A slowly enlarging cheek mass

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A 32-year-old Kenyan male was referred to the Department of Oral and Maxillofacial Surgery with a 4-month history of a slowly enlarging mass in the region of the left cheek (Fig. 1). This was associated with some mild discomfort. There were no other features of note, and in particular no nasal, dental, or sinus symptomatology. On clinical examination there was a 3.0-cm very firm, nonfluctuant swelling over the anterior aspect of the left cheek, with normal appearance of the overlying skin. A 1.5-cm tender nonfixed lymph node was palpable in the ipsilateral submandibular region. Facial nerve function was unaffected, and there were no other features of note. Past medical history was positive for a recent diagnosis of type 1 diabetes mellitus (with poor glucose control), crystal arthropathy, and chronic renal impairment secondary to tuberculous autonephrectomy of the right kidney. He had arrived from Kenya 7 years before presentation, and was an ex-smoker of 2.5 pack years. Routine laboratory investigations demonstrated a normal full blood count, elevated urea (16.6 mmol/L [2.5-6.7 mmol/L]) and creatinine (232 μmol/L [70-150 μmol/L]), and a negative sickle cell screen. An orthopantogram was normal. Computed tomography (CT) and magnetic resonance imaging (MRI) demonstrated a 5 × 5 × 3.5-cm mass occupying the anterior half of the left masseter, with extension superiorly resulting in loss of definition of the inferior surface of the body of zygoma, associated with level IIa and IIb lymph nodes at the upper limit of normal size (Fig. 2, A–D). The mass demonstrated similar characteristics to the surrounding muscle on T1-weighted images; however, with contrast administration and on T2-weighted se-
sequences, the swelling could be clearly defined as a discrete mass. Positron emission tomography (PET)/CT scanning demonstrated increased fludeoxyglucose (FDG) uptake anterior to the left submandibular gland, but no other abnormal avidity.

DIFFERENTIAL DIAGNOSIS
The differential diagnosis of a cheek mass appearing to arise from the masseter muscle includes benign processes, such as chronic submasseteric abscess, masateric hypertrophy, and hemangioma, and both primary and secondary malignant infiltration. The clinical findings of tender lymphadenopathy and swelling supported the possibility of an infectious process originating from the adjacent maxillary sinus, but this was thought unlikely in the absence of pain and malaise, and subsequent localization of the swelling on CT and MRI to the masseter muscle.

The submasseteric space, a subdivision of the masticator space, results from a division of the masseter muscle into 3 parts: superficial, middle, and deep—all arising from the zygomatic arch. Abscess formation in
this space, between the masseter and mandible, is frequently a chronic condition, and patients may, as in the present case, have no dental symptomatology. MRI often identifies a localized fluid collection. Its absence in this case in combination with the anatomical site of the mass was not in keeping with a submasseteric collection.

With no history of trauma, and a gradual rather than acute onset of swelling, hematoma was also thought unlikely.

Masseter muscle hypertrophy is characterized by unilateral or bilateral enlargement of the masseter muscles and may be accompanied by pain. It is most commonly encountered in young adults. Imaging demonstrates a homogeneous enlargement of the muscle. In this case, a discrete mass was identified on imaging with increased signal on T2-weighted sequences and contrast enhancement, inconsistent with masseteric hypertrophy.

Intramuscular hemangiomas are rare, benign neoplasms that account for fewer than 1% of all hemangiomas. Fewer than 20% of these are found in the head and neck area, with the masseter muscle being the most frequently involved site. Typically, intramuscular hemangiomas present in the second or third decade of life, when they undergo a period of growth. Color Doppler sonography is particularly useful for demonstrating the well-defined hypoechoic mass with heterogeneous echotexture. CT scanning may reveal phleboliths and calcification. Most intramuscular hemangiomas show tissue characteristics on MRI of intermediate signal intensity on T1-weighted images and high signal intensity on T2-weighted images. MRI appearances in this case were largely inconsistent with a hemangioma.

The patient’s medical history, in particular his poor diabetic compliance, TB autonephrectomy, and country of origin, supported the theory that his TB eradication therapy may have been incomplete or inadequate. Kenya ranks 13th on the list of 22 high-burden TB countries in the world, and has the fifth highest incidence in Africa. Widespread coinfection with human immunodeficiency virus (HIV) (48% of new diagnoses of TB) makes management particularly challenging. Extrapulmonary tuberculosis occurs in 15% to 20% of cases in the absence of HIV, and in more than 50% of patients with coexisting HIV infection. Cervical lymphadenopathy is the most common head and neck involvement of TB. TB lymphadenitis is more common in women, and is often painless. The lack of constitutional symptoms, such as fever, weight loss, and night sweats in the current patient, reduced our suspicion of TB being the underlying pathologic process.

A neoplastic process was considered to be more likely. Metastatic deposits within muscle are rare, but may be a feature of breast or bronchial carcinoma and melanoma. However, the absence of systemic findings and normal PET/CT made a primary lesion, such as a soft tissue sarcoma more likely. Sarcomas account for 1% of all cancer diagnoses in the United Kingdom, with the most commonly encountered types in adults being malignant fibrous histiocytoma and liposarcoma, accounting for 35% to 45% of all soft tissue sarcomas. Liposarcomas constitute approximately 17% of all sarcomas, and 3% of all liposarcomas occur in the head and neck region, usually in the neck and cheek areas. Liposarcomas most typically present in middle age, with a slight male predilection. Typically, presentation is that of a slowly enlarging, painless, moderately soft mass without surface ulceration or hemorrhage. Although most features were consistent with the presentation of our patient, the mass was firmer in nature than would be expected in a liposarcoma.

Rhabdomyosarcoma is the most common soft tissue sarcoma in children and adolescents. The head and neck, especially the orbit, is the most frequent site of childhood rhabdomyosarcoma, but this location is rare in adults. CT classically shows a heterogeneous mass with variable contrast enhancement and local invasion. MRI demonstrates a homogeneous mass, isointense or minimally hyperintense relative to muscle on T1-weighted images and hyperintense relative to both muscle and fat on T2-weighted images, with contrast enhancement.

The radiological features of rhabdomyosarcoma were consistent with those found in the present patient, although his age at presentation made such a diagnosis a rare possibility.

Other potential differential diagnoses that should be considered include benign and malignant nerve sheath tumors, and lymphoma.

**DIAGNOSIS AND MANAGEMENT**

Fine-needle aspiration cytology of the mass was nondiagnostic and formal incisional biopsy was performed under general anesthesia. A 15-mm tissue sample was obtained for histologic analysis, and resultant histology was interpreted as consistent with an unclassifiable malignant mesenchymal neoplasm. As there was some uncertainty regarding the nodal status, and with neck access required for microvascular free flap reconstruction, level I to III neck dissection was completed in combination with partial maxillectomy, coronoidectomy, and resection of the overlying soft tissues to obtain full oncological clearance. Reconstruction was completed with a right latissimus dorsi free flap. The resected specimen (Fig. 3, A) included a skin ellipse measuring 72 mm anterior to posterior × 70 mm superior to inferior and included part of the left hard
Fig. 3. A, Macroscopic appearance of well-encapsulated tumor. Photomicrographs of the excised lesion: B, Low-power micrograph of the tumor showing an incomplete, peripheral rim of bone (arrow), which is surrounding the tumor above it (hematoxylin and eosin [HE] ×40). C, Epithelioid area of the tumor, where the tumor cells are closely aggregated together forming cords, separated by loose stroma.
palate with the maxillary first, second, and third molar teeth. Superiorly, part of the zygomatic arch and mucosa of the maxillary antral floor was present. No obvious tumor encroachment into the maxillary antrum was identified. Sections taken in the parasagittal plane (between the skin and the maxilla, in the region of the buccal sulcus), demonstrated a circumscribed pearly white, focally hemorrhagic tumor that measured 38 × 35 mm. It extended to the superior margin of excision and was 5 mm from the inferior margin. Microscopically, the cheek tumor was circumscribed and showed a peripheral, incomplete rim of ossified tissue (Fig. 3, B). This bone was very distinct from the zygomatic bone and therefore deemed a feature of the tumor rather than reactive bone change. The tumor was cellular and composed of spindle cells dispersed in loose stroma, with collagenization between individual cells. Focally, the tumor cells exhibited an epithelioid appearance but cytokeratin markers excluded an epithelial origin (Fig. 3, C–H). There was no significant nuclear pleomorphism but mitotic activity was prominent with up to 20 mitoses per 50 high-power fields. There were areas of tumor necrosis. On decalcified sections of the tumor, there was patchy staining with S100, focal staining with actin and desmin, and strong immunopositivity with neuron-specific enolase (NSE). There was no staining for myogenin or MyoD1 on repeated occasions.

The overall histologic features were of a mitotically active and focally necrotic, predominantly spindle-cell tumor that clearly was not of an epithelial origin.

The presence of an ossified bony rim around the tumor not related to native maxillary bone was a very distinctive feature. This is a characteristic feature of ossifying fibromyxoid tumor of the soft tissues, a rare tumor of uncertain differentiation. Diagnosis in this case was confirmed by tumor cell morphology and positive staining with S100 and desmin. However, the presence of a high mitotic index (>2 mitoses/50 high-power fields) and focal areas of necrosis indicated a potential for aggressive behavior (the so-called atypical or malignant variant of ossifying fibromyxoid tumor). The mitotic index of more than 2 per 50 high-power fields indicated that this might have potential for recurrence and metastasis although high cellularity and high nuclear grade were not seen. Level I to III nodes demonstrated reactive hyperplasia, but no evidence of malignancy.

The final diagnosis was atypical ossifying fibromyxoid tumor. The histopathological report of the main specimen suggested a positive superior margin. A second surgical procedure to excise this region was therefore performed. This was histologically negative for further tumor. It was decided, after discussion at the multidisciplinary team meeting, that adjuvant therapy was not required at this stage. The patient is currently 3 years post primary resection, with no evidence of locoregional recurrence.

**DISCUSSION**

Ossifying fibromyxoid tumor (OFT) of the soft parts is a rare tumor first described by Enzinger et al. in 1989. OFT is more frequently encountered in males, typically in the fourth decade with only approximately 13% of tumors occurring in the head and neck. In most cases involving the head and neck, patients present with a slow-growing, asymptomatic mass.

The tumor typically arises from deep subcutaneous tissues, often remaining attached to the underlying fascia, muscle, or tendon, with approximately one third of cases originating from within muscle. The histologic findings include cells arranged in cords or nestlike pattern within a myxoid matrix. In two thirds of cases the cells contain S-100 immunoreactive protein. The main tumor is surrounded by a pseudocapsule within which are nests of tumor cells, and should therefore be excised with a wide excision margin.

The clinical course in general is benign, although atypical and malignant variants have been described. The risk of recurrence is reported to be 18% to 26% with mean time to recurrence being 6.2 years. Features associated with aggressive behavior include increased cellularity, high nuclear grade, and high mitotic count (>2/high-power field). A malignant designation should be applied only when the tumor metastasizes and is not based on histopathological criteria. In Enzinger et al.’s original series, 1 case of recurrent tumor demonstrated transition to a well-differentiated osteosarcoma.

Adjuvant therapy does not seem to be indicated. Folpe et al. examined 70 cases (51 of which had follow-up information) of OFT from all body sites of which 9 were in the head and neck. In their series, 38 were treated with wide local excision; 12 cases re-
ceived adjuvant radiotherapy and 2 chemotherapy. Local recurrence was seen in 9 patients and metastases in 8. Of these, adjuvant radiotherapy was used only following recurrence (3 cases). Primary adjuvant chemotherapy was used in 1 patient, who subsequently developed lung metastases. Miettinen et al. reviewed 104 cases of OFT, of which 20 cases were in the head and neck region. Surgical resection was undertaken for all patients, with no patients receiving adjuvant therapy. There were no cases of distant metastases or disease-related deaths. Adjuvant therapy in the present case was not deemed necessary by the multidisciplinary team, as both the primary site was tumor free and there was no evidence of metastatic disease on imaging. The patient remains under close clinical surveillance.

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REFERENCES

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