Head Scratcher:
A Skull Base Lesion without Definitive Diagnosis

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Introduction

In this case report, we explore the evolving presentation, evaluation, and treatment of a patient with a lytic skull base lesion that did not meet definitive diagnostic criteria for any known pathology but interestingly demonstrated significant clinical improvement with conservative management alone.

Case Presentation

In July 2015, a 44-year-old woman with a history of poorly controlled diabetes mellitus presented to her local hospital with left otalgia and headache. Shortly thereafter, she was found to have a large nasopharyngeal/skull base lesion involving the left nasopharynx, temporal fossa, cavernous sinus, and petrous temporal bone. She had previously undergone three separate biopsies without a definitive diagnosis. Four months later, she developed diplopia, trismus, headache, left facial tingling & pain, neck pain, left sided hearing loss, nausea, vomiting, and an unintentional 37-pound weight loss.

Physical examination in November 2015 revealed left trigeminal hypoesthesia, left abducens paralysis, absence of hearing on the left, severe trismus with minimal inter-incisal distance, and firm, tender left level II lymphadenopathy. An audiogram indicated left profound sensorineural hearing loss (SNHL). Several biopsies of this mass were performed, but all indicated varying levels of acute and chronic inflammation without evidence of neoplasm.

A fine needle aspiration of this mass was nondiagnostic, revealing only mixed inflammatory infiltrate. A endonasal endoscopic biopsy of this nasopharyngeal mass in November 2015 only revealed benign mucosal and submucosal tissue with marked acute and chronic inflammation, but no evidence of a neoplasm. Flow cytometry did not show any clonal rearrangement and was otherwise unremarkable. A bone marrow biopsy in 2015 revealed only hypercellular bone marrow with myeloid hyperplasia, but no features of a lymphoproliferative disorder.

Over the next several months, until the summer of 2016, she completed several courses of antibiotics and high dose prednisone with significant improvement in her diplopia & trismus. In March 2016, she developed new onset bilateral lower extremity neuropathy with a truncal rash of many small circular hyperpigmented papules. She was started on gabapentin and was evaluated by rheumatology, but again without any definitive diagnosis. Laboratory findings from this workup are listed below.

In May 2024, she returned with improvement of her symptoms and dramatic reconstitution of bone at the central skull base, clivus, and lateral wall of the cochlea. In November 2024, her otoscopy was notable for a bluish hue of the left tympanic membrane. On imaging, she continued to have a middle ear and mastoid opacification. MRI was notable for a T1 and T2 hyperintense material in the mastoid consistent with a cholesterol granuloma. She remains with profound left SNHL. Presently, she is being managed conservatively with serial imaging and undergoing evaluation for hearing rehabilitation.

Laboratory Data

Test	Date	Reference Range	Result
ANA	3/15/16	0.00-0.99 U	0.36
C-ANCA	4/29/16	NA	Negative
P-ANCA	4/29/16	NA	Negative
Myeloperoxidase Ab	3/15/16	<0.4 U	Negative
Proteinase 3 Ab	3/15/16	<0.4 U	Negative
Alkaline Phosphatase	10/18/16	40-150 U/L	**205 (H)**
	1/29/21		**189 (H)**
	8/9/23		**164 (H)**
	3/6/24		**158 (H)**
Lactate Dehydrogenase	3/15/16	125 - 250 U/L	192
C-reactive protein	3/15/16	0.2 - 5.0 mg/L	**15.4 (H)**
Sedimentation rate	3/15/16	0-15mm/hr	**65 (H)**
IgG Subclasses			
IgG 1	4/30/16	341 - 894 mg/dL	**957 (H)**
IgG 2	4/30/16	171 - 632 mg/dL	**672 (H)**
IgG 3	4/30/16	18.4 - 106.0 mg/dL	34.4
IgG 4	4/30/16	2.4 - 121.0 mg/dL	81.6
IgG Total Subclass	4/30/16	767 - 1590 mg/dL	**1730 (H)**
Ig Lambda Light Chain	10/18/16	0.57 - 2.63 mg/dL	1.72
Ig Kappa Free Light Chain	10/18/16	0.33 - 1.94 mg/dL	1.7
Kappa/Lambda Ratio	10/18/16	0.26 - 1.65	0.988
Serum Protein Electrophoresis			Not performed
Urine Protein Electrophoresis			Not performed

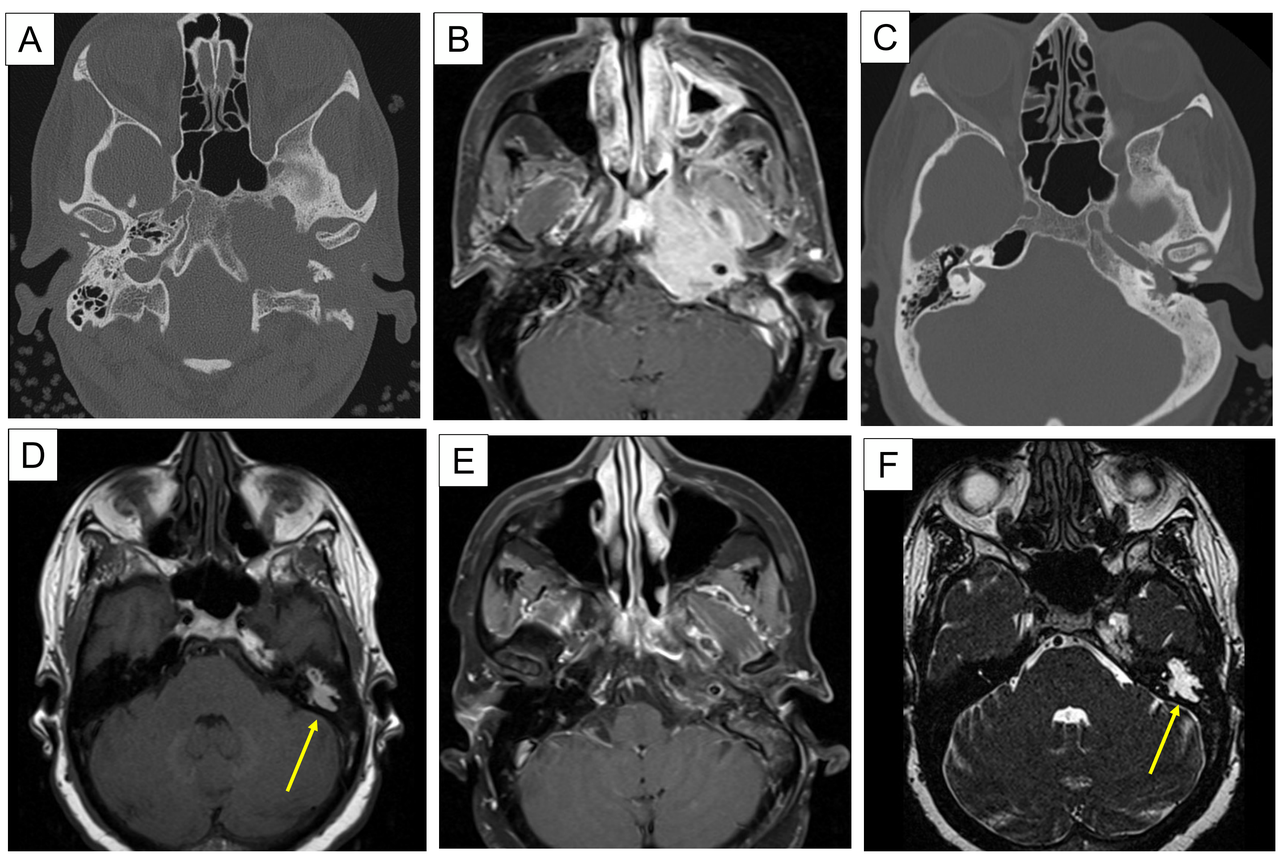

Figure 1: Lytic skull base lesion with remineralization of bone over time. **A)** Axial CT scan without contrast, March 2016. Note the erosion of the petrous carotid canal and clivus. There is also erosion into the left foramen ovale, mastoid (especially along the course of the tympanic facial nerve), and basal turn of the cochlea. **B)** Axial MRI IAC, T1 with contrast, November 2015. Note the large area of enhancement along the left nasopharynx and parapharyngeal space. This surrounds the carotid artery and involves the pterygoid musculature. **C)** Axial CT scan without contrast November 2024. Note the reconstitution of bone along the petrous carotid canal, basal turn of the cochlea, and glenoid fossa. **E)** Axial MRI IAC, T1 without contrast. Note the hyperintense signal in the mastoid and middle ear space (arrow). **D)** Axial MRI IAC, T1 with contrast, November 2024. Note the marked improvement of enhancement. Not pictured here is persistent enhancement in the region of the left foramen ovale. **F)** Axial MRI IAC, 2. Note the hyperintense signal in the mastoid and middle ear space (arrow).

Discussion

For years, there were several possible etiologies for this patient's skull base lesion but no well-fitting diagnosis. Initially, plasma dyscrasias such as solitary plasmacytoma (SP) and IgG monoclonal gammopathy of undetermined significance (MGUS) were promising differential diagnoses given the patient's response to therapy and evolution of findings over time.[1,2] SP has been shown in literature to re-mineralize, and it is associated with persistently elevated alkaline phosphatase.[3,4] MGUS is less likely without an abnormal kappa/lambda ratio,[5] and this patient did not have evidence of disease progression to multiple myeloma.

POEMS (Polyneuropathy, Organomegaly, Endocrinopathy, Monoclonal gammopathy, Skin abnormalities) syndrome is an extremely rare paraneoplastic syndrome due to an underlying plasma cell disorder which could possibly encompass all symptoms and laboratory findings. However, she did not have any organomegaly to complete the traditional POEMS sequelae, and her poorly controlled diabetes may confound her peripheral neuropathic symptoms[6].

Other differential diagnoses such as meningioma, schwannoma, chordoma, and nasopharyngeal carcinoma are less likely as this lesion would be expected to progress without definitive treatment and lytic bone classically would not reconstitute in such cases.

As of November 2024, the most likely diagnosis is a cholesterol granuloma which was previously infected on initial presentation in 2015. A superimposed chronic infection would explain the non-diagnostic biopsies and diffuse inflammation during initial workup, and remineralization could have occurred with protracted convalescence. This diagnosis is supported by a bluish discoloration to the tympanic membrane on recent otoscopy, as well as hyperintense signal in the middle ear space and mastoid on recent MRI imaging in both T1 and T2 sequences.[7] As she is currently without any significant symptoms, we have made the joint decision to continue conservative treatment with serial imaging and hearing augmentation.

Conclusions

When surgical pathology is not sufficient to diagnose a skull base lesion, a variety of laboratory and imaging testing can be utilized to explore more uncommon diagnoses. The surgeon should not undervalue the importance of a thorough physical examination. Although malignancy must always remain on the differential for lesions of this nature, it is important to consider other hematologic, lymphoproliferative, and infectious etiologies.

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References

1. Dimopoulos MA, Hamilos G. Solitary bone plasmacytoma and extramedullary plasmacytoma. *Curr Treat Options in Oncol*. 2002;3(3):255-259. doi:10.1007/s11864-002-0015-2
2. mansouri H, elouaouch S, el youssi Z, et al. Solitary plasmacytoma of the skull base: A case report and literature review. *Radiology Case Reports*. 2023;18(11):3894-3898. doi:10.1016/j.radcr.2023.08.027
3. Mohan M, Kumar M, Samant R, et al. Bone remineralization of lytic lesions in multiple myeloma - The Arkansas experience. *Bone*. 2021;146:115876. doi:10.1016/j.bone.2021.115876
4. Blum A, Bazou D, Ting KR, et al. Successful treatment of solitary bone plasmacytoma and bone remineralisation with novel biological agents leading to new bone formation – a case series. *British Journal of Haematology*. 2021;193(4):e36-e38. doi:10.1111/bjh.17413
5. Kyle RA, Larson DR, Therneau TM, et al. Long-Term Follow-up of Monoclonal Gammopathy of Undetermined Significance. *New England Journal of Medicine*. 2018;378(3):241-249. doi:10.1056/NEJMoa1709974
6. Dispenzieri A. POEMS Syndrome: 2019 Update on diagnosis, risk-stratification, and management. *American Journal of Hematology*. 2019;94(7):812-827. doi:10.1002/ajh.25495
7. Isaacson B. Cholesterol granuloma and other petrous apex lesions. *Otolaryngol Clin North Am*. 2015;48(2):361-373. doi:10.1016/j.otc.2014.12.009