Primary Intracranial Extraskeletal Myxoid Chondrosarcoma in the Sphenoid Sinus: A Case Report and Literature Review

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AUTHORS' CONTRIBUTIONS

Huai Chen: Conception and design, Administrative support, Provision of study materials or patients, Data analysis and interpretation, Manuscript writing, Final approval of manuscript

Shuxin Li: Collection and assembly of data, Data analysis and interpretation, Manuscript writing, Final approval of manuscript

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DISCLOSURES

All authors declare that they have no conflicts of interest.

CONSENT

Yes.

HUMAN AND ANIMAL RIGHTS

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Declaration of Helsinki and its subsequent amendments. Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

ABSTRACT

Background: Extraskeletal myxoid chondrosarcoma (EMC) is an exceedingly rare soft tissue sarcoma of low to intermediate grade. Its occurrence in the sphenoid sinus is exceedingly rare, and to our knowledge, no prior cases have been reported in this location.

Case Description: We report a case of a 37-year-old woman who presented with dizziness, weakness, and gait instability. Head computed tomography and magnetic resonance imaging revealed a soft tissue mass measuring approximately 25 mm × 20 mm × 12 mm in the left sphenoid sinus, with multiple linear and granular calcifications. The mass invaded the clivus and the left internal carotid artery canal. Postoperative histopathological and immunohistochemical findings confirmed the diagnosis of extraskeletal myxoid chondrosarcoma. After two months of follow-up, the patient recovered well with no tendency of tumor recurrence.

Conclusion: To our knowledge, this is the first reported case of a primary intracranial extraskeletal myxoid chondrosarcoma arising in the sphenoid sinus. The distinctive imaging features—particularly the prominent calcification and the characteristic pattern of secondary bone invasion from an extra-axial origin—provide crucial diagnostic clues for this rare tumor.

CASE REPORT

BACKGROUND

Extraskeletal myxoid chondrosarcoma (EMC) is a rare soft tissue sarcoma of low to intermediate histological grade, typically arising in the deep soft tissues of the extremities or trunk. Primary intracranial EMC is exceedingly uncommon, and, to the best of our knowledge, no case originating in the sphenoid sinus has been previously reported in the literature. Due to its rarity and nonspecific imaging features—such as calcification and bone destruction—EMC is frequently misdiagnosed as more common skull base tumors, including chondrosarcoma, chordoma, or meningioma. This report describes a novel case of EMC occurring in an atypical location, underscoring the importance of including EMC in the differential diagnosis of calcified skull base masses. Furthermore, this case contributes valuable radiological and histopathological data to the existing body of knowledge on this rare entity.

CASE REPORT

A 37-year-old female presented with acute-onset dizziness, weakness, and gait instability of one-day duration without identifiable triggers. Initial laboratory investigations—including complete blood count, biochemistry profile, chest radiography, and electrocardiography—demonstrated no significant abnormalities.

IMAGING EXAMINATION: A non-contrast computed tomography (CT) scan of the head revealed a slightly hypodense soft tissue mass (27 HU) within the left sphenoid sinus, measuring 25 mm × 20 mm × 12 mm, exhibiting heterogeneous density with multiple linear and granular calcifications (Figure 1A). Post-contrast imaging revealed marked enhancement (79 HU) and invasion into the posterior clivus and left internal carotid artery canal (Figure 1C). The preoperative radiological impression favored chondroma. Complementary magnetic resonance imaging (MRI) showed the mass as isointense on T1-weighted imaging (Figure 1D), heterogeneously hyperintense on T2-weighted imaging with internal punctate hypointensities corresponding to calcifications (Figure 1E-1G), and demonstrating marked homogeneous enhancement on contrast-enhanced T1WI (Figure 1H). Adjacent paranasal sinuses remained well-aerated without mucosal thickening. The initial MRI suggested hemangioma.

MANAGEMENT: The patient underwent endoscopic resection of the clival skull base tumor via a combined endonasal transsphenoidal and transoral approach. Intraoperative exploration identified the tumor occupying the left sphenoid sinus with its base anchored at the clivus. The lesion demonstrated osseous invasion involving the sinus floor and lateral wall. A focal defect in the internal carotid artery canal was observed, with firm tumor adhesion to the arterial adventitia. Fragmented tumor resection was performed through dual transoral and transnasal corridors. Intraoperative frozen section examination revealed stellate tumor cells embedded within a myxochondroid stroma. Immunohistochemically, the neoplastic cells exhibited diffuse positivity for Vimentin and SATB2, focal reactivity for IDH1 and D2-40, and diffuse SMA expression. Tumor cells were negative for S-100 protein, Brachyury, MDM2, and CDK4. The Ki-67 proliferation index was low (approximately 1% in hotspot areas). Based on the characteristic histomorphology, clinical presentation, and immunoprofile, the final diagnosis was extraskeletal myxoid chondrosarcoma.

FOLLOW-UP: At two-month follow-up, the patient was doing well, and nasal endoscopy showed no evidence of recurrence. Given complete resection with negative margins and low Ki-67 index, the short-term prognosis is favorable. However, long-term surveillance is recommended due to the risk of late recurrence in extraskeletal myxoid chondrosarcoma.

DISCUSSION

Etiology & demographics: Extraskeletal myxoid chondrosarcoma (EMC) was initially characterized by Stout and Verner in 1953, with Enzinger and Shiraki later establishing its diagnostic criteria as a distinct, rare neoplasm in 1972 [1]. With an estimated annual incidence of <1 per 1,000,000 population, it constitutes an exceptionally uncommon entity [2]. The exact cause of EMC remains unknown. However, most EMC tumors harbor recurrent gene fusions, the most common being EWSR1-NR4A3, which may play a role in tumor development [3]. To our knowledge, this case description documents the first reported primary intracranial EMC originating within the sphenoid sinus.

Clinical & imaging findings: Through comprehensive literature analysis, we identified 12 previously published cases of primary intracranial EMC, with the current case constituting the thirteenth (Table 1) [3-14]. The cohort demonstrated a median age at diagnosis of 43.5 years, indicating predominant adult involvement. The clinical manifestations are diverse, with common symptoms including headache, hearing loss, ataxia, cranial nerve deficits (such as facial paralysis, dysphagia, and visual impairment), seizures, and nasopharyngeal symptoms (such as nasal obstruction and epistaxis). The specific presentation is closely related to the anatomical location of the tumor.

The anatomical distribution of extraskeletal myxoid chondrosarcoma (EMC) fundamentally differs from conventional chondrosarcoma. While conventional chondrosarcomas manifest as primary osseous malignancies centered in the clival and temporo-occipital regions—frequently involving the sphenoid bone, sinus, and clivus—intracranial EMCs consistently originate from extra-axial sites [15]. Literature analysis indicates these tumors primarily occupy superficial cerebral cortical surfaces, deep ventricular compartments, or structures interfacing with dura, nerves or choroid plexus [3]. Among the 13 cases analyzed (12 published plus the current case), 84.6% arose in extra-axial locations (e.g., cerebellopontine angle, jugular foramen, meninges, choroid plexus), whereas 15.4% were primarily parenchymal within the cerebellum. Only 15.4% exhibited secondary bone invasion, which represented a late-stage feature. The present case,

centered in the left sphenoid sinus mucosa with extension into the internal carotid canal, exemplifies classic EMC behavior: extra-axial origin with secondary bone invasion. Critically, this represents the first documented EMC specifically localized to the sphenoid sinus, expanding the topographic spectrum of this malignancy.

The principal modalities for diagnosing primary intracranial EMC are head CT and MRI. Characteristic CT findings include round or oval hypodense masses, with occasional intratumoral hemorrhage or peritumoral edema while calcification is historically uncommon [3]. Contrast-enhanced CT typically demonstrates heterogeneous enhancement [4]. On MRI, lesions frequently exhibit T1WI hypointensity, T2WI heterogeneous hyperintensity, and heterogeneous post-contrast enhancement, though the enhancement pattern can sometimes be peripheral rim enhancement [3]. Notably, while calcification occurs in 50% of conventional chondrosarcomas, it was previously unreported in myxoid variants [15]. The presence of linear and granular calcifications in this case (Figure 1B) thus represents a paradoxical imaging feature with potential diagnostic significance. Osseous destruction may also occur. Our expanded cohort revealed secondary bone invasion in 23.1% of cases: two historical cases (clivus [12]; occipital bone [11]) and the current case, exhibiting sphenoid sinus floor and lateral wall invasion, indicative of locally advanced disease progression.

Treatment & prognosis: Surgical resection remains the primary treatment for intracranial extraskeletal myxoid chondrosarcoma, with gross total resection (GTR) associated with lower recurrence risk. Among 12 reported cases, 9 underwent GTR and most remained disease-free, while all 4 recurrences occurred within 2 years—highlighting the importance of close early follow-up. The two fatal cases suggest potential for aggressive behavior despite intermediate grading. Radiotherapy was used in 6 cases, including several with long-term local control, indicating its potential role in improving tumor control, particularly when resection is incomplete [3-14]. In this case, tumor invasion into the clivus and adherence to the internal carotid artery precluded complete resection, and partial resection was performed via combined endonasal and transoral approaches. Residual disease carries a definite risk of recurrence, and adjuvant radiotherapy is generally recommended to reduce local progression. This case illustrates that when complete resection is limited by critical anatomy, a combination of maximal safe resection and radiotherapy offers the best chance for durable local control.

Differential Diagnoses: Soft tissue masses with calcification, marked enhancement, and bone destruction in the sphenoid sinus or clival region require differentiation from several entities. Conventional chondrosarcoma typically arises within the skull base synchondroses. It exhibits characteristic arc-like, ring-like, or punctate calcifications, where abundant calcification indicates better differentiation. Additionally, it shows hyperintensity on T2-weighted imaging and heterogeneous enhancement. The most significant is that the lesion is centered on osseous destruction and demonstrates outward growth. Chordoma originates midline in the clivus, shows less frequent calcification, often grows posteriorly or inferiorly, and classically demonstrates a T2 hyperintense "honeycomb sign" with slow, progressive enhancement. Meningioma commonly presents with a broad dural base (sometimes with hyperostosis), may show psammomatous calcification, and typically exhibits intense homogeneous enhancement with a potential "dural tail" sign [16,17].

TEACHING POINT

Extraskeletal myxoid chondrosarcoma is an extra-axially originating tumor that can involve the sphenoid sinus and cause secondary bone erosion of the skull base. It may show linear or granular calcifications on imaging, a feature that can help distinguish it from other primary skull base tumors.

Table 1 Published and present cases of primary intracranial extraskeletal myxoid chondrosarcoma

QUESTIONS

Question 1: Which of the following CT and MRI features are observed in the sphenoid sinus extraskeletal myxoid chondrosarcoma described in this case?

A. Hypodense mass on non-contrast CT (applies)
B. Calcifications within the tumor (applies)
C. Isointense signal on T1-weighted MRI (applies)
D. Heterogeneous hyperintensity on T2-weighted MRI (applies)
E. No enhancement after contrast administration

Explanation:

The tumor appeared as a slightly hypodense mass on non-contrast CT with multiple linear and granular calcifications [A non-contrast computed tomography (CT) scan of the head revealed a slightly hypodense soft tissue mass... exhibiting heterogeneous density with multiple linear and granular calcifications]. On MRI, it was isointense on T1WI [Complementary magnetic resonance imaging (MRI) showed the mass as isointense on T1-weighted imaging (Fig 1D)], heterogeneously hyperintense on T2WI with internal punctate hypointensities corresponding to calcifications, and demonstrated marked homogeneous enhancement post-contrast [demonstrating marked homogeneous enhancement on contrast-enhanced T1WI]. Therefore, the absence of enhancement (E) is incorrect, but isointensity on T1WI (C) is a correctly observed feature and applies.

Question 2: Which of the following statements about the anatomical origin and behavior of intracranial extraskeletal myxoid chondrosarcoma are correct?

A. It typically arises from osseous structures like the clivus.
B. It originates from extra-axial sites (applies)
C. Secondary bone invasion is a common early feature.
D. It may involve the meninges or choroid plexus (applies)
E. It can invade the internal carotid artery canal (applies)

Explanation:

Intracranial EMC consistently originates from extra-axial sites such as the cerebellopontine angle, jugular foramen, meninges, or choroid plexus, rather than from bone [intracranial EMCs consistently originate from extra-axial sites...]. Among 13 analyzed cases, 84.6% arose in extra-axial locations. Bone invasion is not an early feature but occurs in advanced disease; only 23.1% of cases showed secondary bone destruction [Our expanded cohort revealed secondary bone invasion in 23.1% of cases...indicative of locally advanced disease progression]. In this case, the tumor invaded the clivus and the left internal carotid artery canal, confirming its locally aggressive potential [The mass invaded the clivus and the left internal carotid artery canal].

Question 3: Which of the following treatment strategies are supported by the literature for intracranial extraskeletal myxoid chondrosarcoma?

A. Gross total resection is associated with lower recurrence risk (applies)\

B. Adjuvant radiotherapy is recommended when resection is incomplete (applies)

C. Chemotherapy is the first-line treatment

D. Long-term local control has been achieved with radiotherapy (applies)

E. Endoscopic transnasal approach is contraindicated

Explanation:

Surgical resection remains the primary treatment, and gross total resection (GTR) is linked to reduced recurrence risk [Surgical resection remains the primary treatment...with gross total resection (GTR) associated with lower recurrence risk]. When complete resection is not possible due to critical anatomy—as in this case where the tumor adhered to the internal carotid artery—adjuvant radiotherapy is generally recommended to reduce local progression [Residual disease carries a definite risk of recurrence, and adjuvant radiotherapy is generally recommended...]. Radiotherapy has been used in 6 cases with long-term local control, suggesting its efficacy [Radiotherapy was used in 6 cases, including several with long-term local control...]. Chemotherapy is not mentioned as a first-line option. The endoscopic transnasal approach was successfully used in this case, so it is not contraindicated.

Question 4: Which of the following tumors should be considered in the differential diagnosis of a calcified, enhancing, skull base mass with bone destruction?

A. Chondrosarcoma (applies)

B. Chordoma (applies)

C. Meningioma (applies)

D. Hemangioma

E. Schwannoma

Explanation:

The differential diagnosis includes chondrosarcoma, which typically arises from skull base synchondroses and shows arc-like or ring-like calcifications [Conventional chondrosarcoma typically arises within the skull base synchondroses...with characteristic arc-like, ring-like, or punctate calcifications]. Chordoma originates midline in the clivus, shows less calcification, and often has a "honeycomb" appearance on T2WI [Chordoma originates midline in the clivus...classically demonstrates a T2 hyperintense 'honeycomb sign'...]. Meningioma may show psammomatous calcification and intense homogeneous enhancement with a "dural tail" sign [Meningioma commonly presents with a broad dural base... intense homogeneous enhancement with a potential 'dural tail' sign]. Hemangioma and schwannoma are less likely given the prominent calcification and location in the sphenoid sinus.

Question 5: What are the key teaching points and significance of this case of sphenoid sinus extraskeletal myxoid chondrosarcoma?

A. It is the first reported case of primary intracranial EMC arising in the sphenoid sinus (applies)

B. Calcification is a common feature in all EMCs

C. The tumor demonstrates secondary bone invasion from an extra-axial origin (applies)

D. SATB2 positivity helps differentiate it from chordoma (applies)

E. It typically presents with fever and leukocytosis

Explanation:

This case is the first documented instance of primary intracranial EMC originating in the sphenoid sinus [To our knowledge, this is the first reported case of a primary intracranial extraskeletal myxoid chondrosarcoma arising in the sphenoid sinus]. It exemplifies the typical behavior of EMC: extra-axial origin with secondary bone invasion [The present case...exemplifies classic EMC behavior: extra-axial origin with secondary bone invasion]. Immunohistochemical positivity for SATB2 and negativity for Brachyury help distinguish EMC from chordoma [Tumor cells were negative for Brachyury... Excludes chordoma]. Calcification is not common in EMC and was a paradoxical finding in this case. Systemic inflammatory signs like fever were not reported.

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FIGURES

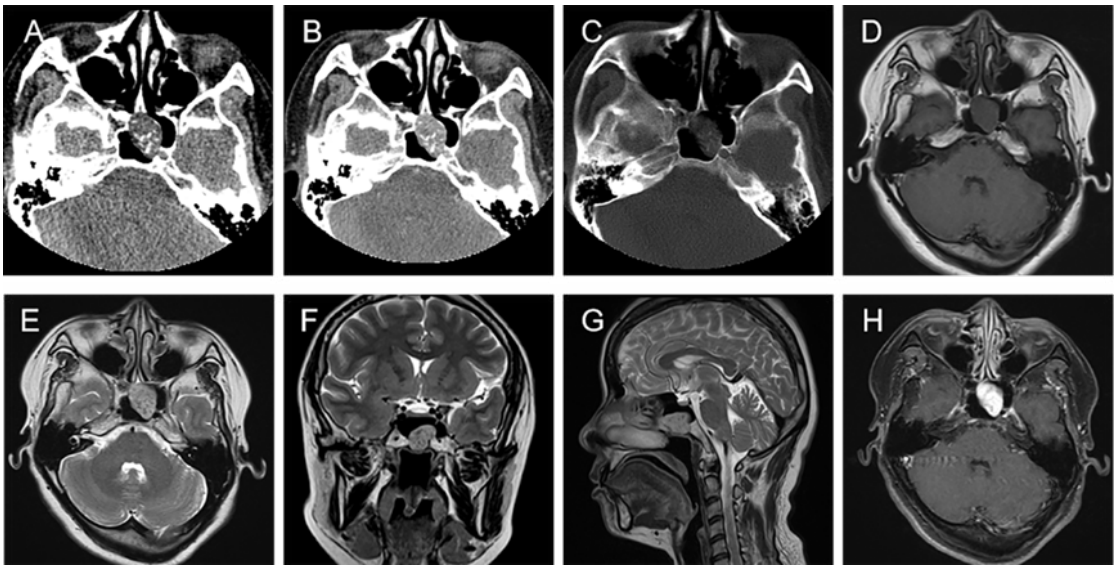

Figure 1: 37-year-old female with left sphenoid sinus extraskeletal myxoid chondrosarcoma. A: Non-contrast CT (soft tissue window): Hypodense mass with multiple linear and granular calcifications. B: Contrast-enhanced CT: Marked homogeneous enhancement of the tumor. C: Non-contrast CT (bone window): Osseous destruction of clivus and left carotid canal. D: T1-weighted axial image: Isointense mass. E-G: T2-weighted axial, coronal, and sagittal images: Heterogeneous hyperintensity with punctate hypointense foci. H: T1-weighted enhanced axial image: Strong homogeneous enhancement. TECHNIQUE: Axial CT, 300 mAs, 120 kV, 2.5 mm slice thickness, 80 mL iopromide (Ultravist) contrast material; MRI using a 1.5 T Siemens Amira system included axial T1-weighted, axial, coronal, and sagittal T2-weighted, and axial post-contrast T1-weighted sequences, TR/TE 600/15 ms (T1), 5000/100 ms (T2), slice thickness 4 mm, field of view 240 × 240 mm, matrix 320 × 256.

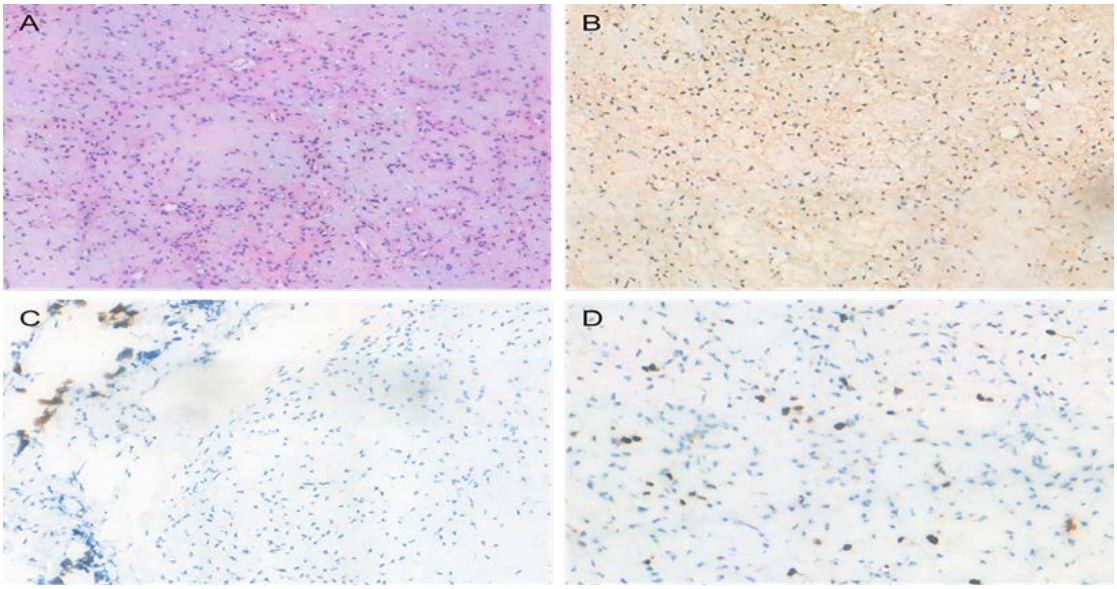

Figure 2: Histopathological and immunohistochemical features of extraskeletal myxoid chondrosarcoma.(A) Hematoxylin-eosin (HE) staining, Characteristic stellate tumor cells embedded in myxochondroid matrix (×40). (B) SATB2 immunohistochemical (IHC) staining, Tumor cells show strong diffuse nuclear positivity for SATB2 (×40). (C) Brachyury IHC staining, Tumor cells are negative for Brachyury with positive internal control in vascular endothelium (arrow, ×40). Excludes chordoma. (D) Ki-67 IHC staining, Ki-67 proliferative index is approximately 1% in hotspot area (×40).

Ref.	Age/ gender	Presenting symptoms	Location	Size	Calcification	Bone destructive lesions	Radiology	Treatment	Outcome (follow-up)
Thomas W.Smith et al. [4], 1981	12\M	Headache, nausea, vomiting, and difficulty ambulating.	left cerebellar hemisphere	NA	N	N	CT: Hyperdense left cerebellar lesion with central lucency and peripheral enhancement; mild-moderate ventriculomegaly.	GTR	No recurrence (13 months)
Kazufumi Sato et al. [5],1993	43\F	blurred vision and gait disturbance.	pineal region	NA	N	N	CT: Multilobulated cystic mass in pineal region with hydrocephalus.	PR, RT (60 Gy), chemotherapy	Died of recurrence (36 months)
C.Gonza´lez-Lois et al. [6],2002	17\F	tonic and clonic seizures, episodic left hemiplegia and intense right-sided headaches.	fronto-parietal area ofthe right hemisphere	NA	N	N	MRI: T1-hypointense mass with heterogeneous gadolinium enhancement.	GTR	Recurrence at 16 months; re-recurrence at 20 months.
T J Cummings et al. [7],2004	63\M	progressive hearing loss and gait imbalance	jugular foramen	24 mm	NA	NA	MRI: Heterogeneously enhancing jugular foramen mass.	GTR	NA
Jin Hoon Park et al. [8],2012	21\F	weakness in the right extremities,and both visual and hearing loss.	posterior horn of the left lateral ventricle	26×40×29 mm	N	N	CT: Enhanced ventricular mass with hypodense foci. MRI: T1-isointense, and T2-hyperintense lesion with perilesional edema and heterogeneous enhancement.	GTR, RT(60.8 Gy)	No recurrence (6 months)
Renaud Dulou et al. [9],2012	70\F	behavioural changes and pro-gressive difficulty with walking.	left frontal lobe	NA	N	N	MRI: T2-hyperintense left frontal mass with edema, and T1-weighted revealing ring enhancement of the lesion.	GTR, preoperative RT (60 Gy)	Recurrence at 3 months; died at 10 months
Janardan B Garde et al. [10],2016	45\M	a slow growing swelling on the left side of the palate.	palatal gingiva	20×15×5 mm	NA	NA	NA	excisional biopsy	NA
You Qin et al.[11],2017	41\F	sudden headache associated with vomiting.	in the left cerebellum	49×43 mm	N	occipital bone	CT: Iso-hypodense cerebellar mass with hemorrhage or edema; occipital bone destruction.	GTR, two stage of RT (56Gy/50Gy), chemotherapy	No recurrence (20 months)
Abhishek Purkayastha et al. [12],2018	60\F	left-sided nasal obstruction and occasional epistaxis.	nasopharynx	35×34×67mm	N	sphenoid and clivus	MRI: T2-hyperintense nasopharyngeal mass invading clivus.	STR, RT	No recurrence (2 years)
Yun Gi Hong et al. [13], 2021	36\M	dizziness	fourth ventricle	16 mm	N	N	MRI: T1-hypointense, and T2-hyperintense fourth ventricular mass with homogeneous enhancement	GTR, RT(54Gy/27F)	No recurrence (3 months)
Zi-You Zhu et al. [3],2022	52\M	moderate intermittent headache and dizziness.	left cavernous sinus	34 × 30 mm	N	N	CT: Homogeneous hypodense mass. MRI: T1-hypointense, T2-heterogeneous mass with septations and heterogeneous enhancement.	GTR, RT(45Gy/15F)	No recurrence (1 years)
Kadir Oktay et al. [14],2023	14\F	dysphonia, dysphagia, tinnitus, and diplopia.	left-sided cerebellopontine angle cistern	28 × 30 ×27mm	N	N	MRI: CPA mass with T1-hypointensity, and T2-hyperintensity, heterogeneous enhancement, and brainstem compression.	GTR	No recurrence (15 months)
Present case	37\F	dizziness, weakness, and gait instability	left sphenoid sinus	25 × 20 ×12mm	multiple linear and granular calcifications	clivus and left internal carotid artery canal	CT: Hypodense sphenoid sinus mass with linear and granular calcifications, clival and carotid canal invasion. MRI: T1-isointense, and T2-heterogeneously hyperintense mass with calcific hypointensities and homogeneous enhancement.	PR	Under follow-up

NA: Not available; PR: Partial resection; STR: Subtotal resection; GTR: Gross total resection; N: No; Y: Yes; CPA: Cerebellopontine angle; RT: Radiotherapy.

Table 2: Summary of extraskeletal myxoid chondrosarcoma (EMC)

Feature	Description
Etiology	Unknown; majority associated with recurrent gene fusions, most commonly EWSR1-NR4A3.
Incidence	Extremely rare, with an estimated annual incidence of <1 per 1,000,000.
Gender Ratio (M:F)	Based on the analyzed 13 intracranial cases: Approximately 1:1 (6 males, 7 females).
Age Predilection	Adults; median age at diagnosis of 43.5 years in intracranial cases.
Risk Factors	None clearly identified.
Treatment	Gross total resection (GTR) is the primary goal. Adjuvant radiotherapy is recommended for incomplete resection.
Prognosis	Potential for late recurrence. Generally low to intermediate grade, but aggressive behavior and fatalities have been reported.
Imaging Findings	**CT**: Hypodense extra-axial mass with possible linear or granular calcifications; shows marked enhancement. **MRI**: Iso- to hypointense on T1WI; heterogeneously hyperintense on T2WI; demonstrates marked homogeneous or heterogeneous enhancement. Secondary bone invasion is a late feature.

Table 3: Differential diagnosis of calcified, enhancing skull base masses

	CT	MRI T2WI	Contrast Enhancement	Distinguishing Features
Extraskeletal Myxoid Chondrosarcoma (EMC)	Hypodense mass with linear/granular calcifications.	Heterogeneously hyperintense	Marked, homogeneous or heterogeneous	**Extra-axial origin** with secondary bone invasion.
Conventional Chondrosarcoma	Arc-like, ring-like calcifications. Arises from bone.	Brightly hyperintense	Heterogeneous	**Centered on osseous destruction** (skull base synchondroses).
Chordoma	Midline clival origin; calcification is rare.	Brightly hyperintense with internal septations ("honeycomb appearance")	Slow, progressive	**Midline** location; classic "honeycomb appearance" on T2WI.
Meningioma	May have psammomatous calcifications; hyperostosis.	Iso- to slightly hyperintense	Intense, homogeneous; "dural tail" sign	Broad **dural base** with associated "dural tail" sign.

KEYWORDS

Extraskeletal myxoid chondrosarcoma; Sphenoid sinus; Case report; Diagnostic Imaging; Skull Base Neoplasms.

ABBREVIATIONS

CT = Computed Tomography
DWI = Diffusion-Weighted Imaging
EMC = Extraskeletal Myxoid Chondrosarcoma
GTR = Gross Total Resection
HU = Hounsfield Units
IHC = Immuno Histo Chemical
MRI = Magnetic Resonance Imaging
T1WI =T1-Weighted Imaging
T2WI = T2-Weighted Imaging