

## “Pushing the envelope in neurosurgery”: dilemma of the appropriate indications

Hussam Abou Al-Shaar<sup>1</sup> · Mohamed A. Labib<sup>1</sup> · Amir R. Dehdashti<sup>1</sup>

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We reviewed the case report of a 68-year-old man who harbored two distinct meningiomas located in the parasagittal and falcine regions. The patient had a past history of scalp irradiation for tinea capitis, which was complicated with severe skin atrophy of the scalp. His parasagittal meningioma was managed previously with surgery and radiation therapy, in which histopathological examination revealed an atypical WHO II meningioma. The surgery was complicated by partial wound dehiscence and cerebrospinal fluid (CSF) leak, which were managed successfully. Despite surgery and radiation, the parasagittal meningioma recurred and the authors performed a subtotal resection of the lesion via a purely endoscopic parafalcine interhemispheric approach due to unsuitable skin condition at the site of the previous surgery.

The authors are to be commended for their brave attempt at removing the tumors via a distant purely endoscopic approach as well as on their technical dexterity.

We would like to point out a few concerns. First, a multidisciplinary approach involving vascular and plastic surgeons could have been planned in order to allow optimal surgical resection of the tumor through the traditional approach. Desai et al. [1] have performed a systematic review and developed an algorithm for optimal scalp reconstruction. Although the exact size of the atrophic scalp was not reported in this patient, Desai et al. have found that patients with large defects and a

history of radiation will likely benefit from free tissue transfer. Therefore, this management strategy should have been considered for a safer access to the tumor.

Second, the effectiveness of a subtotal removal via endoscopic surgery in this particular situation is debatable. Such resection is associated with 44 % recurrence risk at 10 years [2]. The patient in this case harbored a more aggressive tumor (WHO II) and surgery alone (subtotal resection) without radiation might not be enough to control the tumor growth. Although a gross total resection might mandate the resection of the encased/infiltrated superior sagittal sinus, no information about the sinus patency (magnetic resonance venography or angiography) was provided. Other factors (e.g., MIB-1 index) are also important, particularly in grades II-III like the one observed in the authors' patient [3]. The authors, however, did not report the MIB-1 index (Ki-67) for their patients, making the estimation of the efficacy of the procedure and risk of recurrence rather difficult.

Although no reports exist on the optimal treatment modality for recurrent aggressive parasagittal meningiomas, many therapeutic modalities have been reported in the literature with variable outcomes, including repeat surgery, re-irradiation, brachytherapy, or a combination between them [4, 5]. Recently, Abou Al-Shaar et al. [4] reported two patients with aggressive falcine meningiomas, which recurred despite receiving multiple surgeries and radiation therapy. Both patients harbored WHO II meningioma with a MIB-1 index (Ki-67) of 30 % and 7.8 %, respectively. The patients underwent resection of their tumors and permanent implantation of brachytherapy seeds along the resection site. Both patients were doing well with no recurrence at 31 and 10 months after brachytherapy. Others achieved tumor control with permanent or temporary placement of brachytherapy seeds without resecting the recurrent tumor [6]. Although the efficacy of these treatments is very debatable, they could have been

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✉ Amir R. Dehdashti  
Adehdashti@NSHS.edu

<sup>1</sup> Department of Neurosurgery, Hofstra Northshore LIJ School of Medicine, Northshore University Hospital, Manhasset, NY, USA

utilized without jeopardizing the atrophic scalp for meningioma with multiple recurrences.

Endoscopic approaches have been used for a great variety of indications [7]. Endoscopic endonasal approaches using natural corridors for various anterior skull base and suprasellar lesions have been shown to be beneficial and sometimes superior to traditional cranial approaches. It has been shown that these approaches are associated with reduced cost and hospital stay, as well as better aesthetic outcomes and patient satisfaction [8, 9]. However, such great modality does not come without its own inherent limitations and complications. A steep learning curve is noted with the endoscopic approaches [10]. Therefore, an individual risk-benefit analysis is indicated to ensure optimal patient outcome with minimal or no complications, and careful selection of patients is of paramount importance for the success of these approaches. Using an endoscope to remove a distant intracranial lesion through a cranial approach is not the standard of care. There is an inherent barrel-type spatial distortion in any panoramic endoscopic view. In addition, the bidimensional view of the endoscope interferes with depth perception for distant lesions, such as the one presented here [11]. Moreover, it would be very difficult to manage complications (e.g., bleeding) during this particular endoscopic approach. The corridor is too long (7–8 cm) and might be considered rather unsafe.

However, we would like to point out that with the recent advances in operative technology, the search for alternative approaches and techniques should be advocated for. Important questions arise, such as: “What are the ethics of surgical innovation? When is it safe to push the envelope?” The answers for such questions are difficult and challenging. No-one can deny the absolute necessity of innovation in neurosurgery, and for this particular reason we applaud the authors for their innovative albeit unusual approach to this tumor. Neurological surgery is a dynamic science, there are plenty of opportunities to improve our capabilities and knowledge and therefore a neurosurgical dogma must be avoided. Meanwhile, attempting to create an innovation, or performing an unusual surgery without any “regulatory body” may jeopardize the autonomy and safety of the patients we are striving to serve. Fortunately, large trials evaluating therapies/interventions for brain tumors, vasospasm, and intracranial hemorrhages are subject to ethical scrutiny by institutional review boards (IRBs). Less visible interventions, however, like using stereotaxy for shunt insertions or the so-called “off label use” of a variety of new endovascular tools may not be subjected to detailed IRB reviews. Even worse, smaller “snack size” innovations like the one discussed in this manuscript may not even be presented to the patient as an “innovation,” let alone to the IRB. It is with those “on the go” innovations that neurosurgeons should carefully assess their indications and treatment.

The relationship between patients and surgeons is a fiduciary one where the patient trusts that his/her surgeon is promoting the patient’s interest. We are required and must be

encouraged to push the envelope and contribute to the advancement of our field and the benefit of our patients through innovation. Yet, we are still obliged to abide by the *primum non nocere* rule and work for the patient’s best interest. Balancing the ethical principles of beneficence and nonmaleficence may not be easy at times and may require a tremendous amount of self-scrutiny and honesty. In the modern era, the safest way to address any “innovation” *significant or not*, especially those done on an elective basis, is to subject it to review by IRBs first before even proposing it to the patient in order to ensure optimal patient outcomes. That will subsequently contribute to advances in the exciting field of neurosurgery. In practice, however, it will be quite difficult and time consuming to subject every creative clinical idea to Board review. Therefore, some decisions should be made purely based on the surgical team’s clinical indication and surgical expertise.

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