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Jugular Foramen Meningioma: Imaging and Differentiating Features

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Purpose
Meningiomas that arise intrinsically within the jugular foramen represent a rare manifestation of a common tumor. The clinical and radiologic features of jugular foramen meningiomas may be similar to the more common lesions of this location, notably paraganglioma, possibly resulting in incorrect preoperative diagnosis. Recent otological and neurosurgical reviews have highlighted the important management and surgical issues, emphasizing the importance of accurate preoperative imaging.

Materials & Methods
A retrospective review of all surgically treated jugular foramen meningiomas at our institution resulted in eight cases of jugular foramen meningioma with available imaging studies. Meningiomas were defined as intrinsic (5/8) when centered in the jugular foramen, and extrinsic (3/8) when centered in the posterior fossa with secondary extension into the jugular foramen. Eight cases of jugular foramen paraganglioma and ten cases of jugular foramen schwannoma also were reviewed. Images were analyzed for anatomical location and morphology, with specific attention to those characteristics that might assist in differentiation. Clinical information including demographic data and presenting features was reviewed.

Results
Intrinsic meningiomas were characterized by extensive circumferential skull base infiltration (5/5), with involvement of the middle ear cavity (5/5), internal auditory canal (5/5), hypoglossal canal (5/5), clivus (4/5), and carotid space (5/5) noted.
CT demonstrated a characteristic (5/5) permeative-sclerotic appearance to the bony margins of the jugular foramen in all intrinsic meningiomas. Extrinsic meningioma (3/8) typically appeared as globular (2/3) or en-plaque (1/3) posterior fossa masses with secondary extension into the jugular foramen and limited (1/3) skull base infiltration. All meningiomas with contrast-enhanced studies (7/8) demonstrated strong, uniform enhancement and dural tails. Paraganglioma was characterized by localized skull base infiltration, with predominant involvement of the middle ear cavity (8/8) and carotid space (8/8). Medial spread with involvement of the hypoglossal canal (2/8), jugular tubercle (2/8), and clivus (0/8) was less common. Enhancement, flow voids on MR imaging, and permeative destruction of the bony margins of the jugular foramen on CT were universal features. Schwannoma caused expansion of the jugular foramen without invasion of the marrow space (10/10), and typically involved the carotid space (8/10) and posterior fossa (6/10), without involvement of the temporal bone or clivus. Enhancement and well corticated bony margins on CT were universal features.

**Conclusion**

Intrinsic jugular foramen meningiomas are characterized by extensive circumferential skull base infiltration, which result in important clinical, surgical and imaging differences from the typical meningioma arising elsewhere. MR imaging and bone only CT are complementary imaging techniques which allow accurate delineation of tumor extent and differentiation from other more common jugular foramen lesions.