

Clinical Features and Neuroimaging Volumetrics in a Cohort of Patients with Skull Base Meningiomas: Retraction vs. Non-retraction?

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Introduction

Skull-base location represents 20-30% of all intracranial meningiomas, being considered as a challenging region in terms of clinical symptoms, surgical accessibility, and complete resection achievement. Peritumoral edema may represent an important prognostic variable, which also has been attributed to surgical retraction.

Methods

Retrospective review of clinical records from patients who underwent a first-time surgical resection of a meningioma (WHO grade 1) at Johns Hopkins Hospital between 2003 and 2015. DICOMS files from brain MRIs were analyzed with OSirix software. Volume measurements of the lesion and peritumoral brain edema were based on manual delineation assisted by a region-growing tool (Roi editor).

Results

118 out of 1276 patients diagnosed with a single meningioma (WHO grade 1) were selected with a tumor location at the skull-base anterior midline and middle fossa. Solely located in the olfactory groove (20.33%), planum sphenoidale (24.57%) and sellar region (39.83%). Median age was 54.66 years (IQR 47.25-63.48%), with a 73% of women.

Results (Continued)

After the procedure, patients exhibit symptomatic recovery of seizures (68,42%), headaches (64,06%) and visual disturbances (41,52%). Besides, pre-operative tumor volume was 10.10 cm³ (IQR 3.77-28.40), achieving a median resection of 97.14%. Pre-operative, post-operative, 3-months follow-up and last follow-up (26.5 months) MRIs showed peritumoral edema median volumes of 0.53 cm³ (IQR 0.00-29.72), 11.07 cm³ (IQR 2.31-37.65), 1.73 cm³ (IQR 0.00-5.46), and 1.23 cm³ (IQR 0.00-5.04) respectively.

Post-operative symptoms comparison between the retraction vs non-retraction cohorts

Post-operative Symptoms	Retraction (n=66)	No Retraction (n=52)	All (n=118)	p value
Ischemic stroke	6 (9%)	1 (1%)	7 (5%)	0.132
Hemorrhage	6 (9%)	10 (19%)	16 (13%)	0.110
New motor deficit	5 (7%)	2 (3%)	7 (5%)	0.463
Headache	17 (25%)	18 (34%)	35 (29%)	0.296
Confusion	3 (4%)	5 (9%)	8 (6%)	0.299
Visual disturbances	36 (54%)	27 (51%)	63 (53%)	0.711
New speech symptoms	4 (6%)	4 (7%)	8 (6%)	0.730
New olfactory symptoms	9 (13%)	4 (7%)	13 (11%)	0.383
Seizures	6 (9%)	4 (7%)	10 (8%)	0.999
DVT/PE	3 (4%)	5 (9%)	8 (6%)	0.539
Local infections	4 (6%)	6 (11%)	10 (8%)	0.333
Other Infections	1 (1%)	4 (7%)	5 (4%)	0.168

No statistical significance was found when comparing the post-operative symptoms/complications between patients that had brain retraction vs non-retraction

Multivariate logistic models adjusted for pre-operative and post-operative peritumoral edema differences

Presence of Edema		
Period	p value	GoF
Post-operative	0.531	0.901
Follow-up at 3 months	0.213	0.998
Follow-up >3 months	0.201	0.000

Severity of Edema (90 th percentile)		
Period	p value	GoF
Post-operative	0.824	0.999
Follow-up at 3 months	0.687	0.979
Follow-up >3 months	0.468	0.082

Severity of Edema (Japanese)		
Period	p value	GoF
Post-operative	0.111	0.999
Follow-up at 3 months	0.675	0.000
Follow-up >3 months	0.959	0.246

No significance was found in post-operative edema between the retraction and non-retraction cohorts at immediate post-operative time, three months or after three months.

Pre-operative symptoms in the cohorts with and without retraction

Pre-operative Symptoms	Retraction (n=66)	No Retraction (n=52)	All (n=118)	p value
Seizures	10 (15%)	9 (17%)	19 (16%)	0.752
Confusion	3 (4%)	6 (11%)	9 (7%)	0.180
Headache	36 (54%)	28 (53%)	64 (54%)	0.940
Numbness	3 (4%)	5 (9%)	8 (6%)	0.299
Motor symptoms	3 (4%)	4 (7%)	7 (5%)	0.698
Visual disturbance	41 (62%)	25 (48%)	66 (55%)	0.127
Speech symptoms	3 (4%)	3 (5%)	6 (5%)	0.999
Olfactory symptoms	7 (10%)	7 (13%)	14 (11%)	0.634

Brain retraction was performed for 66 (55.93%) patients. There were no significant differences among groups with and without retraction in regards to clinical outcomes and post-operative edema (p=0,050).

Conclusions

Following peritumoral brain edema volume through time may be a good strategy to assess recovery in patients; nonetheless, in this study, no statistical significance was found for variables that can be associated with it. Further research using encephalomalacia volumetric measurements may be useful to address patients' outcomes when retracting vs. non-retraction of the brain.

Learning Objectives

To characterize the pre- and post-operative clinical features of patients who underwent Meningioma's resection. To measure peritumoral edema volumes based on pre-operative, post-operative, 3-months' follow-up and last follow-up MRI. To identify significant clinical and neuroimaging differences among patients who require brain retraction, or not, during the procedure.