

Importance of Preserved Periosteum Around Jugular Foramen Neurinomas for Functional Outcome of Lower Cranial Nerves: Anatomic and Clinical Studies

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BACKGROUND: Surgical removal of jugular foramen (JF) neurinomas remains controversial because of their radicality in relation to periosteal sheath structures.

OBJECTIVE: To clarify the particular meningeal structures of the JF with the aim of helping to eliminate surgical complications of the lower cranial nerves (LCNs).

METHODS: We sectioned 6 JFs and examined histological sections using Masson trichrome stain. A consecutive series of 25 patients with JF neurinomas was also analyzed, and the MIB-1 index of each excised tumor was determined.

RESULTS: In the JF, meningeal dura disappeared at the nerve entrance, forming a jugular pocket. JF neurinomas were classified into 4 types: subarachnoid (type A by the Samii classification), foraminal (type B), epidural (type C), and episubdural (type D). After an average follow-up of 9.2 years, tumors recurred in 9 cases (36%). Type A tumors did not show regrowth, unlike type B tumors, in which all recurred. Radical surgery by the modified Fisch approach did not contribute to tumor radicality in type C and D tumors, even in cases in which LCN function was sacrificed. In preserved periosteum, postoperative LCN deterioration was decreased. Bivariate correlation analysis revealed that jugular pocket extension, tumor removal, MIB-1 greater than 3%, and reoperation or gamma knife use were significant recurrence factors.

CONCLUSION: For LCN preservation, the periosteal layer covering the cranial nerves must be left intact except in patients with a subarachnoid tumor. To prevent tumor regrowth, postoperative gamma knife treatment is recommended in tumors with an MIB-1 greater than 3%.

KEY WORDS: Jugular foramen, Jugular pocket, Neurinoma, Meninges, Surgical method

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Jugular foramen (JF) schwannomas, which may arise from cranial nerves IX, X, and XI, compose only 8% of all intracranial schwannomas.^{1,2} Surgical removal of JF neurinomas remains controversial because of potential dispersion of the tumor and the risk of lower cranial nerve (LCN) paresis. In addition, high recurrence rates (5.7%) have been reported by previous authors after surgical intervention.² In these cases, the tumor is assumed to remain in the dural layer of the JF after excision. It is

thought that the complex nature of the JF's meningeal architecture as well as that of its surrounding neurovascular structures may cause the high morbidity and low radicality observed after surgical treatment. Therefore, the objective of this article is to clarify the particular meningeal structures of the JF with the aim of helping to eliminate surgical complications of the LCNs.

METHODS

Anatomic Study

Ethical approval for this study was obtained from the Ethics Committee of Keio University Hospital. Three decapitation specimens from adult cadavers

ABBREVIATIONS: JF, jugular foramen; LCN, lower cranial nerve