Pulvinar 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 approach (iSCIT), contralateral supracerebellar infratentorial approach (cSCIT), ipsilateral occipital transtentorial (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). 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)].

The purpose of a study was to compare the surgical approaches to different parts of the pulvinar and to examine the efficacy of the endoscope as an adjunct to the operating microscope in this area.

The pulvinar was examined in 6 formalin-fixed human cadaveric heads through 5 approaches: 4 above and 1 below the tentorium. Each approach was performed using both the surgical microscope and 0° or 45° rigid endoscopes.

The pulvinar has a lateral ventricular and a medial cisternal surface that are separated by the fornix and the choroidal fissure, which wrap around the posterior surface of the pulvinar. The medial cisternal part of the pulvinar can be further divided into upper and lower parts. The superior parietal lobule approach is suitable for lesions in the upper ventricular and cisternal parts. Interhemispheric precuneus and posterior transcallosal approaches are suitable for lesions in the part of the pulvinar

forming the anterior wall of the atrium and adjacent cisternal part. The posterior interhemispheric transtentorial approach is suitable for lesions in the lower cisternal part and the supracerebellar infratentorial approach is suitable for lesions in the inferior and medial cisternal parts. The microscope provided satisfactory views of the ventricular and cisternal surfaces of the pulvinar and adjacent neural and vascular structures. The endoscope provided multi-angled and wider views of the pulvinar and adjacent structures.

A combination of endoscopic and microsurgical techniques allows optimal exposure of the pulvinar [2].

1)
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2)
Akiyama O, Matsushima K, Gungor A, Matsuo S, Goodrich DJ, Shane Tubbs R, Klimo P Jr, Cohen-Gadol AA, Arai H, Rhoton AL Jr. Microsurgical and endoscopic approaches to the pulvinar. J Neurosurg. 2016 Dec 9:1-16. [Epub ahead of print] PubMed PMID: 27935359.

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