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# Optimizing Patient Outcomes in Petroclival Meningioma Treatment: Evaluating Surgery, Radiosurgery, Radiotherapy, and Combined Treatment Approaches

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**Abstract**
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## Abstract

Objectives:

Petroclival meningiomas pose a formidable challenge due to their proximity to critical neurovascular structures, necessitating complex surgical interventions with a high risk of complications. Stereotactic radiosurgery (SRS) offers an alternative or complementary treatment option, yet the optimal treatment strategy remains undefined. Our objective was to evaluate the local control rates of petroclival meningiomas and the incidence of cranial nerve palsies following treatment with surgical resection, radiotherapy, and SRS.

Methods:

This retrospective study reviewed medical records of patients treated for petroclival meningiomas at Stanford University between 1980-April 2024. Pre- and post-treatment radiological data were analyzed to assess local control. Cranial nerve function was evaluated pre- and post-treatment, and at last follow-up.

Results:

A total of 171 patients (129 females; median age 54.65 years) diagnosed with petroclival meningioma were identified. Treatment modalities included: 31 patients underwent surgical resection alone, 27 received SRS alone, 11 received radiotherapy alone, 36 underwent combined surgical resection and SRS, 28 received combined surgical resection and radiotherapy, 9 were treated with a triad of surgical resection, SRS, and radiotherapy, and 29 were managed with serial imaging alone. The percentage change of tumor volume from diagnosis to follow-up for these groups was -55.6%, 28.9%, 73.0%, -64.9%, -12.0%, 35.3%, and -8.8%, respectively. The incidence of new cranial nerve palsies was highest (68%) in patients who underwent surgical resection. The percentage of worsening pre-existing palsies was greater in patients receiving single-modality non-surgical treatment.

Conclusion(s):

Surgery, radiotherapy, and SRS demonstrated promising local control rates for specific patient cohorts with petroclival meningiomas. Patients receiving combination therapies generally fared better than those receiving single-modality treatments, with surgery followed by SRS yielding the best outcome. The incidence of cranial nerve palsies was lower following SRS and radiotherapy compared to surgery. Future research should focus on refining multi-modal treatment strategies to minimize complications and improve patient quality of life.