Jugular foramen tumor surgery

Surgical management of jugular foramen tumors is complex and difficult. Radical removal of benign jugular foramen tumors is the treatment of choice, may be curative, and is achieved with low mortality and morbidity rates. Larger lesions can be radically excised in one surgical procedure by using a multidisciplinary approach. Reconstruction of the skull base with vascularized myofascial flaps reduces postoperative Cerebrospinal fluid fistulas. Postoperative lower cranial nerve deficits are the most dangerous complication [1].

Total resection of GJ tumors, meningiomas, and lower CN schwannomas can be a curative treatment. However, subtotal removal may be required to preserve CN function, vital vascular structures, and the brainstem. Postoperative radiotherapy is used to control residual tumors. When postoperative complications develop in patients, early rehabilitation is important to decrease mortality and morbidity. Therefore, patients should be closely followed [2].

Anatomically, the Jugular foramen has two vascular compartments that may be affected by tumor: the jugular bulb laterally and a passage for the inferior petrosal sinus medially.

Tumors may also penetrate the JF along the fibro-osseous diaphragm, which divides these two vascular channels. The lower cranial nerves lie on either side of this partition, which is connected to the posterior cranial fossa via a curved, funnel-shaped cone of the dura. Tumors that arise within or penetrate the JF lateral to this neural plane displace the nerves medially, a position favorable for their preservation during tumor extirpation. By contrast, medially positioned tumors displace the cranial nerves onto the lateral tumor surface, where they interpose between the surgeon and tumor in an unfavorable location. Glomus tumors consistently arise in the lateral aspect of the JF, displacing the lower cranial nerves medially. This positioning accounts for the high rate of neural preservation in small and medium-size glomus tumors that have not invaded the foramen's central partition. Meningiomas that arise lateral to the JF (e.g., the posterior petrous surface, sigmoid sinus) favorably displace the lower cranial nerves medially. By contrast, tumors that originate medial to the JF (e.g., clivus, foramen magnum) are unfavorable, laterally displacing the multiple small rootlets that coalesce into cranial nerves IX-XI into a vulnerable location. Schwannomas arise within the neural plane and have a variable geometry that depends, in part, upon the nerve of origin. Theoretically, tumors that arise from the ninth nerve, which is located on the lateral surface of the neural plane, should be more favorable than those originating from the tenth or eleventh nerves, which lie on its deep surface. The propensity of these three tumor types toward thrombosis of the jugulosigmoid complex also carries important surgical implications. Because glomus tumors arise from the jugular bulb, the jugulosigmoid complex is nearly always occluded. In both meningiomas and schwannomas, however, the jugular system may occasionally remain patent. This is important to recognize through angiography and/or magnetic resonance venography, since sacrifice of a patent, dominant system risks intracerebral venous infarction [3].

Surgery for tumors around the jugular foramen has significant risks of dysphagia and vocal cord palsy due to possible damage to the lower cranial nerve functions. For its treatment, long-term tumor

control by maximum resection while avoiding permanent neurological damage is required. To accomplish this challenging goal, Matsushima et al. developed an intraoperative continuous vagus nerve monitoring system and herein report their experience with this novel neuromonitoring method.

Fifty consecutive patients with tumors around the jugular foramen (34 jugular foramen schwannomas, 11 meningiomas, 3 hypoglossal schwannomas, and 2 others) who underwent microsurgical resection under continuous vagus nerve monitoring within an 11-year period were retrospectively investigated. Evoked vagus nerve electromyograms were continuously monitored by direct 1-Hz stimulation to the nerve throughout the microsurgical procedure.

The average resection rate was 96.2%, and no additional surgery was required in any of the patients during the follow-up period (average 65.0 months). Extubation immediately after surgery and oral feeding within 10 days postoperatively were each achieved in 49 patients (98.0%). In 7 patients (14.0%), dysphagia and/or hoarseness were mildly worsened postoperatively at the latest follow-up, but tracheostomy or gastrostomy was not required in any of them. Amplitude preservation ratios on intraoperative vagus nerve electromyograms were significantly smaller in patients with postoperative worsening of dysphagia and/or hoarseness (cutoff value 63%, sensitivity 86%, specificity 79%).

Intraoperative continuous vagus nerve monitoring enables real-time and quantitative assessment of vagus nerve function and is important for avoiding permanent vagus nerve palsy while helping to achieve sufficient resection of tumors around the jugular foramen [4].

Endoscopic surgical access from the neck to the jugular foramen is feasible. This surgical approach can simultaneously remove intracranial and extracranial tumors and can also be used to remove tumors in the ventral region of the occipital foramen and the hypoglossal canal. Furthermore, this approach is advantageous in that minimal trauma is inflicted. With judicious patient selection, this approach may have significant advantages and may be used as a primary or secondary surgical approach in the future. Nonetheless, this approach is still in development in a laboratory setting, and further research and improvements are needed before facing more complicated situations in clinical practice [5].

Jugular foramen schwannoma surgery

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