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Pictorial Review

Imaging of palatal lumps

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Palatal tumours are relatively rare and of variable aetiology, rendering radiological evaluation a daunting process for many. A systematic approach to the imaging of a palatal lump is therefore essential. The hard and soft palates are oral cavity and oropharyngeal structures, respectively. They have different tissue compositions, and therefore, lesions occur with different frequencies at each site. The hard palate has the highest concentration of minor salivary glands in the upper aerodigestive tract and most tumours here are salivary in origin, whereas most tumours at the soft palate are epithelial in origin, i.e., squamous cell carcinomas, in line with other oropharyngeal subsites. The most common malignant tumours of the palate, after squamous cell carcinoma, are minor salivary gland tumours, predominantly adenoid cystic and mucoepidermoid carcinomas. These tumours have a propensity to spread perineurally; understanding the anatomy and imaging features of perineural spread is vital, as it can have significant implications for patient management and tumour resectability. When confronted with a palatal lump, it is important to consider the following: its location on the hard or soft palate; whether it is mucosal or submucosal; the frequently occurring lesions at that site; the most suitable imaging techniques (ultrasound, computed tomography, magnetic resonance imaging); whether there are typical imaging features for any of the common lesions; and whether there are aggressive features, such as bone erosion or perineural spread. This approach allows the radiologist to narrow the differential diagnosis and assist the clinicians with planning treatment.

Introduction

Palatal lesions are relatively rare and of variable aetiology, therefore radiological evaluation of a palatal lump is daunting for many. Applying a systematic approach to the imaging is essential. We describe a checklist to consider when assessing a palatal lump: its location on the hard or soft palate; whether it is mucosal or submucosal; frequently occurring lesions at that site; the most suitable imaging techniques: ultrasound (US), computed tomography (CT), magnetic resonance imaging (MRI); whether there are typical imaging features for any of the common lesions; and whether there are aggressive features, such as bone erosion or perineural spread (PS). This approach allows the radiologist to narrow the differential diagnosis and assist the clinicians with planning treatment.

Anatomy

The hard palate is an oral cavity structure formed by the palatine processes of the maxillae anteriorly and horizontal

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plates of the palatine bones posteriorly. It constitutes the anterior two-thirds of the palate and divides the oral from the nasal cavities. It is bounded anteriorly and laterally by the maxillary alveolar arches. Its oral surface is covered by mucoperiosteum, which consists of thick keratinised stratified squamous epithelium bound to the underlying bone by relatively dense submucosal tissue containing accessory salivary glands, and lymphoid and adipose tissue. Three foramina open onto the oral surface of the hard palate. The incisive foramen is in the anterior midline behind the central maxillary incisors; it is the opening of the incisive canal, which transmits the terminal branches of the nasopalatine nerve and sphenopalatine arteries and veins. The greater and lesser palatine nerve canals, which transmit the principal neurovascular bundles to the palate, open medial to the third maxillary molars and are important landmarks for PS from malignant tumours (Fig 1).

The fleshy soft palate is an oropharyngeal structure. It is suspended from the posterior border of the hard palate and is composed of five muscles: tensor veli palatini, palatoglossus, palatopharyngeus, levator veli palatini, and musculus uvulae; these allow upward movement to close off the nasopharynx during swallowing. Posteriorly, it has a free margin that terminates at the uvula in the midline. The soft palate gives rise to two arches: the anterior arch is formed by the palatoglossus muscle that joins the palate to the tongue, and the posterior arch is formed by the palatopharyngeus muscle that joins the palate to the upper border of the thyroid lamina and oropharyngeal wall. The tonsillar fossa lies between the two.

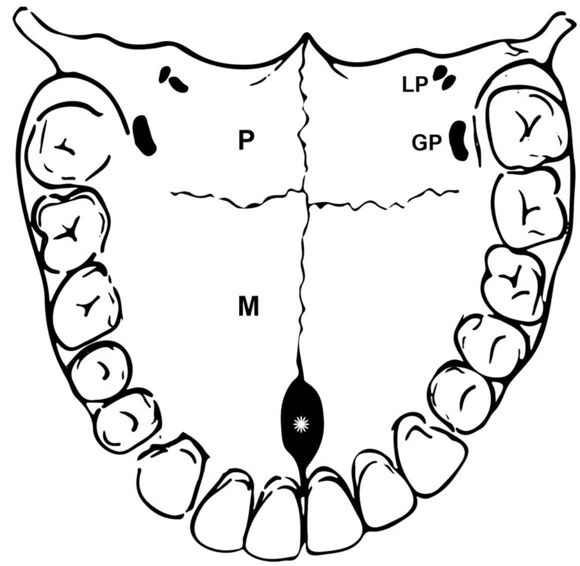

Figure 1 Illustration of the oral surface of the hard palate, which is bordered anteriorly and laterally by the teeth-bearing maxillary alveolar arches. The hard palate is formed by the palatine processes of the maxillae anteriorly (M) and horizontal plates of the palatine bones posteriorly (P). The incisive foramen is in the anterior midline behind the central maxillary incisors (*). The greater palatine (GP) and lesser palatine (LP) nerve canals open medial to the third maxillary molars.

Imaging techniques

MRI and CT are the mainstay of imaging the oral cavity and oropharynx, and are the best imaging methods for detecting deep tumour extension and PS. Intraoral US, although not widely practiced, can be a helpful adjunct. One advantage is that the radiologist can clinically evaluate the lesion at the US appointment, enabling cross-sectional imaging to be more precisely protocolled and interpreted. In patients with adequate mouth opening, a hockey stick or finger transducer can be placed directly on the lesion. Maintaining probe contact in patients with a high-arched palate can be overcome with generous use of US gel within a sterile probe cover and water as a contact medium. Local anaesthetic spray or gel can facilitate assessment of painful mucosal lesions. Small studies have shown that intraoral US is well tolerated.[1] High-frequency intraoral US has better spatial resolution than CT or MRI, and is not susceptible to dental amalgam and motion artefacts. This is particularly important for shallow (<5 mm thickness) mucosal or submucosal lesions,[2,3] as these may be entirely inconspicuous on cross-sectional imaging. Furthermore, the depth of oral cavity lesions at US has shown high correlation with depth at histopathology[3]; whereas MRI showed only moderate correlation.[4] Although the majority of the tumours included in these studies were located on the tongue or floor of mouth, we would speculate that the findings could be extrapolated to other subsites of the oral cavity and oropharynx. The rarity of palatal tumours, and therefore, the irregularity with which they present to a single institution, renders robust data collection more difficult than for tongue tumours, for example, and this remains an area for development.

The risk of nodal metastases in oral cavity malignancy is closely related to tumour thickness[5]; this was found to be approximately 12% for tumours ≤7 mm in thickness, rising to 57% for tumours >7 mm.[3] Intraoral US can be combined with cervical lymph node staging, including fine-needle aspiration cytology (FNAC).[3] US-guided FNAC of the palatal lesion with local anaesthetic is also sometimes possible, avoiding a more complex surgical procedure with sedation or general anaesthetic. Future development of specially adapted transducers is likely to expand the role and availability of intraoral US.[6]

CT is principally useful for assessing bone erosion at the hard palate and alveolar ridges. High-resolution images (0.625 mm section thickness) should be reconstructed in three planes using a high spatial frequency bone algorithm. The coronal plane is the most useful for evaluating cortical discontinuity and marrow sclerosis.

At our institution, a standard soft-tissue head and neck MRI protocol is used to image the palate. This includes coronal and axial T1-weighted (W) and T2W sequences, diffusion-weighted sequences, and post-contrast axial and coronal T1W sequences (fat suppressed in one plane) centred on the palate with 4–5 mm section thickness. Additional T1W post-contrast sagittal images can be particularly useful for assessing lesions at the soft palate. The field of

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