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Assessment and treatment of peritumoral cortical veins in parasagittal meningiomas with application of 3D imaging fusion model

Tengkun Yin, M.D. candidate, Jianjun Gu, Yinxing Huang, Liangfeng Wei, Jinxi Gao, Shousen Wang



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Running head: cortical veins assessment in parasagittal meningiomas

## Assessment and treatment of peritumoral cortical veins in parasagittal meningiomas with application of 3D imaging fusion model

### ABSTRACT

**Background:** Operation of cortical veins is the keystone of parasagittal meningiomas (PSM) resection. Little is known about pathological changes of the veins and proper treatment. We built three-dimensional (3D) image fusion models by neuronavigation to analyze the features of peritumoral cortical veins for PSM and explore intraoperative treatment options.

**Methods:** We performed a prospective study of 42 consecutive surgically treated PSM patients who underwent preoperative evaluation of peritumoral cortical veins using a 3D venous-tumor fusion model established by a neuronavigation system. We categorized cortical veins into three types: a) single-end anastomosis, b) tumor-to-end anastomosis, c) end-to-end anastomosis. We present surgical strategies to operate these veins.

**Results:** Preoperative evaluation demonstrated 39 patients with peritumoral cortical veins. The 3D models show 100% of the veins (95 in total) which were confirmed intraoperation. The postoperative complication rates after vein injury were 60% (Type-a), 16.7% (Type-c), 0 (Type-b). Ten patients (23.8%) had residual tumor due to venous protection (equal to Simpson III). After correlation analysis, Type-b and c cortical veins were positively correlated with tumor volume.

**Conclusion:** The anastomoses of cortical veins may provide compensation for venous transaction. There may be a time-evolution relationship between different cortical veins (Type a→c→b). Treatment of cortical veins should follow the following principles: single-end veins must be protected, tumor-to-end veins could be transacted directly, and end-to-end veins could be cut selectivity based on the degree of occlusion of the superior sagittal sinus. Detailed preoperative assessment of peritumoral cortical veins is critical for proper treatment.

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