Letters to the Editor

NEUROSURGICAL FORUM

Joining the masters: the Dolenc-Kawase approach


Basal extensions of the pterional and extended orbitozygomatic approach, such as the transcranverous approach (Dolenc technique), or the subtemporal, anterior petrosectomy (Kawase) approach, have been proposed to treat posterior and middle cranial fossa lesions.2,3 We have objectively studied these techniques, as we reported in previous papers,3,4 and call the attention of the authors to another study that we believe should have been cited in their paper.5

Using a computerized system to identify Cartesian coordinates and a robotic microscope, we quantitatively analyzed anterior petrosectomy and transcranverous techniques.3 We measured the area of exposure on the ventral surface of the brain stem, linear extension of the basilar artery, angles of approach to the midpoint of the retrolateral segment of the basilar artery, and the area available to manipulate surgical instruments, i.e., the superficial exposure (surgical freedom). Additionally, we evaluated the extent of the infrasellar basilar artery available for proximal control (caudal extent of exposure).3 Such information could have been relevant for their study.

One main methodological concern in performing this kind of work is related to how best to measure areas and angles.1 The authors presented quantitative data related to area and volume of the bone window in dry temporal bones. Such measurements may not be extrapolated or realistic for clinical and anatomical settings, because the space-occupying and viscoelastic properties of the brain and neural and vascular structures limit bone resection in real surgical scenarios. These surgical approaches have been focused on the expansion of the deep windows of exposure, which often involve internal carotid artery and cranial nerve mobilization. Thus, areas and volumes resulting from fresh bone resection are not the best proxy for measurement, assessment, and description of the actual surgical exposure.

In their cadaver dissection, the authors obtained a fenestration of 20 × 18 mm when using the modified Dolenc-Kawase (MDK) approach and 10 × 5 mm after the Kawase approach.2 Nonetheless, there are no details about how such fenestration was quantified. It appears that the increments in angulations and surgical freedom provided are only surgical impressions, because they were not corroborated by quantitative measurements. Values for angles of approach, areas of surgical exposure in the cadaver dissection, and surgical freedom, with their means, standard deviations, and p values, have not been provided. Statements that surgical exposure changed significantly between the approaches should be supported by objective data. Quantitative and anatomical study helps us to understand the advantages and limitations of different approaches and may support a surgeon’s choice, which should not be based on intuition and personal impressions only.

Except for these methodological concerns, the authors should be commended for their surgical results and for using 3D scanning methods to scrutinize surgical techniques. This may have relevant applications in future studies.

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References
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Response
We are thankful to Figueiredo et al. for their interest and critical evaluation of our article. The MDK approach is a combination of two approaches for middle cranial fossa lesions with variable extension to the posterior cranial fossa. The purpose of this study was to expand the anatomical limitations to allow maximum petrous bone removal and exposure at the prepontine area.

We have previously evaluated cited articles by the reviewers and are glad to acknowledge the fact that these papers guided us to morphometric evaluation of the area and exposure obtained at the anterior petrous apex.2–4 We are happy to cite the paper by Figueiredo et al., which explains the comparative analysis of anterior petrosectomy and transcavernous approaches to retrosellar and upper clival basilar artery aneurysms.4

All of our cadaver dissections were performed and recorded following a strict protocol in the well-equipped Neurosurgery Education and Training School of the All India Institute of Medical Sciences, New Delhi, India.7–10 Microneurosurgical principles were followed for dissection and all anterior petrous drilling was performed under fixed magnification (magnification factor 1.0, magnification 7.08) by the same surgical team. The head position and magnification were kept uniform for both approaches to minimize surgical and observation bias.9 The protocol has been explained in detail in the methodology section of the article. Fixed bone landmarks were previously defined for Kawase’s triangle and the MDK rhomboid construct in dry temporal bones. The same landmarks were followed during cadaver dissection. The average dimensions for Kawase’s triangle were 21.71 ± 0.79 mm × 17.11 ± 0.40 mm × 13.05 ± 1.01 mm. In comparison, the average dimensions of the rhomboid construct were 13.15 ± 0.84 mm × 24.53 ± 1.77 mm × 12.54 ± 0.94 mm × 14.69 ± 1.16 mm (p < 0.001). The dimensions and fenestration achieved are consistent with results in the existing literature. The same has been observed in another cadaveric study conducted by Day et al.1,5 During cadaver dissection, for the rhomboid construct, maximum diagonal dimensions were measured with a divider measurement instrument with submillimeter accuracy and compared with fenestration achieved by Kawase’s triangle (Table 1). The same areas were drilled and exposed areas were objectively recorded at the prepontine area in both vertical and horizontal dimensions. Apart from the fenestration, other morphometric details such as area and volume of the drilled bones were not calculated during cadaver dissection as 3D laser scanning in cadavers was not possible. We agree that angle of approach and surgical freedom were not quantitatively measured, but our concept has definitely resulted in better exposure, tumor resection, and clinical outcome in these patients.

We agree with the comment that judicious bone removal and mobilization of neurovascular structures is the key for skull base approaches. The rhomboid construct can be obtained only after temporal dura mater and lobe retraction, interdural cavernous dissection, and medial mobilization of the mandibular division of the trigeminal nerve and Gasserian ganglion.9 A quantitative evaluation of dry temporal bones acts as a proxy for fixed bone landmarks of both the constructs and reflects increased exposure of the area at the prepontine space using the MDK approach. It might not be considered the best estimate, but translation of the MDK rhomboid approach into clinical cases has helped in providing better exposure, angulation, surgical freedom, and outcome, with no added morbidity.1,9 The surgical approach allows for intradural cisternal exposure of cranial nerves III–VIII, and a spectrum of lesions straddling the middle and posterior cranial fossa (Video 1).

**Video 1.** Clip showing a multicompartmental epidermoid tumor: suprasellar, interpeduncular, prepontine, right ambient, right crural, and right cerebellopontine cisterns excited completely using the transcavernous anterior transpetrosal approach. Copyright Ashish Suri. Published with permission. Click here to view.

We are thankful to the reviewers for their comment on using 3D scanning methods to scrutinize surgical approaches. We have further analyzed 3D laser scanning for quantitative evaluation of exposure by variable extent of the anterior clinoideectomy using intradural and extradural techniques.10

**Table 1. Fenestration achieved at Kawase’s triangle and the MDK rhomboid approach by cadaver dissections**

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Kawase Approach (mm)</th>
<th>MDK Rhomboid Approach (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11.6 × 5.7</td>
<td>21.8 × 19.6</td>
</tr>
<tr>
<td>2</td>
<td>9.9 × 4.8</td>
<td>19.9 × 17.9</td>
</tr>
<tr>
<td>3</td>
<td>9.2 × 4.4</td>
<td>19.6 × 17.8</td>
</tr>
<tr>
<td>4</td>
<td>10.6 × 5.7</td>
<td>20.8 × 19.2</td>
</tr>
<tr>
<td>5</td>
<td>9.7 × 4.9</td>
<td>19.4 × 17.5</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>10.2 ± 0.6 × 5.1 ± 0.3</td>
<td>20.3 ± 0.6 × 18.4 ± 0.3</td>
</tr>
</tbody>
</table>

**Acknowledgments**

The senior and corresponding author (A.S.) would like to thank Prof. Vinko V. Dolenc, of Ljubljana, Slovenia, from whom he learned (2000) the anatomy of and surgical approaches to the lesions in and around the cavernous sinus. Upon his return to India, he performed several cadaver dissections, followed by a clinical series. He presented the surgical works paper on “Posterior cavernous anterior transpetrosal approach to petroclival lesions” at the Second International Symposium on the Cavernous Sinus—20 Years Later, in Ljubljana, Slovenia, on September 10–13, 2006. The paper was commented on and appreciated by both Prof. Vinko V. Dolenc and Prof. Takeshi Kawase, and they rephrased the posterior cavernous anterior transpetrosal approach as the “Dolenc-Kawase approach.” We thank the scientific, technical, and application team of the Neurosurgery Education and Training School, especially Mr. Trivender Kumar Yadav, for his assistance in video and photo archiving and editing.