Surgical Approaches and Patient Outcomes in Jugular Foramen Schwannomas: A Meta-Analysis and Systematic Review

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Introduction

Jugular foramen schwannomas (JFS) are the second most common non-vestibular schwannomas after trigeminal schwannomas.[1] They most commonly arise from cranial nerves IX, X, or XI, with the vagus nerve frequently implicated.

Due to their deep skull base location and proximity to the brainstem, lower cranial nerves, and major vascular structures, surgical resection presents significant technical challenges.[2] Postoperative lower cranial nerve deficits remain a major source of morbidity.

Several surgical approaches have been described to maximize tumor resection while minimizing neurological compromise.[3] However, due to the variance in growth patterns and approach, clear surgical guidelines and surgical outcomes remains unclear. This meta analysis and systematic review evaluates contemporary surgical strategies and associated patient outcomes in JFS management.

Aim

To synthesize available evidence on surgical management of jugular foramen schwannomas and quantify pooled rates of gross total resection, recurrence, and postoperative morbidity in order to better inform operative decision-making and patient counseling.

Methods and Materials

A comprehensive literature search was performed using PubMed, Scopus, and Web of Science for studies reporting surgical management and outcomes of jugular foramen schwannomas.

Inclusion criteria: original studies reporting surgical approach and postoperative outcomes, English full-length texts.

Exclusion criteria: reviews, meta-analyses, case reports, case series with <5 patients.

Data extracted: demographics, tumor origin, surgical approach, extent of resection, postoperative complications, recurrence rates, follow-up duration.

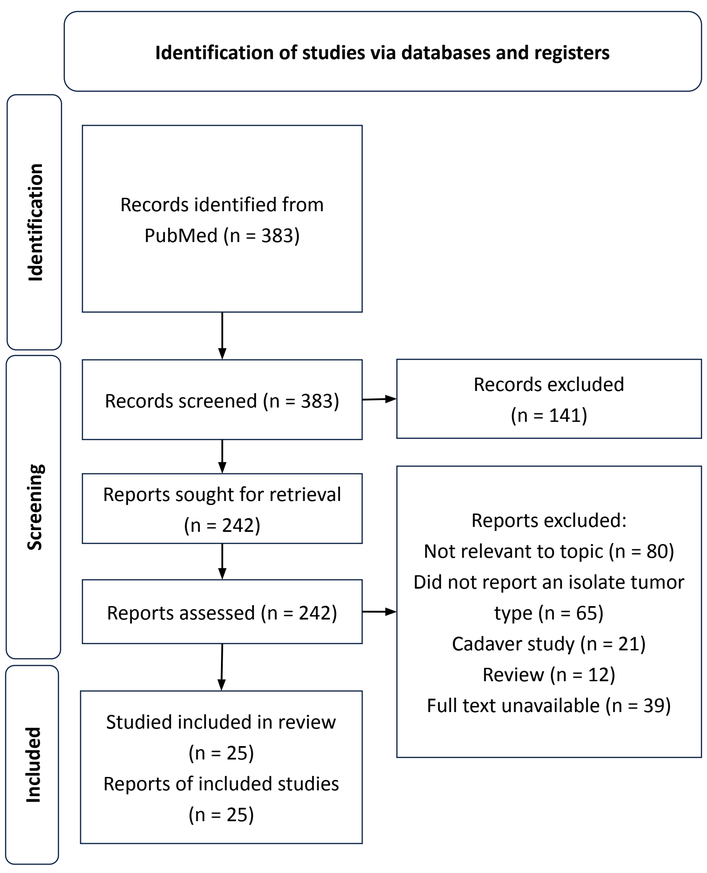


Figure 1. PRISMA Diagram of study selection

Results

From 383 initial unique articles, 25 met all inclusion criteria with 636 total patients (n = 83/49/7/497 CN IX/X/XI/Unknown JFS). Mean age at presentation was 40.8 years (53% female).

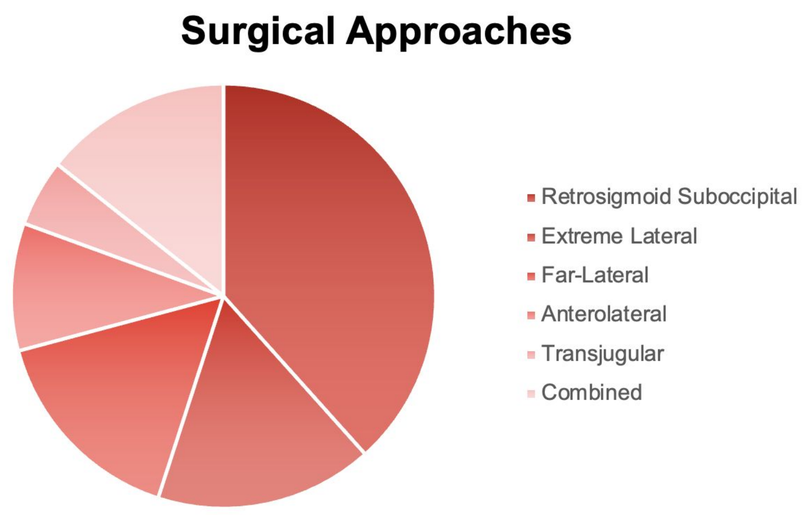
Gross total resection was achieved in 73% of cases (Table 1). Recurrence or progression following resection was 7.8% over a mean follow-up of 35 months. The retrosigmoid approach was the most frequently utilized, followed by far or extreme-lateral, anterolateral, and then combined approach techniques.

Combined approach techniques and radiosurgery were commonly employed for subtotal resections. The most common postoperative complications were new or worsening dysphagia, hoarseness, and facial nerve palsy. Perioperative mortality was rare (1.5%).

GTR is achievable in most cases, but lower cranial nerve involvement and extent of resection were strongly associated with postoperative morbidity.

Table 1. Pooled Weighted Postoperative Outcomes Following Surgical Resection of JFS

Outcome	Rate (%)
Gross Total Resection	73
Recurrence	7.8
New/Worsened Post-operative deficit	
CN VII	6.8
CN VIII	6.5
CN IX	21
CN X	17
CN XI	8.6
CN XII	7.6
Infection	5.3
Hydrocephalus	1.1
CSF Leak	1.7
Mortality	1.5



Discussion

Retrosigmoid and infralabyrinthine approaches are suitable for intracranial lesions, whereas combined skull base techniques are best for dumbbell-shaped tumors with intra- and extracranial extension.

Subtotal resection with adjuvant surveillance or radiosurgery can balance tumor control with functional preservation. Postoperative complications often correlated with tumor size and extent of resection.

Advances in monitoring, tailored resections, and radiosurgery integration have improved long-term outcomes.

Conclusions

Management of JFS is challenging given their proximity to critical neurovascular structures. Although GTR is possible, it carries significant risk of new cranial nerve deficits.

Approach selection should be individualized to tumor configuration and preoperative function.

A tailored multimodal strategy — including combined approaches and subtotal resection with radiosurgery when appropriate — offers the best balance between oncologic control and preservation of function.

Standardized outcome reporting and prospective studies are needed to refine treatment algorithms.

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