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Cemento-Ossifying Fibroma of the Maxilla Mimicking a Malignant Chondroid-Matrix Tumor in a Young Adult Treated with Hemimaxillectomy: A Case Report and Review of the Literature

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Abstract

Cemento-ossifying fibroma (COF) is a benign fibro-osseous neoplasm of the jaws that predominantly occurs in the mandible, whereas maxillary lesions are less common and may exhibit more aggressive local behavior. Radiologically, these lesions can mimic malignant bone tumors, including chondrosarcoma and osteosarcoma, particularly when they exhibit extensive bone destruction and a chondroid-appearing matrix. This case report aimed to describe a young adult with a large right maxillary COF exhibiting computed tomography (CT) findings suggestive of malignancy, highlight the diagnostic approach, and discuss surgical management and the potential role of adjuvant radiotherapy. A 26-year-old man presented with a two-year history of painless right cheek swelling accompanied by nasal deviation, reduced olfaction, loosening of the right maxillary posterior teeth, and diplopia. Contrast-enhanced CT revealed a heterogeneous, hyperattenuating mass measuring 6.58 × 6.97 × 5.76 cm, with a chondroid-appearing matrix, arising from the wall of the right maxillary sinus. The lesion demonstrated erosion of the orbital floor and destruction of the zygomatic bone and maxillary alveolar process, raising suspicion of a primary malignant bone tumor. Incisional biopsy revealed a benign fibro-osseous lesion, while immunohistochemical staining was negative for MDM2 and showed no detectable Ki-67 labeling. The patient subsequently underwent right hemimaxillectomy through a Weber–Ferguson incision, and definitive histopathological examination confirmed ossifying fibroma without evidence of malignancy. No adjuvant therapy was administered, and postoperative local disease control was reported. This case highlighted the potential for large maxillary COF lesions to mimic malignant bone tumors on imaging, emphasizing the importance of integrating clinical, radiologic, and histopathologic findings, with adjunctive immunohistochemical assessment when indicated, to establish an accurate diagnosis and avoid unnecessary treatment. Complete surgical excision remained the primary treatment approach, while adjuvant radiotherapy was not indicated for histologically confirmed benign COF.

INTRODUCTION

Cemento-ossifying fibroma (COF), also known as ossifying fibroma, is a benign fibro-osseous neoplasm of the jaws characterized by the replacement of normal bone with cellular fibrous tissue containing variable amounts of mineralized material (Gautier et al., 2025; Neumann et al., 2024). Most lesions occur in the mandible, particularly in the premolar–molar region (Chidzonga et al., 2023; Matthys & Vanhoenacker, 2025). Maxillary lesions are less common but may exhibit more extensive local involvement because their expansion can affect the maxillary sinus, nasal cavity, orbit, and zygomatic bone (Bhat et al., 2022; Packiaraj et al., 2021; Tompodung & Sensusiati, 2024; Van Snick et al., 2022).

Although histologically benign, large maxillary COFs can cause substantial facial deformity, dental displacement, nasal obstruction, and ocular symptoms (Azab, 2024; Bhat et al., 2022). On imaging, large expansile lesions exhibiting mixed attenuation, internal matrix mineralization, and cortical erosion may closely resemble primary malignant bone tumors, including osteosarcoma and chondrosarcoma (Cè et al., 2025; Jeong et al., 2025; Naraghi et al., 2022). Histopathologically, these lesions may also overlap with fibrous dysplasia, cemento-osseous dysplasia, and low-grade central osteosarcoma (Chandini et al., 2023; Gautier et al., 2025; Yin et al., 2024). Accurate diagnosis therefore requires careful correlation of clinical, radiologic, and histopathologic findings. Complete surgical excision remains the primary treatment approach, whereas adjuvant radiotherapy is generally not recommended for benign COF, although its potential role in selected unresectable or recurrent cases has been discussed (Adham & Dewi, 2020; Greenberg & Schmelzeisen, 2019; Strickler et al., 2017).

This report presents a young adult with a large right maxillary COF exhibiting computed tomography (CT) findings suggestive of a malignant chondroid-matrix tumor. It describes the diagnostic process used to establish the benign nature of the lesion and discusses surgical management and considerations regarding adjuvant radiotherapy.

A major diagnostic challenge associated with large maxillary fibro-osseous lesions is radiologic–histopathologic discordance, particularly when imaging suggests malignancy despite benign findings on tissue examination. Large maxillary COFs may exhibit extensive expansion, erosion of the orbital floor, destruction of the zygomatic bone and maxillary alveolar process, and displacement of adjacent orbital and nasal structures. These features can resemble those of malignant bone tumors, particularly chondrosarcoma and osteosarcoma. Distinguishing COF from low-grade central osteosarcoma is especially important because these lesions may share overlapping radiologic and histopathologic characteristics despite requiring different clinical management. Assessment of MDM2 gene amplification using molecular techniques, such as fluorescence in situ hybridization (FISH), may help distinguish low-grade central osteosarcoma from benign fibro-osseous lesions, while MDM2 immunohistochemistry can provide supportive but nondefinitive evidence. Similarly, the Ki-67 labeling index may offer supplementary information regarding proliferative activity, although a low index alone cannot exclude malignancy. These diagnostic considerations were relevant to the present case, involving a 26-year-old man with a large right maxillary mass initially interpreted on CT as a possible malignant chondroid-matrix tumor. Histopathologic review and adjunctive immunohistochemical evaluation were subsequently performed to clarify the diagnosis and guide surgical management.

Previous studies of maxillary ossifying fibroma have described its clinical characteristics, radiologic features, and surgical management; however, the diagnostic challenges associated with lesions mimicking malignancy remain less extensively documented. Nnko et al. (2024) reported a case of maxillary ossifying fibroma in a 26-year-old man managed through a Weber–Ferguson approach, highlighting the diagnostic difficulties associated with clinicopathologic similarities between ossifying fibroma and other maxillofacial neoplasms. A case reported in 2025 involving juvenile ossifying fibroma in a 9-year-old patient emphasized orbital involvement and severe dental displacement. However, juvenile ossifying fibroma represents a distinct clinicopathologic entity and may not directly reflect the diagnostic considerations associated with conventional ossifying fibroma in adults (Chandini et al., 2023; Kadhiresan et

al., 2026). Systematic reviews have also examined recurrence patterns and surgical outcomes following conservative and extensive resection (Adham & Dewi, 2020; Gautier et al., 2025), generally supporting more complete surgical removal for large or locally extensive lesions (Dewi et al., 2023). Regarding malignant transformation, Haidry et al. (2024) described an exceptionally rare case of COF associated with osteosarcoma, highlighting the importance of careful pathologic assessment and clinical follow-up, although such isolated reports do not establish the frequency or mechanism of malignant transformation. Strickler et al. (2017) discussed the potential use of adjuvant radiotherapy for juvenile ossifying fibroma involving the maxillary sinus when further surgical intervention could result in substantial morbidity. Nevertheless, the applicability of this approach to conventional COF remains uncertain, particularly given the limited evidence regarding radiotherapy outcomes and long-term safety. Consequently, complete surgical excision remains the preferred treatment for resectable benign lesions.

Despite existing reports, important gaps remain in understanding the diagnostic evaluation and management of maxillary COF with imaging features suggestive of malignancy. First, relatively few published cases have described maxillary COF presenting with radiologic characteristics strongly suggestive of chondrosarcoma or osteosarcoma, particularly those requiring additional histopathologic and immunohistochemical assessment. The diagnostic contribution and limitations of MDM2 and Ki-67 immunohistochemistry in such cases also warrant further clarification (Owosho et al., 2022). Second, evidence supporting adjuvant radiotherapy for conventional maxillary COF remains insufficient, particularly for extensive lesions requiring hemimaxillectomy. Most available evidence consists of individual case reports or small case series, with limited long-term follow-up and insufficient data to determine whether aggressive radiologic features are associated with biological behavior that would justify additional treatment. The present case contributes to this literature by documenting radiologic–histopathologic discordance, adjunctive immunohistochemical findings, definitive surgical treatment, and the decision to avoid adjuvant radiotherapy following confirmation of a benign lesion.

The clinical significance of this diagnostic challenge lies in the potential consequences of misclassifying benign and malignant maxillary bone lesions. Extensive bone destruction and a chondroid-appearing matrix on CT may raise suspicion of malignancy and influence decisions regarding surgical extent and additional treatment. However, interpreting a benign lesion as malignant may expose patients to unnecessary treatment and associated functional, aesthetic, and psychological morbidity. Conversely, misdiagnosing low-grade central osteosarcoma as a benign fibro-osseous lesion may result in inadequate treatment, recurrence, or disease progression. These considerations emphasize the importance of multidisciplinary evaluation and careful correlation of imaging findings with representative tissue sampling and histopathologic examination. When diagnostic uncertainty persists, additional immunohistochemical or molecular investigations may be appropriate. Documenting cases in which apparent radiologic malignancy is not confirmed histopathologically may therefore provide useful clinical insights into diagnostic decision-making and individualized treatment planning.

The distinctive contribution of this case lies in its integrated assessment of a large maxillary COF that radiologically mimicked a malignant chondroid-matrix tumor, together

with its histopathologic and immunohistochemical evaluation and subsequent surgical management. The case highlights the adjunctive role of MDM2 and Ki-67 immunohistochemistry in evaluating the differential diagnosis between benign fibro-osseous lesions and low-grade central osteosarcoma, while recognizing that negative immunohistochemical findings alone do not definitively exclude malignancy. It also addresses the clinical rationale for hemimaxillectomy without adjuvant radiotherapy after a benign diagnosis was established. By integrating clinical presentation, imaging characteristics, tissue examination, and treatment considerations, this report provides a practical illustration of diagnostic reasoning in a challenging maxillofacial lesion.

The purpose of this case report was to describe the clinical, radiologic, histopathologic, and immunohistochemical findings of a 26-year-old man with a large right maxillary COF initially suspected to be a malignant chondroid-matrix tumor on preoperative CT. It also aimed to explain the diagnostic evaluation that supported the final benign diagnosis and discuss the rationale for surgical treatment through hemimaxillectomy without adjuvant radiotherapy. Through this approach, the report sought to emphasize the importance of integrating clinical assessment, radiologic interpretation, histopathologic review, and adjunctive immunohistochemical findings when evaluating maxillary fibro-osseous lesions with aggressive imaging characteristics.

From a clinical perspective, this case illustrates the importance of interpreting MDM2 and Ki-67 immunohistochemical findings alongside conventional histopathologic features rather than relying on individual markers to establish or exclude malignancy. It reinforces the principle that extensive maxillary bone destruction and a chondroid-appearing matrix on CT do not independently establish a malignant diagnosis. Instead, such findings warrant appropriate tissue sampling, multidisciplinary assessment, and additional diagnostic investigations when indicated. The case also contributes descriptive evidence regarding surgical management of extensive benign maxillary COF without adjuvant therapy, although conclusions regarding recurrence risk and long-term disease control require adequate postoperative follow-up.

Accordingly, this report aimed to present the clinical manifestations, CT characteristics, histopathologic findings, immunohistochemical assessment, and surgical management of a large right maxillary cemento-ossifying fibroma in a 26-year-old man. Particular emphasis was placed on the initial radiologic suspicion of a malignant chondroid-matrix tumor, subsequent diagnostic clarification through biopsy review and adjunctive immunohistochemistry, right hemimaxillectomy performed through a Weber–Ferguson-type incision, and definitive histopathologic confirmation of ossifying fibroma without malignant features. By contextualizing these findings within the existing literature on maxillary fibro-osseous lesions, diagnostic pitfalls, and adjuvant radiotherapy, the report sought to support accurate diagnosis, appropriate surgical decision-making, and avoidance of unnecessary treatment-related morbidity.

METHOD

Patient information and history

A 26-year-old self-employed male workshop worker was referred to the Surgical Oncology Division of Hasan Sadikin General Hospital, Bandung, Indonesia, with a painless

swelling of the right cheek. Two years before presentation, he had noticed a quail egg-sized lump that had increased approximately tenfold in size. No overlying skin ulceration was observed. Six months after the initial swelling appeared, he developed a firm, painless swelling of the right palate without intraoral ulceration. One year after symptom onset, he experienced reduced olfaction, leftward nasal deviation, loosening of the right maxillary posterior teeth, and diplopia accompanied by occasional dizziness, although his visual acuity remained intact (Figures 1 and 3). He reported no history of facial trauma, maxillofacial surgery, cervical or other masses, persistent headaches, early-morning vomiting, cough, or dyspnea.

The patient was a nonsmoker with no history of diabetes mellitus or hypertension and no family history of malignancy. His dental history included caries affecting the right maxillary posterior teeth three years before the onset of cheek swelling and extraction of two right maxillary and one left maxillary posterior teeth two years before symptom onset. As the mass progressively enlarged, he initially sought medical attention at Dustira Hospital, where a tissue biopsy was performed, before being referred to Hasan Sadikin General Hospital for further evaluation and management.

Clinical findings

The patient was in good general condition (ECOG performance status 0; weight 63 kg, height 168 cm; blood pressure 120/70 mmHg, heart rate 88/min, respiratory rate 20/min, temperature 36.7 °C). Examination of the head showed facial asymmetry with dystopia, right ptosis and enophthalmos of the right eye. Visual acuity was 6/6 in both eyes, the pupils were isochoric (3 mm) with normal light reflexes, and diplopia was present. The nose was displaced to the left and the right naris was narrowed without discharge.

Local examination revealed a mass of the right cheek extending from the lower border of the right lower eyelid inferiorly, displacing the nose and right upper lip toward the left (Figure 1). The overlying skin had the same color as the surrounding skin, with a scar on the lateral aspect of the nose. On palpation the mass was hard, fixed, painless and ill-defined with a regular surface, measuring 7 × 7 × 6 cm. Intraoral examination showed protrusion of the right hard palate with intact mucosa and no ulceration (Figure 2). A hard, solid swelling of 5 × 4 × 1 cm extended from the gingival margin to the third molar region, with mobility of the right upper first molar. Dental calculus was present on most teeth, with caries of the first molar and missing second and third molars on the right and the third molar on the left upper arch. No cervical lymph nodes were palpable. Examination of the thorax, heart, abdomen, inguinal region, spine, pelvis and extremities was unremarkable.



Figure 1. Preoperative clinical photographs: (A) frontal view showing right facial swelling, nasal deviation to the left and right ptosis; (B, C) right oblique and right lateral views; (D, E) left oblique and left lateral views.

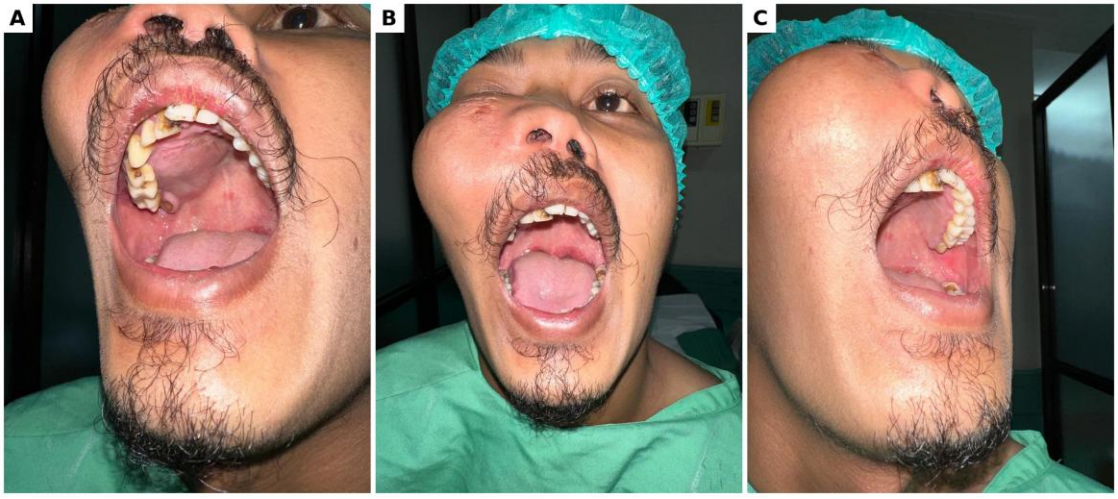


Figure 2. Intraoral photographs showing protrusion of the right hard palate and alveolar process with intact mucosa (A–C).

Diagnostic assessment

Based on the clinical picture, the working diagnosis was a right maxillary tumor, suspected benign, with fibrous dysplasia, osseous dysplasia and ossifying fibroma as differential diagnoses; a malignant tumor invading the nasal cavity and orbit (chondrosarcoma) without regional or distant metastasis was also considered. Contrast-enhanced CT of the head and chest radiography were requested, and the biopsy slides from the referring hospital were reviewed. The sequence of events is summarized in Figure 3 and the investigations in Table 1.

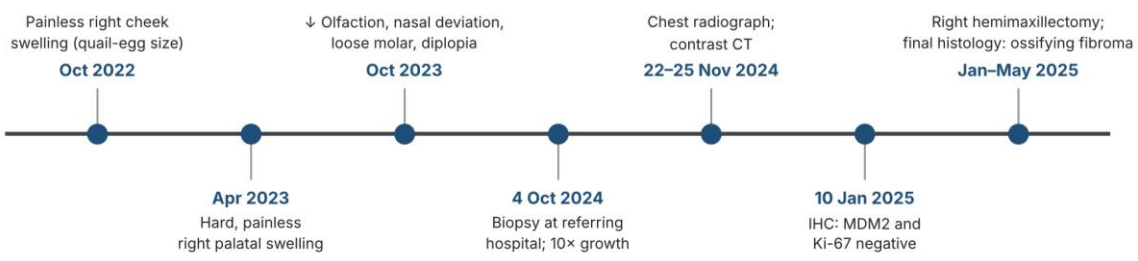


Figure 3. Timeline of the clinical course, investigations and treatment

Incisional biopsy at the referring hospital (4 October 2024) showed fragments of hypercellular spindle cell tissue with hyalinized stroma and abundant osseous matrix without osteoblastic rimming and without features of malignancy. The conclusion was a fibro-osseous lesion of the right zygomatic region, with cemento-ossifying fibroma, fibrous dysplasia, cemento-osseous dysplasia and low-grade osteosarcoma as differential diagnoses. Chest radiography (22 November 2024) showed no pulmonary metastasis and a normal cardiac silhouette.

Contrast-enhanced CT of the head (25 November 2024) demonstrated an inhomogeneous hyperdense lesion with regular, well-defined margins and a chondroid matrix, measuring approximately 6.58 × 6.97 × 5.76 cm, arising from the wall of the right maxillary sinus (Figure 4). The lesion displaced the right globe superiorly, eroded the orbital surface of the maxilla, displaced the nasal septum to the left with narrowing of the right nasal cavity, obliterated the right zygoma laterally and destroyed the right dentoalveolar process inferiorly. Attenuation was 49–68 HU before and 90–132 HU after contrast administration, with rim enhancement. There was no intracranial infiltration and no cervical lymphadenopathy. Incidental findings were left maxillary sinusitis and a mucous retention cyst of the right ethmoid. The radiological impression was a malignant primary bone tumor, with chondrosarcoma and osteosarcoma as differential diagnoses.

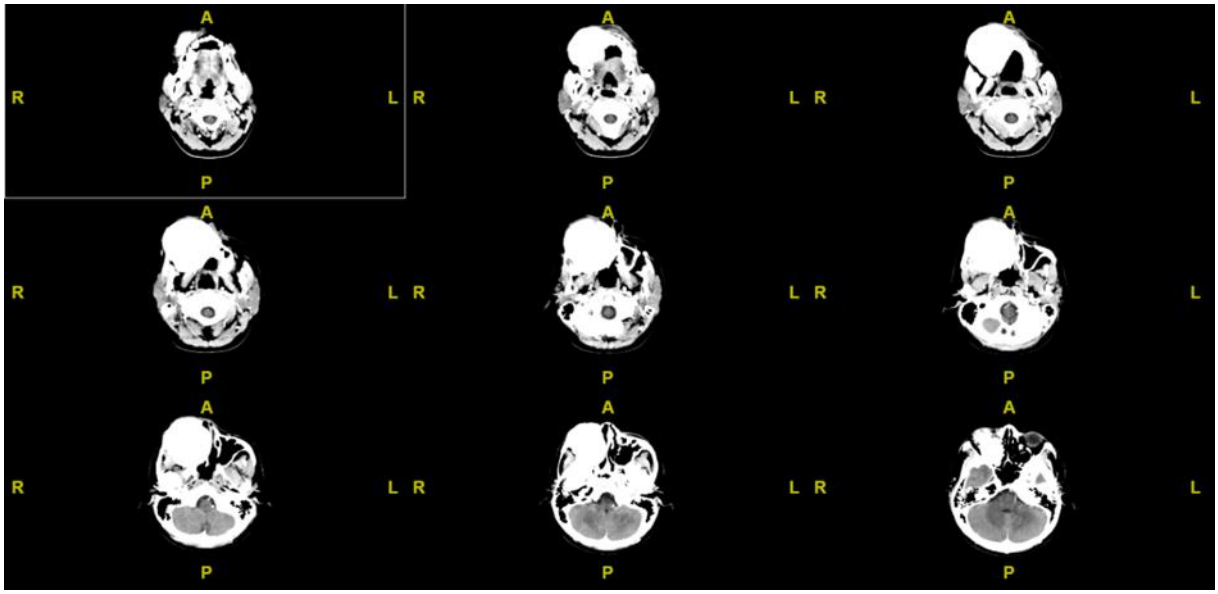


Figure 4. Axial contrast-enhanced CT of the head showing a large, inhomogeneous, hyperdense mass with chondroid matrix arising from the right maxilla and extending into the maxillary sinus, nasal cavity and orbital floor.

The radiological suspicion of malignancy was discordant with the histological findings, and the biopsy was therefore reviewed. Immunohistochemistry (10 January 2025) was negative for both MDM2 and Ki-67, which was more consistent with a benign fibro-osseous lesion and compatible with cemento-ossifying fibroma. The final preoperative diagnosis was cemento-ossifying fibroma of the right maxilla.

Table 1. Summary of diagnostic investigations.

Date	Investigation	Principal findings
4 Oct 2024	Incisional biopsy (referring hospital)	Hypercellular spindle cell stroma, hyalinization, osseous matrix without osteoblastic rimming; no malignancy; fibro-osseous lesion (DD: COF, fibrous dysplasia, cemento-osseous dysplasia, low-grade osteosarcoma)
22 Nov 2024	Chest radiograph (PA)	No pulmonary metastasis; normal heart size
25 Nov 2024	Contrast-enhanced CT head	6.58 × 6.97 × 5.76 cm chondroid-matrix mass of right maxillary sinus wall with bone erosion/destruction, rim enhancement; no intracranial infiltration or cervical lymphadenopathy; impression: malignant primary bone tumor
10 Jan 2025	Immunohistochemistry	MDM2 negative; Ki-67 negative; consistent with benign fibro-osseous lesion (COF)
2025	Specimen histopathology	Ossifying fibroma of the right maxilla; no features of malignancy

Therapeutic intervention

After multidisciplinary discussion, right hemimaxillectomy was performed through a Weber–Ferguson-type facial incision (Figure 5). The tumor was exposed and removed en bloc together with the involved right maxilla and teeth. The resected specimen consisted of a bony, tooth-bearing mass measuring 8 × 7 × 6 cm. Because the final diagnosis was a benign tumor, no adjuvant therapy was given.



Figure 5. Intraoperative findings: (A) preoperative marking of the Weber–Ferguson-type incision; (B, C) exposure of the tumor; (D, E) resection cavity after right hemimaxillectomy; (F) wound closure; (G) resected specimen (8 × 7 × 6 cm) with surgical ruler.

Histopathology and outcome

Macroscopically, the specimen was a hard, whitish-brown, bony, tooth-bearing tissue measuring 8 × 7 × 6 cm. Microscopically, the tumor consisted of oval to spindle-shaped fibrocytic cells growing in a densely hypercellular pattern with bland nuclei, interspersed with woven bone containing irregularly arranged osteocytes (Figure 6). Osteoblastic rimming and features of malignancy were absent. The final diagnosis was ossifying fibroma of the right maxilla. Surgical excision achieved local control without adjuvant therapy.

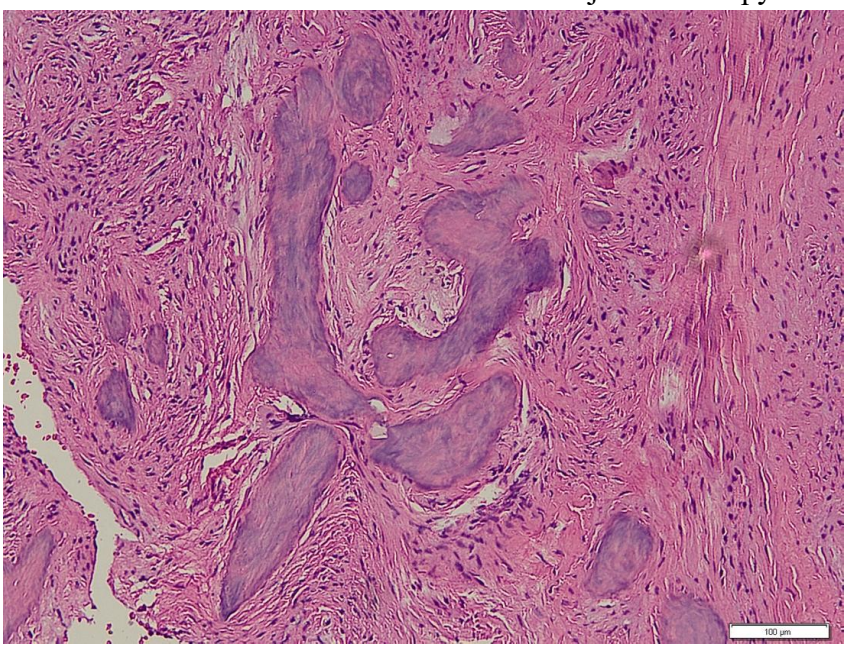


Figure 6. Histopathology of the resected specimen (hematoxylin and eosin; scale bar 100 µm): bland spindle-cell fibrous stroma with irregular woven bone trabeculae, without osteoblastic rimming, atypia or malignant features.

RESULTS AND DISCUSSION

Nomenclature and clinical behavior

Cemento-ossifying fibroma and ossifying fibroma are terms used interchangeably for a benign fibro-osseous neoplasm of the jaws, which is distinct from the reactive fibro-osseous lesions such as fibrous dysplasia and cemento-osseous dysplasia, and from the juvenile (trabecular and psammomatoid) variants that may behave more aggressively (Chandini et al., 2023; Gautier et al., 2025; Neumann et al., 2024). The lesion typically presents in the third and fourth decades as a slowly growing, painless swelling, and is usually mandibular. Maxillary lesions are rarer, but their expansion into the sinus, orbit and nasal cavity may give rise to proptosis, diplopia, nasal obstruction and facial deformity (Grewal et al., 2020; Tompodung & Sensusiati, 2024; Van Snick et al., 2022). Our patient, a 26-year-old man with a two-year history of slow, painless growth and later ocular and nasal symptoms, fits this pattern.

Imaging and histopathological characteristics

On CT, COF typically appears as a well-circumscribed, expansile lesion whose density varies with the degree of mineralization, from predominantly lytic to densely sclerotic, often with a thin peripheral rim of bone (Christian et al., 2023; Tompodung & Sensusiati, 2024; Van Snick et al., 2022). Large maxillary lesions may thin or erode the cortex and displace the sinus walls, orbital floor, nasal septum and teeth, which accounts for the globe displacement, nasal

deviation and dental mobility seen here. Histologically, the lesion is composed of a cellular fibrous stroma of bland spindle cells in which woven bone, lamellar bone or cementum-like calcifications are deposited, usually in a well-demarcated mass that can be shelled out from the adjacent bone (Gautier et al., 2025; Yin et al., 2024). In contrast to focal cemento-osseous dysplasia, COF is a true neoplasm with a distinct border and a tendency to enlarge progressively (Yin et al., 2024). In our case the bland spindle cell proliferation with irregular woven bone, the absence of cytological atypia and the lack of cartilage were decisive in excluding chondrosarcoma and osteosarcoma.

The diagnostic challenge

The central lesson of this case is the discordance between imaging and histology. The CT features, namely a large mass with chondroid-type matrix, erosion of the orbital floor and destruction of the zygoma and dentoalveolar process, were reported as suggestive of chondrosarcoma or osteosarcoma. Several features nevertheless favored a benign process: the margins were regular and well-defined, adjacent structures were displaced rather than diffusely infiltrated, there was no intracranial extension or lymphadenopathy, and the clinical course was prolonged and painless. Histology from a limited incisional biopsy can be insufficient, and low-grade osteosarcoma may mimic benign fibro-osseous lesions. This is why the biopsy was reviewed and immunohistochemistry was added. Negative MDM2 and Ki-67 staining argued against low-grade osteosarcoma and supported a benign fibro-osseous tumor; the diagnosis was then confirmed on the complete surgical specimen. A multimodal approach, with the radiologist, pathologist and surgeon working together, was therefore essential, in agreement with reports of diagnostic difficulty in other maxillary cases (Tompodung & Sensusiati, 2024; Van Snick et al., 2022; Yin et al., 2024).

Table 2. Differential diagnosis of a large maxillary fibro-osseous/matrix-forming lesion and corresponding findings in this case.

Entity	Typical features	Findings in this patient
Fibrous dysplasia	Ill-defined lesion merging with normal bone, ground-glass density; irregular woven bone in fibrous stroma	Discrete, well-defined mass with regular margins and expansile growth
Cemento-osseous dysplasia	Periapical/alveolar, often multiple and asymptomatic, mixed density, little expansion	Solitary, symptomatic, large expansile mass
Chondrosarcoma	Cartilaginous matrix, aggressive destruction; chondroid matrix on CT	Chondroid matrix on CT, but no cartilage or atypia on histology
Low-grade osteosarcoma	Infiltrative growth; atypical spindle cells; frequent MDM2 expression	Bland cells; MDM2 and Ki-67 negative
Ossifying fibroma (COF)	Well-circumscribed, expansile; fibrous stroma with woven bone or cementum-like material	Consistent on imaging, histology and immunohistochemistry

Surgical management

Complete surgical excision is the treatment of choice. Conservative procedures such as enucleation and curettage may suffice for small, well-circumscribed lesions, but a systematic review found that more radical surgery was associated with lower postoperative recurrence (Adham & Dewi, 2020). In maxillary tumors, incomplete removal is difficult to avoid because

of the complex anatomy, and large lesions with involvement of the sinus, orbital floor, nasal cavity and zygoma often require en bloc resection such as hemimaxillectomy, with attention to functional and aesthetic reconstruction (Grewal et al., 2020; Tompodung & Sensusiati, 2024). Given the size of the tumor, the orbital and nasal involvement and the initial radiological suspicion of malignancy, right hemimaxillectomy was a justified approach in our patient and provided the definitive diagnosis and local control.

The role of adjuvant radiotherapy

Whether radiotherapy has any role in COF was the clinical question raised by this case. The available evidence is limited to case reports. Strickler *et al.* (2017) described a juvenile ossifying fibroma of the maxillary sinus in which re-excision after local recurrence carried a high risk of morbidity; adjuvant radiotherapy was well tolerated with no recurrence, and the authors argued that statements that radiotherapy is contraindicated because of radioresistance and malignant transformation are not supported by firm evidence. In contrast, standard craniomaxillofacial surgery texts state that radiotherapy is generally not indicated for these lesions and may even be harmful, because of the possibility of malignant transformation to osteosarcoma (Greenberg & Schmelzeisen, 2019).

In our patient the tumor was benign on histology, and surgery alone achieved local control. We therefore did not offer adjuvant radiotherapy. In our view, radiotherapy should not be part of routine management and should be reserved for exceptional situations, such as repeated recurrence or unresectable disease in which further surgery would cause unacceptable morbidity, after multidisciplinary discussion and with a clear understanding of the uncertain risk.

Limitations and lessons

This report describes a single patient, and long-term follow-up is needed because recurrence of ossifying fibroma may occur late. The main lessons are: (1) a large maxillary mass with chondroid matrix and bone destruction on CT does not necessarily indicate malignancy, and should prompt tissue diagnosis rather than empirical treatment; (2) a discordance between imaging and histology should be resolved by pathology review and immunohistochemistry (MDM2, Ki-67) before definitive surgery is planned; and (3) complete surgical resection is curative in most patients and obviates adjuvant therapy.

CONCLUSION

This case demonstrated that a large maxillary cemento-ossifying fibroma (COF) in a young adult could exhibit computed tomography (CT) features suggestive of a primary malignant bone tumor, including a chondroid-appearing matrix, orbital floor erosion, destruction of the zygomatic bone and maxillary alveolar process, and peripheral contrast enhancement. These findings highlighted the potential for benign fibro-osseous lesions to mimic chondrosarcoma or osteosarcoma and emphasized that radiologic suspicion alone should not determine malignancy-directed treatment. The discrepancy between imaging and histopathologic findings was investigated through a sequential diagnostic approach. Review of the initial incisional biopsy obtained at the referring hospital revealed bland spindle cells within a hyalinized stroma and an osseous matrix without osteoblastic rimming or malignant cytologic features. Immunohistochemical evaluation showed negative MDM2 staining and no detectable Ki-67 labeling, providing supportive, although not definitive, evidence against low-grade

central osteosarcoma. The diagnosis was subsequently confirmed through histopathologic examination of the resected specimen following right hemimaxillectomy performed through a Weber–Ferguson-type incision. The surgical specimen demonstrated bland oval-to-spindle-shaped fibroblastic cells and irregular woven bone without cytologic atypia or osteoblastic rimming, consistent with ossifying fibroma. Complete surgical excision was followed by reported local disease control without adjuvant therapy, supporting surgical resection as the primary treatment for extensive benign maxillary COF. Adjuvant radiotherapy is generally not indicated for histologically confirmed benign COF, and its potential use in exceptional cases involving unresectable or repeatedly recurrent disease requires careful multidisciplinary consideration because supporting evidence remains limited. Clinically, well-defined lesion margins, displacement rather than diffuse infiltration of adjacent structures, absence of intracranial extension or cervical lymphadenopathy, and a prolonged painless clinical course may favor a benign process but cannot independently exclude malignancy. Therefore, accurate diagnosis requires integration of clinical findings, radiologic characteristics, representative tissue sampling, histopathologic examination, and adjunctive immunohistochemical or molecular investigations when indicated. Close collaboration among radiologists, pathologists, and surgeons remains essential for appropriate diagnostic interpretation and individualized treatment planning in this anatomically complex region.

Future research should address the limitations of this single-patient report, particularly the absence of sufficient long-term follow-up to establish sustained local disease control and assess the possibility of delayed recurrence following hemimaxillectomy without adjuvant therapy. Multicenter studies and prospective registries are warranted to determine the frequency of maxillary COF presenting with imaging features suggestive of malignancy and to identify radiologic characteristics that may help distinguish benign fibro-osseous lesions from malignant bone tumors. Particular attention should be given to lesion margins, patterns of cortical erosion and bone destruction, contrast enhancement characteristics, and internal matrix mineralization. Further investigations should also evaluate the diagnostic accuracy of MDM2 immunohistochemistry, molecular assessment of MDM2 gene amplification, and Ki-67 proliferation indices in differentiating benign fibro-osseous lesions from low-grade central osteosarcoma, using standardized diagnostic protocols and blinded histopathologic assessment. Although adjuvant radiotherapy is not routinely recommended for benign maxillary COF, its potential role in exceptional cases of unresectable or recurrent disease warrants further investigation through systematic reviews and pooled analyses of published cases. Such investigations should consistently report tumor characteristics, surgical margins, recurrence patterns, follow-up duration, radiotherapy exposure, and treatment-related complications to strengthen the available evidence. Additionally, future studies should assess postoperative functional outcomes, facial aesthetics, patient-reported quality of life, and reconstructive strategies following hemimaxillectomy for benign maxillary tumors. Integrating clinical assessment, advanced imaging, histopathologic evaluation, and appropriate immunohistochemical or molecular testing into a standardized diagnostic pathway may improve diagnostic accuracy, reduce unnecessary treatment of benign lesions, and minimize the risk of undertreating low-grade malignancies.

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