioma were included in the study. DTI and DSP were performed within a week prior to surgical excision. Lesion/normal (L/N) tissue ratios and peritumoral area/normal tissue (P/N) ratios were calculated for the apparent diffusion coefficient (ADC), fractional anisotropy (FA) and relative cerebral blood volume (rCBV). In the tumor specimens Ki-67 antigen expression was evaluated by the MIB-1 immunostaining method.

Results: There were 31 grade I, 7 grade II and one grade III meningiomas. Grade I meningiomas had a significantly lower L/N rCBV ratios than grade II/III meningiomas (median 5.1 vs 6.4, $p=0.031$). Grade I meningiomas revealed significantly lower P/N rCBV ratios than grade II/III meningiomas (median 0.78 vs 1.1, $p=0.0077$). Grade I meningiomas had significantly higher FA ratios than grade II/III meningiomas (median 0.5 vs 0.31, $p=0.012$). Meningiomas of meningothelial type had a significantly higher L/N rCBV ratio than other grade I meningiomas (median 5.4 vs 3.8, $p=0.0136$). There was no significant correlation between rCBV, ADC, FA and Ki-67 index.

Conclusion: Dynamic susceptibility perfusion indexes in lesion/normal and peritumoral/normal tissue ratios are useful for the differentiation grade I from grade II/III meningiomas. Meningothelial meningiomas showed higher lesion/normal tissue rCBV ratios from the other benign meningioma subtypes.

© 2016 Elsevier B.V. All rights reserved.

1. Introduction

Meningioma is the most common type of intracranial tumor [1]. Benign meningiomas (grade I) are the most common. Among 294 meningiomas that were operated, 92% were found to be benign, 6.26% atypical (grade II) and 1.7% malignant (grade III) [2]. Apart from atypical and malignant meningiomas that even with complete excision are associated with high recurrence, benign meningiomas may also recur in nearly 7–15% of cases [3–6]. Meningiomas of the same histopathological characterization and receiving similar treatment may display diverse outcome because of differences in the proliferative potential of the disease or because of different molecular characteristics. Abnormalities of chromosome 22q

were more frequent in transitional and fibrous meningiomas than in the meningothelial type and are associated with more aggressive tumors [7]. Furthermore, assessment of tumor proliferation, such as Ki-67 index, has also been suggested as an important additional predictor of tumor behaviour [8].

Although indispensable in the structural study of intracranial neoplasms, conventional magnetic resonance imaging (MRI) has limitations as regards evaluation of the meningioma grade, subtype and proliferation potential. Diffusion tensor imaging (DTI) and dynamic susceptibility perfusion (DSP) MRI have been found useful for the assessment of glioma grade and proliferation potential [9,10]. In meningiomas controversial studies exist on the role of ADC and FA values for the assessment of meningioma grade and proliferation [11–13]. Perfusion MRI has been found useful for the assessment of meningioma grade, but to the best of our knowledge no previous study focused on the differentiation of meningothelial meningiomas from other benign meningioma

* Corresponding author at: P.O. Box 103, Neohoropoulou, Ioannina 45500, Greece.
E-mail addresses: alexioygr@yahoo.gr, alexioygr@gmail.com (G.A. Alexiou).

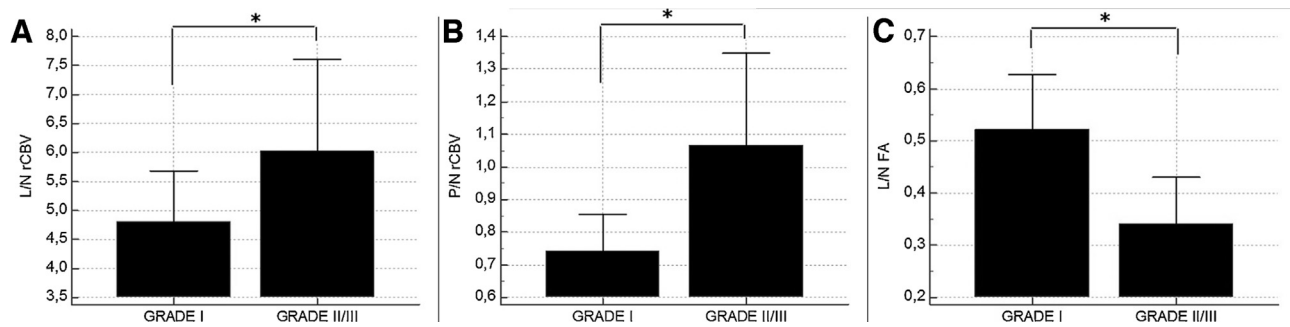


Fig. 1. The L/N rCBV (A) and P/N rCBV (B) were higher in atypical/anaplastic meningiomas. The L/N F/A (C) were higher in benign meningiomas. The data were represented as the mean standard deviation (SD). * $P < 0.05$ atypical/anaplastic versus benign data calculated by Mann–Whitney U test.

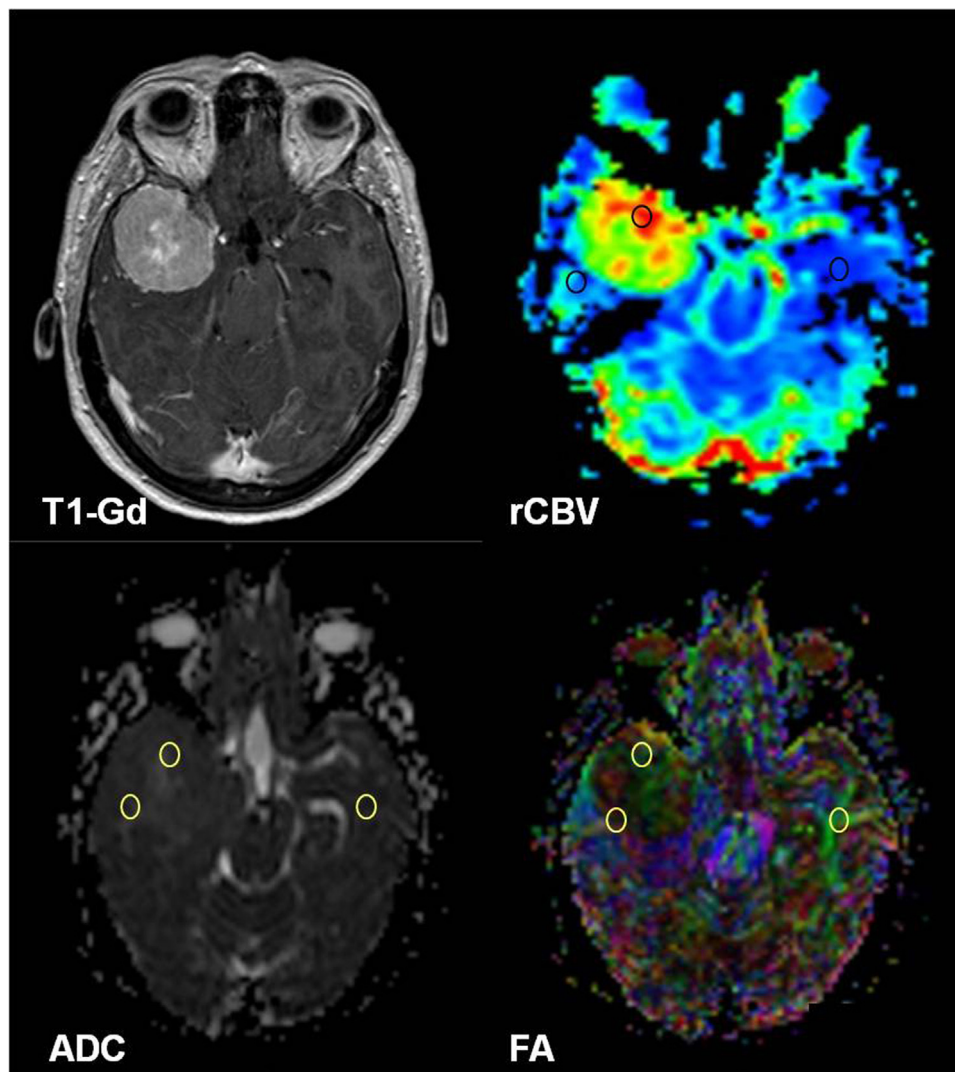


Fig. 2. A patient with histological confirmed grade I meningothelial meningioma. Contrast-enhanced T1-weighted image shows an homogeneous enhanced mass lesion on the right sphenoid wing. The red color within tumor parenchyma indicates a higher rCBV. ROI's placement at the lesion, peritumoral and to contralateral normal brain in rCBV, ADC and FA maps. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

subtypes based on perfusion metrics. Thus, in the present study we investigated the possible correlation between diffusion tensor imaging (DTI) and dynamic susceptibility perfusion (DSP) MRI with meningioma grade, meningothelial subtype and Ki-67 labelling index.

2. Material and methods

2.1. Patients

Successive patients with suspected meningioma on brain MRI over a 5-year period that underwent DTI and DSP MRI were

Download English Version:

<https://daneshyari.com/en/article/3039617>

Download Persian Version:

<https://daneshyari.com/article/3039617>

[Daneshyari.com](https://daneshyari.com)