

Cholesterol Granuloma and Other Petrous Apex Lesions



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KEYWORDS

- Cholesterol granuloma • Petrous apex • Temporal bone • Skull base • Petrous bone
- Cholesterin granuloma

KEY POINTS

- Petrous apex cholesterol granuloma has a unique appearance on MRI that distinguishes it from other lesions. These lesions are hyperintense on both T1 and T2 weighted images.
- Asymptomatic petrous apex cholesterol granulomas can be managed with observation using serial imaging.
- A thorough headache history should be obtained to determine if this symptom is a result of the more common entities of migraine or muscle tension as opposed to a petrous apex cholesterol granuloma.
- Symptomatic lesions can be managed with marsupialization, with either an endonasal approach or a lateral transtemporal approach, depending on the individual's anatomy.
- Symptom resolution or improvement is achieved in the vast majority of patients regardless of the surgical approach, and one should consider recurrent symptoms or enlargement of the cholesterol granuloma as opposed to lack of aeration in determining disease progression.

INTRODUCTION

Diagnosis and management of petrous apex lesions present unique challenges secondary to their centralized location and critical adjacent and in situ structures. The petrous apex forms the most medial aspect of the temporal bone and is defined laterally by the otic capsule, petrous carotid artery, and the semicanal of the tensor tympani muscle. The superior surface of the petrous apex is the floor of the middle fossa, and it extends from the arcuate eminence to Meckel cave. The posterior surface of the petrous bone extends from the endolymphatic duct operculum to the clivus. The jugular fossa, vertical petrous carotid canal, and inferior petrosal sinus make up the inferior border of the petrous bone. The superior petrosal sinus defines the border

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Abbreviations

CSF	Cerebrospinal fluid
CT	Computed tomography
MRI	Magnetic resonance imaging

between the middle and posterior fossa surface of the petrous apex. The internal auditory canal arbitrarily divides the petrous apex into anterior and posterior segments when viewed from above, which is important with respect to selecting surgical approaches. Petrous apex cholesterol granuloma is a non-neoplastic inflammatory lesion of the petrous apex that is often found incidentally on cranial imaging.^{1,2}

EPIDEMIOLOGY AND PATHOPHYSIOLOGY

Asymmetric pneumatization and effusion are the most common entities identified on medical imaging of the petrous apex. It has been estimated that petrous apex effusions outnumber cholesterol granulomas 500 to 1.³ The incidence of petrous apex cholesterol granuloma has been estimated at 0.6 cases per 1 million population.⁴ Cholesterol granulomas are 10 times more common than petrous apex cholesteatomas.⁵

Two hypotheses exist for the pathogenesis of cholesterol granuloma. Uniform to both hypotheses is that blood enters a mucosalized space, and the anaerobic breakdown products of blood, including cholesterol crystals, incite a foreign body giant cell reaction, thus resulting in cyst formation. The original theory proposes that negative pressure resulting from eustachian tube function is responsible for bleeding into a mucosalized space. Jackler and Cho proposed an alternative hypothesis, as middle ear hemorrhage and a hyperpneumatized temporal bone are rarely seen in patients with chronic eustachian tube dysfunction.⁶ Another argument by these same authors against the classic hypothesis is that once the air cell is filled with blood, pressure should be equalized, thus no further bleeding would occur, which is necessary for further expansion and enlargement of a cholesterol granuloma. Jackler and Cho offered an alternative exposed marrow hypothesis that cholesterol granulomas form when there is an osseous dehiscence between bone marrow and a pneumatized air cell. They supported this theory by demonstrating that 6 out of 13 patients with cholesterol granuloma indeed had an osseous dehiscence between bone marrow and an air cell in the contralateral petrous apex, whereas control patients with pneumatized petrous apices had no evidence of dehiscence.⁶ The exposed marrow theory has been supported by additional temporal bone histologic studies.⁷

PRESENTATION

Petrous apex pathology can present with a variety of symptoms, but is often incidentally discovered on imaging for unrelated symptoms. Headaches, hearing loss, ear pressure, and dizziness are common chief complaints from otolaryngology patients, and these complaints can also be seen in patients with petrous apex lesions. Most headache and petrous apex pathologies are not related to the lesion but are more commonly secondary muscle tension or migraines. Retro orbital pain and generalized temporoparietal headaches are sometimes seen in patients with a petrous apex lesion.¹ Pain in the distribution of the ipsilateral trigeminal nerve in the presence of a petrous apex mass can be explained by compression or irritation of the cisternal segment or the Gasserian ganglion and is seen in approximately 20% of patients with cholesterol granuloma.⁸ Double vision is occasionally identified and results

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