

# Meningioma Pathology and Imaging Features Associate With Genomic Profile

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#### Introduction

- Genomic features of tumors are increasingly appreciated to associate with their phenotype and clinical course.
- Recently, our understanding of the copy number profile and mutations underlying meningiomas have expanded.
- We investigated the association between the genomic signature of a large series of meningiomas and its relationship to their pathologic grade and imaging features.

#### **Study Cohort** Full Cohor Grade 1 Grade 2 Grade 3 221 125 13 No. cases Gender (F:M) 136:85 94:31 35:48 7:6 No. chromosome arms altered, 4.9 2.8 7.1 10.5

221 meningiomas were analyzed for alterations in chromosome profile using high-resolution array CGH as well as established radiographic features on T1-weighted contrastenhanced pre-operative MRI.

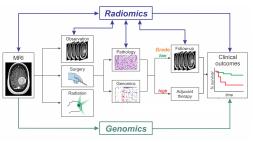
## **Results**

- The extent of chromosomal copy number alterations was significantly associated with meningioma grade (p<1e-10), as well as the number of atypical features associated with grade 1 and 2 meningiomas.
- Intratumoral heterogeneity and cystic features associated with increasing chromosomal disruption, as defined by a more frequent copy number gains or losses.
- Presence of intratumoral heterogeneity and necrosis or hemorrhage within the tumor was also significantly associated with increasing meningioma grade.

Radiographic feature	Association with chromosomal alterations, p-value
Intratumoral heterogeneity	p = 0.002
Cystic	p = 0.003
Edema	p = 0.049
Hyperostosis	p = 0.055
Venous sinus invasion	p = 0.085
Necrosis/hemorrhage	p = 0.155
Shape (spiculated, flat, round)	p = 0.718
Multifocality	p = 0.327
Mass effect	p = 0.463
Midline shift	p = 0.942

Radiographic features, including peritumoral edema, tumor shape, presence of cystic features, hyperostosis, invasion of adjacent venous sinuses, intratumor heterogeneity, necrosis/hemorrhage, and extent of mass effect were scored for each tumor by an experienced neuroradiologist and investigated for association with overall extent of chromosomal abnormalities.

# Paradigm: Imaging analysis (radiomics) and genomic characterization of meningioma may predict clinical outcomes



### **Conclusions**

- We demonstrate a strong association between the genomic profile, radiologic features, and pathologic classification for meningiomas.
- Pre-operative prediction of tumor grade and biologic signature based on imaging features offers promise for guiding personalized medicine and improving patient management.

