Giant Arachnoid Granulations of the Transverse and Sigmoid Sinuses: Analysis of Morphology and Clinical Relevance in 108 Posterior Fossa Surgeries

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Background

Giant arachnoid granulations (GAGs) are large protrusions of arachnoid tissue into the dural venous sinuses, most commonly the transverse and sigmoid sinuses. Although generally regarded as incidental findings, GAGs may mimic dural sinus thrombosis or neoplastic lesions on imaging, leading to potential misdiagnosis and inappropriate treatment.

Despite increasing recognition with modern neuroimaging, their frequency, distribution, and clinical relevance remain incompletely understood.

Objective

To investigate the dominance pattern of the transverse sinus, the maximal diameters of the transverse and sigmoid sinuses, and the prevalence, size, and distribution of arachnoid granulations, including giant forms, in 108 posterior fossa surgeries.

Materials and Methods

We retrospectively analyzed 108 consecutive patients who underwent posterior fossa surgery at Juntendo University Hospital between 2023 and 2024. Preoperative contrast-enhanced MRI and MR venography were reviewed to determine the dominance of the transverse sinus and to measure the maximal diameters of the transverse and sigmoid sinuses. The presence, location, and size of arachnoid granulations were assessed, with GAGs defined as lesions measuring 10 mm or greater in maximal dimension. Clinical records were reviewed for symptoms potentially related to venous outflow obstruction.

Patient Characteristics	
Number of patients	108
Age, years (mean ± SD, range)	54.0 ± 15.3 (17–86)
Sex, n (%)	
Male	50 (46.3%)
Female	58 (53.7%)
Transverse sinus dominance, n (%)	
Right dominant	46 (42.6%)
Left dominant	30 (27.8%)
Codominant	32 (29.6%)
Maximal sinus diameter, mean (mm)	
Transverse sinus	7.80
Sigmoid sinus	6.55
Presence of arachnoid granulations, n (%)	
Present	61 (56.5%)
Absent	47 (43.5%)
Presence of giant arachnoid granulations (≥10 mm), n (%)	6 (5.6%)

Table 1. Patient Characteristics

Discussion

Our findings demonstrate that arachnoid granulations, including giant forms, are not uncommon in posterior fossa surgery cases. Although asymptomatic in this series, their imaging appearance may closely resemble sinus thrombosis or dural-based tumors, which underlines the importance of accurate recognition. Preoperative awareness of GAGs can prevent unnecessary anticoagulation or surgical interventions and may reduce the risk of intraoperative complications, particularly during approaches involving the transverse or sigmoid sinuses. While no symptomatic cases were encountered in this cohort, prior reports have described associations with headache, tinnitus, or raised intracranial pressure, highlighting the need for further investigation into their potential pathophysiological impact.

Results

Right dominance of the transverse sinus was identified in 46 cases (42.6%), left dominance in 30 cases (27.8%), and no dominance in 32 cases (29.6%). The mean maximal diameter of the transverse sinus was 7.80 mm, while that of the sigmoid sinus was 6.55 mm. Arachnoid granulations were present in 61 cases (56.5%). Among these, six lesions (5.6% of the total cohort, 9.8% of cases with granulations) met criteria for GAGs. GAG locations were as follows: right (n=2), left (n=2), midline (n=1), and bilateral (n=1). None of the patients demonstrated venous outflow obstruction or clinical symptoms attributable to the presence of GAGs.

Figure 1. Location-based dot plot with 10 mm cut-off

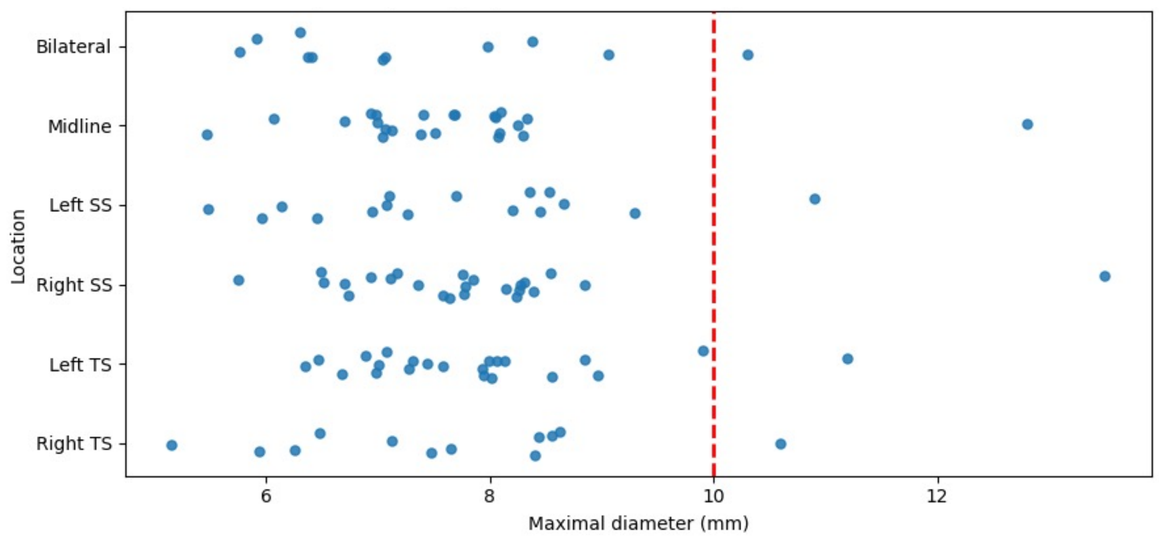
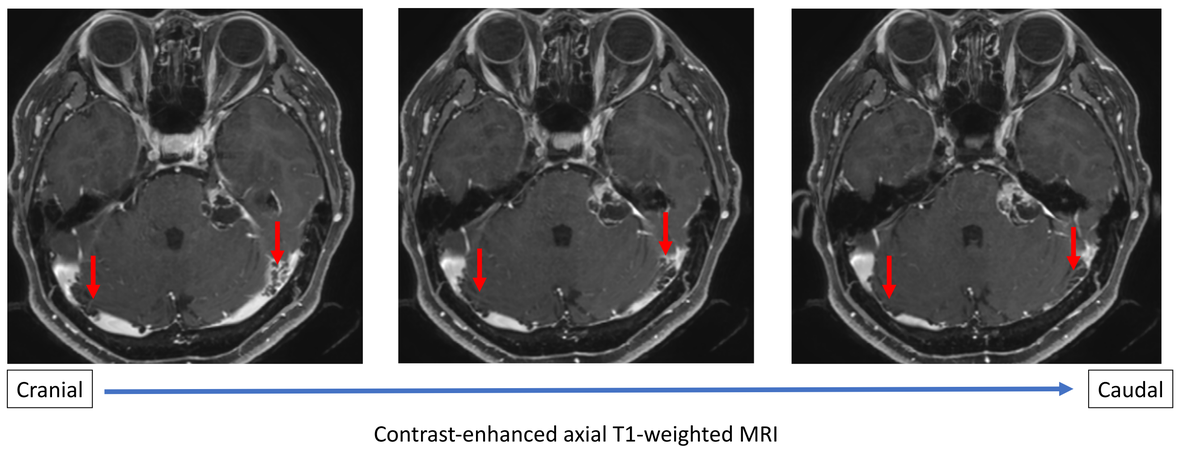


Table 2. Comparison Between Patients With and Without Giant Arachnoid Granulations

	GAGs present (n = 6)	GAGs absent (n = 51)	p value
Age, years (mean ± SD)	60.5 ± 8.7	57.6 ± 14.0	0.489
Sex, n (%)			0.397
Male	1 (16.7)	20 (39.2)	
Female	5 (83.3)	31 (60.8)	
Transverse sinus codominance, n (%)	1 (16.7)	14 (27.5)	1.000
Max transverse sinus diameter (mm)	8.62	7.85	0.472
Max sigmoid sinus diameter (mm)	7.16	6.44	0.061
Symptoms related to venous outflow obstruction, n (%)	0 (0)	0 (0)	—

Figure 2. Representative case of bilateral giant arachnoid granulations (≥10 mm)



Contrast-enhanced axial T1-weighted MRI

Three consecutive contrast-enhanced axial T1-weighted images from superior to inferior levels demonstrate large filling defects within the bilateral transverse–sigmoid sinuses (arrows).

Conclusions

GAGs of the transverse and sigmoid sinuses are relatively frequent and occasionally reach giant size. They are clinically significant primarily in the context of differential diagnosis and surgical planning, and should be considered important anatomical variants rather than mere incidental findings.

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