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BACKGROUND: The endoscopic endonasal approach (EEA) has been proposed as a potential alternative for ventral brainstem lesions. The surgical anatomy, feasibility, and limitations of the EEA for intrinsic brainstem lesions are still poorly understood.

OBJECTIVE: To describe the surgical planning, anatomy, and technique of an intrinsic pontine glioma operated via EEA.

METHODS: Six-human brainstems were prepared for white matter microdissection. Ten healthy subjects were studied with high-definition fiber tractography (HDFT). A 56-yr-old female with right-hemiparesis underwent EEA for an exophytic pontine glioma. Pre- and postoperative HDFTs were implemented.

RESULTS: The corticospinal tracts (CSTs) are the most eloquent fibers in the ventral brainstem. At the pons, CSTs run between the pontine nuclei and the middle cerebellar peduncle (MCP). At the lower medulla, the pyramidal decussation leaves no room for safe ventral access. In our illustrative case, preoperative HDFT showed left-CST displaced posteromedially and partially disrupted, right-CST posteriorly displaced, and MCP severely disrupted. A transclival exposure was performed achieving a complete resection of the exophytic component with residual intra-axial tumor. Immediately postop, patient developed new left-side abducens nerve palsy and worse right-hemiparesis. Ten days postop, her strength returned to baseline. HDFT showed preservation and trajectory restoration of the CSTs.

CONCLUSION: The EEA provides direct access to the ventral brainstem, overcoming the limitations of lateral approaches. For intrinsic pathology, HDFT helps choosing the most appropriate surgical route/boundaries for safer resection. Further experience is needed to determine the indications and limitations of this approach that should be performed by neurosurgeons with high-level expertise in EEA.

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