Contralateral supracerebellar infratentorial approach

Approaches to the pulvinar remain challenging because of the depth of the target, surrounding critical neural structures, and complicated arterial and venous relationships.

Four approaches for reaching the pulvinar without cortical transgression are the ipsilateral supracerebellar infratentorial (iSCIT), contralateral supracerebellar infratentorial approach (cSCIT), ipsilateral occipital transtentorial approach (iOCTT), and contralateral occipital transtentorial/falcine (cOCTF) approaches. A study quantitatively compared these approaches in terms of surgical exposure and maneuverability.

Each of the 4 approaches was performed in 4 cadaveric heads (8 specimens in total) and studied from authors in the Barrow Neurological Institute, Department of Neurosurgery, The First Affiliated Hospital of Soochow University, Suzhou, and Department of Neurosurgery, Irkutsk State Medical University.: A 6-sided anatomical polygonal region was configured over the cisternal pulvinar, defined by 6 reachable anatomical points in different vectors. Multiple polygons were subsequently formed to calculate the areas of exposure. The surgical freedom of each approach was calculated as the maximum allowable working area at the proximal end of a probe, with the distal end fixed at the posterior pole of the pulvinar. Areas of exposure, surgical freedom, and the working distance (surgical depth) of all approaches were compared.

No significant difference was found among the 4 different approaches with regard to the surgical depth, surgical freedom, or medial exposure area of the pulvinar. In the pairwise comparison, the cSCIT approach provided a significantly larger lateral exposure (39 ± 9.8 mm2) than iSCIT (19 ± 10.3 mm2, $p < 0.01$), iOCTT (19 ± 8.2 mm2, $p < 0.01$), and cOCTF (28 ± 7.3 mm2, $p = 0.02$) approaches. The total exposure area with a cSCIT approach (75 ± 23.1 mm2) was significantly larger than with iOCTT (43 ± 16.4 mm2, $p < 0.01$) and iSCIT (40 ± 20.2 mm2, $p = 0.01$) approaches (pairwise, $p \leq 0.01$).

The cSCIT approach is preferable among the 4 compared approaches, demonstrating better exposure to the cisternal pulvinar than ipsilateral approaches and a larger lateral exposure than the cOCTF approach. Both contralateral approaches described (cSCIT and cOCTF) provided enhanced lateral exposure to the pulvinar, while the cOCTF provided a larger exposure to the lateral portion of the pulvinar than the iOCTT. Medial exposure and maneuverability did not differ among the approaches. A short tentorium may negatively impact an ipsilateral approach because the cingulate isthmus and parahippocampal gyrus tend to protrude, in which case they can obstruct access to the cisternal pulvinar ipsilaterally [1)].

Cohen-Cohen et al. analyzed and compared the ipsilateral vs the contralateral version of the 2 main approaches to the cisternal pulvinar surface: paramedian supracerebellar infratentorial (PSCI) and interhemispheric occipital transtentorial (IOT).

The PSCI and IOT approaches were performed on 7 formalin-fixed adult cadaveric heads to evaluate qualitatively and quantitatively the microsurgical exposure of relevant anatomic structures. We quantitatively measured the corridor distance to our target with each approach.

The ipsilateral PSCI approach provided an easier access and a better exposure of the anteromedial portion of the cisternal pulvinar surface. The contralateral approach provided a wider and more accessible exposure of the posterolateral portion of the cisternal pulvinar surface. When protrusion of the posterior parahippocampal gyrus above the free edge of the tentorium was present, the contralateral PSCI approach provided an unobstructed view to both areas. The IOT approach provided a better view of the anteromedial portion of the cisternal pulvinar surface, especially with a contralateral approach.

Multiple approaches to the pulvinar have been described, modified, and improved. Based on this anatomic study we believe that although the corridor distance with a contralateral approach is longer, the surgical view and access can be better. We recommend the use of a PSCI contralateral approach especially when a significant protrusion of the posterior parahippocampal gyrus is present [2)].

From 1997 to 2017, 75 patients underwent this approach for cerebrovascular/oncologic pathology by Lawton. Of these, 30 patients underwent the ipsilateral approach for CM resection, and 3 patients underwent the contralateral approach. Historical patient data, radiographic features, surgical technique, and postoperative neurological outcomes were evaluated in each patient.

All 3 patients presented with symptomatic CMs within the right posterior thalamus with radiographic evidence of hemorrhage. All surgeries were performed in the sitting position. There were no intraoperative complications. Neuroimaging demonstrated complete CM resection in all cases. There were no new or worsening neurological deficits or evidence of rebleeding/recurrence noted postoperatively.

This study establishes the surgical feasibility of a contralateral SCIT approach in resection of symptomatic thalamic CMs It demonstrates the application for this procedure in extending the surgical trajectory superiorly and laterally and maximizing safe resectability of these deep CMs with gravity-assisted brain retraction [3)].

Videos

A 19-year-old woman who presented with a long-standing history of right hemiparesis with recent deterioration. MRI revealed a large CVM located in the left thalamus, with signs of recent hemorrhage extending to the left cerebral peduncle. Resection was achieved with a paramedian contralateral supracerebellar infratentorial approach in a semisitting position, with an uneventful postoperative course.

<html><iframe width="560" height="315" src="https://www.youtube.com/embed/Arvu52FkHOE" frameborder="0" allow="accelerometer; autoplay; encrypted-media; gyroscope; picture-in-picture" allowfullscreen></iframe></html> [4)]

References

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