

Complications after resection of parasagittal and superior sagittal sinus meningiomas

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Background

Parasagittal meningiomas (PSM) represent one of the most frequently encountered intracranial meningiomas. They can pose unique challenges given their intimate relationship with parasagittal bridging veins and superior sagittal sinus (SSS)^{1–3}. Intraoperatively, venous drainage can become compromised during resection which is postulated to be be a potential source of significant post-operative complications including catastrophic intraparenchymal hemorrhage (IPH)^{2,4,5}.

<u>Objective</u>: Identify postoperative complications in our series of patients and delineate associated risk factors that predispose patients to developing these complications in order to better understand how to safely approach parasagittal meningiomas.

	Parasagittal (%)	SSS (%)	p-value
Age	49.93 (12.33 SD)	57.74 (12.71 SD)	0.0439
Treatment Naive	10 (62.5)	32 (69.6)	0.6025
Sex			0.8737
Males	6 (37.5)	21 (45.6)	
Females	10 (62.5)	25 (54.3)	
Location along SSS			
Anterior 1/3	4 (25)	16 (65.2)	0.4709
Middle 1/3	10 (62.5)	26 (56.2)	0.6764
Posterior 1/3	5 (31.3)	17 (36.6)	0.6811
Tumor Volume	95.20 (55.02 SD)	137.35 (130.85 SD)	0.1571
Degree of Resection			0.8476
(Simpson Grade)			
	6 (37.50)	15 (32.61)	
	3 (18.75)	13 (28.26)	
	2 (12.75)	7 (15.22)	
IV	5 (31.25)	11 (23.91)	
WHO Grade			0.0083
	8 (50)	24 (52.17)	
	3 (18.75)	20 (43.48)	
	5 (31.25)	2 (4.35)	
Hemorrhage	4 (25%)	4 (54.34)	0.0938
Shunt	1 (6.25)	3 (6.67)	0.9539
Chronic Headaches	3 (20)	11 (25)	0.6942

Introduction

- Up to a 10% complication rate has been reported following SSS sacrifice⁶
- Historically, surgeons have tried salvage techniques to avoid resection including venous bypass or reconstruction with variable success rates^{5,7,8}
- Most surgeons now favor less aggressive approach, avoid resection of the sinus and prefer to leverage adjuvant radiotherapy⁹
- However, in higher grade tumors or in certain cases such as a failure of prior adjuvant treatment, an aggressive surgery including SSS sacrifice might be warranted even for disease control
- The literature reports the following complications after PSM surgery⁴:
 - venous congestion
 - infarction
 - intraparenchymal hemorrhage
 - new onset seizures
- Our series also identified:
 - Vision degradation
 - Chronic headaches

Table 1. Demographics





Methods and Materials

- Retrospective review of institutional database
 - PSMs with history of neurosurgical procedure between 2011-2020 within our hospital system
- Inclusion criteria
 - Pathologically confirmed diagnosis of meningioma
 - Sindou grade I-VI
 - Health records contained complete preoperative and postoperative imaging and clinical information
- Data collection via chart review:
 - Pre-operative grading of SSS patency
 - Pre and post-op tumor volumetric analysis
 - Presenting symptoms, immediate postoperative deficits, and deficits at the last follow up, symptoms of elevated intracranial pressure
 - Review of post-op images for hemorrhage
 - Degree of resection utilizing Simpson grading

Discussion and Conclusions

- In our series, the risk of IPH was similar regardless of SSS sacrifice, the degree of SSS involvement, preoperative SSS patency, or tumor location along the SSS
- Revision surgery and a higher tumor grade were the major factors associated with the risk of a postoperative hemorrhage
- Our present data did not suggest that SSS resection provides benefit

Table 2. Post-operative complications in patients who did and not have superior sagittal sinus resected in surgery

Results

- Series of 62 patients
- Mean follow up was 40.84 months
- Complete occlusion was diagnosed in 23 (37.1%) cases, stenosis in 24 (38.71%), and no morphological SSS alteration in 15 (24.19%) cases.
- IPH
 - Prior surgery as well as a higher tumor grade were independently associated with greater risk of postoperative hemorrhage (p = 0.006, p = 0.01, respectively), even after controlling for degree of resection, resection of SSS and preoperative SSS patency
 - Increase in WHO Grade (OR = 4.64, 95% CI = 1.45-14.79) leads to a 4.64-times increased risk of postoperative IPH
 - Similarly, patients with prior treatment had 22.1-times greater odds of postoperative IPH (p = 0.006, OR = 22.1; 95% CI = 2.48-196.5)
- Headache
 - 22.5% of patients reported long term headaches
- CSF diversion
 - Patients who had hemorrhage or headaches, were more like to

for tumor control regardless of WHO grade, however, follow up may not be sufficiently long enough have required a shunt (p=0.0124; p<0.0001)

• Sinus resection in 38.7% of patients more commonly in higher grades

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