

# Falcotentorial meningioma case series

Zhao et al. identified all patients with [falcotentorial meningiomas](#) treated with resection at the Barrow Neurological Institute between January 2007 and October 2017. Perioperative clinical, surgical, and radiographic data were retrospectively collected. For patients who underwent the supracerebellar infratentorial approach, the tentorial angle was defined as the angle between the line joining the nasion with the tuberculum sellae and the tentorium in the midsagittal plane.

Falcotentorial meningiomas occurred in 0.97% (14/1441) of the patients with meningiomas. Most of the patients (13/14) were female, and the mean patient age was  $59.8 \pm 11.3$  years. Of 17 total surgeries (20 procedures), 11 were single-stage primary surgeries, 3 were two-stage primary surgeries (6 procedures), 2 were reoperations for recurrence, and 1 was a reoperation after surgery had been aborted because of brain edema. Hydrocephalus was present in 5 of 17 cases, 4 of which required additional treatment. Various approaches were used, including the supracerebellar infratentorial (4/17), occipital transtentorial/transfalcine (4/17), anterior interhemispheric transsplenic (3/17), parietal transventricular (1/17), torcular (2/17), and staged supracerebellar infratentorial and occipital transtentorial/transfalcine (3/17) approaches. Of the 17 surgeries, 9 resulted in Simpson grade IV resection, and 3, 1, and 4 surgeries resulted in Simpson grades III, II, and I resection, respectively. The tentorial angle in cases with Simpson grade I resection was significantly smaller than in those with an unfavorable resection grade ( $43.3^\circ \pm 4.67^\circ$  vs  $54.0^\circ \pm 3.67^\circ$ ,  $p = 0.04$ ). Complications occurred in 10 of 22 approaches (17 surgeries) and included visual field defects (6 cases, 2 permanent and 4 transient), hemiparesis (2 cases), hemidysesthesia (1 case), and cerebellar hematoma (1 case).

Falcotentorial meningiomas are challenging lesions. A steep tentorial angle is an unfavorable preoperative radiographic factor for achieving maximal resection with the supracerebellar infratentorial approach. Collectively, the study findings show that versatility is required to treat patients with falcotentorial meningiomas and that treatment goals and surgical approach must be individualized to obtain optimal surgical results <sup>1</sup>.

## 2016

Of 2983 meningiomas from October 2001 to January 2014, Hong et al. operated on 11 patients with falcotentorial meningiomas, which accounted for about 0.3% of all intracranial meningiomas.

Preoperatively, all patients underwent magnetic resonance imaging (MRI) and cerebral angiography to determine the appropriate approach trajectory and craniotomy size.

The main surgical approach was an occipital transtentorial with or without transfalcine approach. Moreover, they favored the three quarter prone position, except in one case, since they believed this position to be safer, providing lower risk of air embolism during the prolonged operative time. In patient positioning, airway patency and jugular venous pressure are the most important factors determining positive outcomes.

For determination of bone flap size and location, as well as for identifying which side of the patient was to be upward, they thoroughly reviewed preoperative imaging studies. The location, size, and growth direction of the tumor were all important factors in determining the surgical approach. They compared those factors with surrounding normal brain parenchyma using a three-dimensional (3D)

concept with the help of 3D simulation software (3D volume viewer version 1.2.3, released 14th August 2007, RMR systems, East Anglia, UK, [www.rmrsystems.co.uk](http://www.rmrsystems.co.uk)). The approach site was determined based on the shortest pathway from normal brain cortex to the tumor, and the patient's position was set so that the approach axis was parallel to the microscopic view. An occipital bone flap was made over the main bulk of the tumor considering possible exploration area through axis for surgical access.

They could remove the tumor totally via a single, relatively small bone flap.

## 2009

From 2001 to 2005, 9 patients underwent operation for meningiomas arising from the falcotentorial junction, with some extending to and/or invading the torcula. All patients were assessed preoperatively with magnetic resonance neuroimaging and cerebral angiography. Furthermore, preoperative embolization was attempted in all cases. A supratentorial/infratentorial torcular craniotomy technique was used in all but 1 of these cases.

The average dimensions of the falcotentorial meningiomas were 5.1 x 4.4 x 4.2 cm. The angiograms revealed that these tumors were fed by branches of the internal carotid artery, choroidal arteries, branches of the meningohypophyseal trunk, and branches of the posterior cerebral artery. Preoperative embolization was achieved in only 2 patients. Five patients had gross total resection (Simpson grade 1), and 4 had subtotal resection (Simpson grade 4). Two of the tumors (22%) recurred during a mean follow-up period of 49 months (range, 17-88 months). The most common complication after surgery was cortical blindness, but all postoperative visual deficits had fully recovered at the last follow-up evaluation within several months.

An excellent outcome can be expected with detailed preoperative neuroimaging and knowledge of the nuances of the surgical technique that we describe in detail in the article <sup>2)</sup>.

## 2006

Goto et al. evaluated their surgical experience over 20 years with 14 treated falcotentorial meningiomas.

In the past 20 years, 14 patients with falcotentorial junction meningiomas were surgically treated. There were seven men and seven women, whose ages ranged from 34 to 79 years. On the basis of neuroimaging studies, the authors analyzed the influence of the anatomical relationship of the tumor to the vein of Galen, patency of the vein of Galen, tumor size, and the signal intensities on the magnetic resonance images to determine possible difficulties that might be encountered during surgery and to prognosticate the outcome of surgery. Depending on the relationship with the vein of Galen, tumors were labeled as either a superior or an inferior type. All tumors were resected via an occipital transtentorial approach. The surgical outcome in eight patients was excellent; in the remaining six patients, it was fair. Of the prognostic factors, tumor location especially seemed to be the most important ( $p < 0.01$ , Fisher exact test). The outcome associated with the inferior type of tumor was significantly less optimal probably due to the relationship to the deep veins and the brainstem. In this series, the occlusion of deep veins did not significantly influence outcome.

Classification of the tumor location by preoperative neuroimaging studies can be helpful in estimating

the surgical difficulty that might be encountered in treating the falcotentorial junction meningioma <sup>3)</sup>.

## 2004

Between 1975 and 1996, in the Neurosurgical Unit at the University of Rome, "La Sapienza," 13 consecutive patients underwent surgery for falcotentorial meningiomas that had been localized on preoperative imaging and confirmed by histology. The surgical approach varied according to the site of the tumor.

Nine meningiomas were totally removed and 4 subtotally. Three patients (23.0%), all treated early in the series, died after the operation. Ten patients (76.9%) survived: 3 (23.0%) had postoperative neurologic complications necessitating reintervention, and 7 patients (53.8%) had an uneventful postoperative course. Two of the 4 patients who had subtotal resections had regrowth at 1 year that responded to radiosurgery.

The ideal surgical approach to falcotentorial meningiomas should allow gross total removal and minimum brain retraction while safeguarding the galenic system and other vital neighboring structures. Toward achieving this aim they propose detailed preoperative imaging studies to classify falcotentorial meningiomas according to their site and direction of growth-craniocaudal or anteroposterior-in relation to the cerebellar tentorium <sup>4)</sup>.

## 2003

Meningiomas arising from the falcotentorial junction are rare. As a result, their clinical presentation and surgical management are not well described. During the past 3 years, the authors have treated six patients with falcotentorial meningiomas.

Most patients presented with symptoms related to raised intracranial pressure, including headaches, papilledema, and visual and gait disturbances. Magnetic resonance imaging revealed a smooth, oval, or round mass, which was typically homogeneously enhancing. Angiography was useful in evaluating arterial supply for embolization, when possible, and determining the status of venous collateral supply and sinus patency. The authors detail the surgical technique used in all six patients. Postoperatively, patients experienced transient cortical blindness, which in all cases spontaneously resolved during the course of several days to weeks. They provide a comprehensive description of the presentation and surgical management of falcotentorial meningiomas.

An excellent outcome can be expected when surgery is predicated on detailed preoperative neuroimaging and knowledge of the nuances of the surgical technique <sup>5)</sup>.

## 2001

Okami et al. present four surgical cases. An occipital transtentorial approach was used in three cases, and a combined midline occipital and suboccipital approach in one case. Total tumour excision was impossible in two cases because of engulfing deep venous structures including the great vein of Galen. Postoperative Gamma knife radiosurgery was performed in these two cases. On the other hand, a posteriorly located tumour was relatively easy to remove, and macroscopic total removal was accomplished. In conclusion, precise microvascular anatomical knowledge is indispensable to

satisfactorily excise meningiomas in the falcotentorial area without significant morbidity <sup>6)</sup>.

## 1995

Asari et al. describe the clinical features, neuroimaging studies, and results of surgical treatment of meningiomas of the falcotentorial junction and clarify the characteristics of this lesion based on a review of the literature and seven patients treated at their institution. The most common symptoms resulted from intracranial hypertension. Upward-gaze palsy appeared in only one patient. Computerized tomography (CT) showed no specific findings, but there was no evidence of edema around the tumor. Magnetic resonance (MR) imaging revealed a round, smooth-bordered mass with a peritumoral rim, without edema, and showing marked contrast enhancement. The multiplanar capability of MR imaging delineated the relationship between the tumor and adjacent structures better than did CT. Detailed knowledge of the vascular structures, especially evidence of occlusion of the galenic venous system and the development of collateral venous channels, is critical for successful surgery; stereoscopic cerebral angiography is necessary to achieve this aim. The seven patients described developed five types of collateral venous channels: through the basal vein of Rosenthal to the petrosal vein, through the veins on the medial surface of the parietal and occipital lobes to the superior sagittal sinus, through superficial anastomotic veins, through veins of the posterior fossa to the transverse or straight sinus, and through the falcian veins to the superior sagittal sinus. The first three types mainly developed after occlusion of the galenic system. The tumors were removed through the occipital transtentorial approach with a large window at the posterior part of the falx. A favorable prognosis for patients undergoing surgical treatment of falcotentorial junction meningiomas can be expected if detailed neuroimaging studies and microsurgical techniques are used <sup>7)</sup>.

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The tumors were removed subtotally or totally via an occipital interhemispheric transtentorial approach and/or infratentorial supracerebellar approach. The postoperative courses were uneventful, and no neurological deficit was detected postoperatively. Pineal region tumors with a maximum diameter of 5 cm or larger should be operated on via a unilateral or bilateral occipital interhemispheric transtentorial approach, regardless of the angiographic findings, because this permits a wide operative field and can be followed, if necessary, by an infratentorial supracerebellar approach. Selection of the operative approach for a relatively small pineal region tumor should depend on the angiographic findings: downward displacement of the bilateral internal cerebral veins and the great vein of Galen indicates an occipital interhemispheric transtentorial approach, whereas upward displacement indicates an infratentorial supracerebellar approach <sup>8)</sup>.

## 2008

Clinical data in a consecutive series of 13 patients treated for a meningioma of the FT junction were retrospectively reviewed. Tumors were classified into 4 types according to their dural origin and tumor extent as depicted from preoperative MRI.

Main presenting symptom in 9 women and 4 men (mean age, 56 years) was headache (69%) and gait disturbance (54%). Clinical examination revealed gait ataxia in 62% of the patients. The tumor displaced the vein of Galen inferiorly in 6 patients, superiorly in 2, and medially in 5 cases. The main

surgical approach to the meningioma was via an occipital interhemispheric route (10 patients). Additional resection of the falx and/or incision of the tentorium was performed in 6 cases each. A complete resection (Simpson grade 1 and 2) was achieved in 85% of patients. Permanent surgical morbidity was 23%. One tumor recurrence in an atypical meningioma was observed after the mean follow-up period of 6.2 years (range, 1-14 years) with clinical and MRI examination and had to be reoperated. Eighty-five percent of the patients regained full daily activity on follow-up.

The surgical approach should be tailored to the dural origin and extent of the tumor as depicted from preoperative MRI. Preservation of the straight sinus and Galenic venous system is recommended <sup>9)</sup>.

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