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Pathology in Focus

Primitive neuroectodermal tumour of the masseter muscle

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Abstract
Masseter muscle enlargement is one of the differential diagnoses of swelling of the cheek. We discuss a unique case of a malignant tumour of the masseter which was found to be a peripheral primitive neuroectodermal tumour (PNET). A review of tumours of the masseter is presented.

Key words: Masseter muscle; Neuroectodermal tumour, primitive

Case report

A 20-year-old lady presented to a local hospital in Australia with an 18-month history of a gradually enlarging right-sided mass in the parotid region. She underwent surgical excision of this, through a superficial parotidectomy incision, when the mass was found to be arising from the masseter muscle. Post-operative radiotherapy and chemotherapy were given since excision margins were incomplete. There were no signs of metastatic disease.

During the next 18 months, she noticed intermittent swellings in the region of the previous surgery. However, fine needle aspiration cytology (FNAC) specimens were reported as benign. Twenty months later she developed a recurrent PNET suggested by FNAC. This was resected with clear margins, but the procedure was complicated by the development of a facial nerve palsy. Metastatic disease was again excluded with computerised tomography (CT) scans of the chest and abdomen. Subsequent management was carried out at the Head and Neck Unit of the Royal Marsden Hospital.

At age 24, a groin flap procedure was performed to reconstruct the facial defect left by the previous procedures. Unfortunately, a further recurrence was discovered, in the region of the masseter remnant, and was excised in entirety. A further course of adjuvant chemotherapy was administered to improve prognosis, although metastases were not demonstrated on CT scans of chest, abdomen and pelvis nor bone marrow aspirate.

There was no evidence of local or regional recurrence over the ensuing two years. Over this period the facial nerve palsy recovered slightly. At age 26 a dermal graft was carried out to reduce the defect of the prior surgical procedures.

Pathological findings

The originally resected mass measured 14 x 13 mm, was well circumscribed and had a grey-white appearance. Microscopically, the lesion was encapsulated and composed of sheets and nodules of cells which were individually surrounded by reticulin fibres (Figures 1 and 2). The tumour cells were round and ovoid with pleomorphic vesicular nuclei and abundant eosinophilic cytoplasm. Mitotic figures were frequent (up to 10 per 10 high power fields) but no melanin pigment nor necrosis was present (Figure 3).

Immunohistochemistry showed reactivity for S100 protein, synaptophysin and neurone-specific enolase but none for MIC2, neurofilament, HMB45, CD45, CD20, CD3, CAM5.2 and a wide range of antihormone antibodies. Fresh material was not available for electron microscopy or cytogenetic studies. The histological features were those of a malignant round cell tumour, consistent with extraskeletal Ewing's sarcoma/primitive neuroectodermal tumour (PNET).

The specimen, from the first recurrence, was a firm white nodule up to 2 cm, comprising recurrent tumour

Fig. 1

Low power view showing nodular appearance of tumour and invasion of adjacent muscle.

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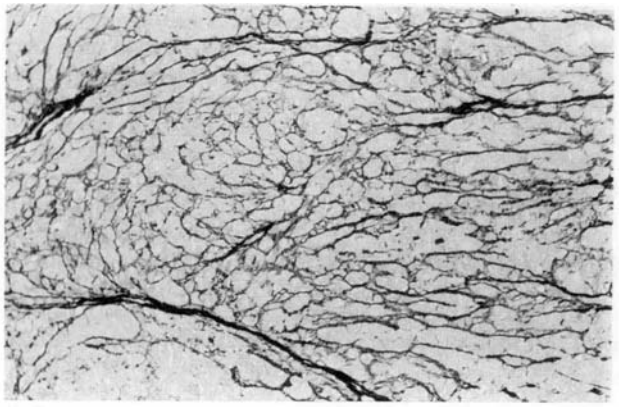

FIG. 2

Higher power view with reticulin staining showing nodules and individually encapsulated cells.

similar to that seen previously. Marker tests for all known endocrine and bone marrow tumours were carried out and found to be negative.

Discussion

Isolated tumours of the masseter muscle are extremely rare. Enlargement in that area most commonly being due to a parotid swelling or local lymphadenopathy. However, the masseter may be involved in benign or malignant conditions. Most commonly, benign hypertrophy can occur which is usually unilateral and presents most frequently in adolescence. The most common benign tumour of muscle is the haemangioma which affects masseter and sterno-cleidomastoid most often when occurring in the head and neck (Broniatowski, 1993). The condition was first described by Dietrich in 1930 and has subsequently been classified into capillary, cavernous and mixed types with the capillary type occurring most often in the head and neck region (Allen and Enzinger, 1972).

Ewing's sarcoma of bone, osseous and extra-osseous sites, and PNET are closely related lesions, which are characterised by a specific chromosomal t(11;22)(q24; q12) translocation (Dehner, 1993). At present, the two tumour types are regarded as part of a continuous spectrum, in which PNETs are characterised by immmunohistochemical and ultrastructural features of neural differentiation which are not found in Ewing's sarcoma. Other distinguishing features include the presence of intracellular glycogen, although this not a specific finding since up to 35 per cent of tumours do not contain detectable glycogen. Similarly,

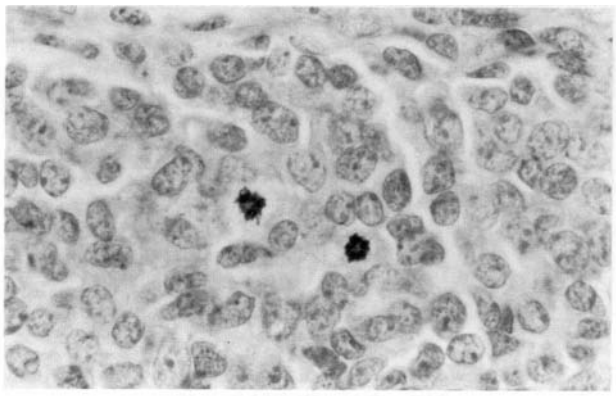

FIG. 3

Small-round-cells with eosinophilic cytoplasm and mitotic figures.

antibodies to the MIC2 antigen were originally thought to be valuable tumour markers, although expression in other unrelated tumours limits their reliability (Angervall and Enzinger, 1975; Dehner, 1986; Stevenson *et al.*, 1994; Weidner and Tjoe, 1994).

In practice, the histological diagnosis of Ewing's sarcoma/PNET is based upon a combination of morphologic, immunophenotypic and electron microscopic features and is often a diagnosis of exclusion. The recent identification of hybrid transcripts of the EWS gene with the FL11 or ERG gene may eventually be of diagnostic use (Delattre, 1994).

Lymphangiomas are a less common finding in the head and neck but a case has been described which involved the masseter (Chisin *et al.*, 1988). These tumours, too, can be divided into various histological types – simple lymphangioma, cavernous lymphangioma and cystic hygroma and, like haemangiomas, they are characterised microscopically by their prominent vascular architecture. Simple and cavernous lymphangiomas occur predominantly in the lips, tongue, cheek and floor of mouth, whereas, cystic hygromas occur mainly in the neck (Maran *et al.*, 1993).

In children, rhabdomyosarcoma is the commonest malignant tumour in the head and neck region. It can be classified into four subtypes – the pleomorphic or adult; embryonal; alveolar and botryoid (Chemello *et al.*, 1988). The embryonal type is that most often seen in children and is so called because it resembles foetal developing muscle and histologically it can mimic a variety of other small cell malignant tumours including melanoma, retinoblastoma and neuroblastoma. Rhabdomyosarcomas can also adopt a spindle cell morphology and when immunohistochemistry is positive for desmin and other anti-muscle antibodies enables diagnosis from other sarcoma subtypes. Chemello *et al.* (1988) reported an embryonal rhabdomyosarcoma of the masseter muscle in a 12-year-old girl. This occurred as a second malignant neoplasm (SMN) ten years after she underwent enucleation of both eyes for bilateral retinoblastoma. SMNs have an increased risk of developing in patients who survive treatment of bilateral or unilateral familial retinoblastoma with osteosarcoma being the most common tumour to develop (Abramson *et al.*, 1984; Draper *et al.*, 1986). It has been shown that a pre-existing genetic susceptibility acting synergistically with treatment regimes of chemo- and radiotherapy is the cause for such SMNs to develop (Meadows *et al.*, 1980; Tucker *et al.*, 1987).

Myxomas are benign mesenchymal tumours which occur rarely in the extra-cardiac site of the head and neck and when doing so, usually affect the jaw (Canalis *et al.*, 1976). They are diagnosed histologically by the presence of stellate and spindle-shaped fibroblasts and myofibroblasts in an abundant, hypovascular myxoid stroma. Myxomas of the jaw are considered to have a separate origin from odontogenic mesenchyme since they often arise from around erupting teeth. An intramuscular myxoma of the masseter muscle was reported by Bedrossian *et al.*, 1984 and was treated by wide local surgical excision. Recurrence is unusual and due to incomplete excision since the tumours do not often possess a well-demarcated capsule.

Tosios *et al.*, 1992 reported a case of metastatic breast carcinoma of the right masseter which presented two years after the patient had undergone a left radical mastectomy for a moderately differentiated, infiltrative ductal carcinoma. Such clinically apparent intramuscular metastases are very rare and when occurring usually affect the extraocular muscles (Capone and Sizmorits, 1990). The method of presentation is varied with enlargement of the muscle, pain, wasting, dysaesthesia, weakness and myopathic findings on electromyography.

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