Key landmark muscles of the head and neck

Poster No.: C-1891
Congress: ECR 2012
Type: Educational Exhibit
Authors: S. Ghosh-Ray¹, R. Swamy², R. K. Lingam³; ¹London/UK, ²Harrow/UK, ³HA13UJ/UK
Keywords: Pathology, Diagnostic procedure, Ultrasound, MR, CT, Head and neck
DOI: 10.1594/ecr2012/C-1891

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Learning objectives

Within the head and neck there are a number of muscles however only a select few are of particular clinical and radiological significance

This poster evaluates the anatomy and illustrates the importance of key muscles within the head and neck in the context of disease processes that involve them

These muscles are used to ascertain degree of spread of disease and also aid in treatment planning.

Background

Regions of Interest

This poster exhibit will cover the following areas:

1. Orbit: extra-ocular muscles
2. Nasopharynx: Tensor and Levator veli palitini, Styloglossus
3. Oral cavity: Geniohyoid, Genioglossusglossus, Hyoglossus, Mylohyoid
4. Oropharynx: Palatoglossus, Palatopharyngeus
5. Neck: Sternocleidomastoid, Anterior belly of digastric, Omohyoid, Trapezius

Imaging findings OR Procedure details

Orbit

The extra-ocular muscles divide the intraconal from the extraconal space. The lacrimal gland lies within the extra-conal fat. The space within the cone contains orbital fat and vessels, sensory and motor nerves and the optic nerve sheath complex. Identifying the extraocular muscles will help localise a lesion (see Fig 1).

Conal structures include the rectus muscles and the fibrous septa webbed between them. An orbital pseudotumour involving a rectus muscle, dysthyroid ophthalmopathy and
rhabdomyosarcoma are examples of conal lesions. Coronal plane imaging is particularly useful in identifying the location (Fig 2).

The importance of accurately identifying extraconal lesions lies in the urgency of management. The main concern is involvement of the adjacent skull vault and intracranial extension. In that respect CT imaging can be useful for assessment of the orbital bony margins (Fig 3).

Nasopharynx

The pharyngobasilar fascia is a tough aponeurosis separating the nasopharynx from the parapharyngeal space. It extends from the superior constrictor muscle to the skull base. A breach of this fascia indicates an aggressive process. Its position can be approximated by the levator veli palatini which lies medially, and the tensor veli palatini and styloglossus which lie lateral to it (Fig 4).

Identification of these muscles aid in accurate staging in nasopharyngeal squamous cell carcinoma (SCC). Assessing muscular invasion and parapharyngeal spread can be carried out using MR imaging (Fig 5).

Oropharynx

The anterior tonsillar pillar is a mucosal fold over the palatoglossus muscle (Fig 6). This pillar separates the oral cavity from the oropharynx. Tonsillar malignancy may extend superiorly along the muscle to involve the hard and soft palates. Inferior extension along the palatoglossus muscle results in invasion of the tongue base.

The posterior tonsillar pillar is a mucosal fold over the palatopharyngeus muscle (Fig 6). Tonsillar malignancy may spread along this muscle to involve the soft palate. Caudal extension results in invasion of the thyroid cartilage, middle pharyngeal constrictor and pharyngoepiglottic fold.

Oral Cavity

The oral cavity broadly comprises the tongue, gingiva, teeth, buccal mucosa, hard palate and floor of mouth. Important muscles in the oral cavity include the mylohyoid, buccinator and extrinsic muscles of the tongue.
Mylohyoid (Fig 8): The mylohyoid muscle separates the floor of the mouth from the submandibular space and the midline submental space. The sublingual space is located superomedial to the mylohyoid muscle. The submandibular space is located inferolateral to the mylohyoid.

The mylohyoid muscle defect (normal variant) can allow pathological processes to cross between the oral cavity and suprahypoid neck.

Buccinator (Fig 9): The layers of the cheek from the inner surface include the mucosa, pharyngobasilar fascia, buccinator muscle, buccinator fat pad, subcutaneous tissue and skin. There are no barriers beyond the buccinator muscle to prevent the extension of cancer. SCC of the buccal mucosa extending to the skin surface via invasion of the buccinator muscle upstages the tumour (Fig 10).

Extrinsic muscles of the tongue (Fig 11):

The genioglossus and geniohyoid muscles arise from the mental spine of the mandible and insert into the hyoid bone. They form the medial border of the sublingual space. The hyoglossus originates from the hyoid bone and inserts into the side of the tongue. It divides the sublingual space in lateral (containing the submandibular duct with hypoglossal and lingual nerves and vein) and medial (containing lingual artery) compartments.

Within the sublingual space there are multiple possible pathological processes. Correct localisation of a lesion to this space will allow consideration of this list (Table 1) and narrow down the possibilities to the most likely diagnosis.

Neck

For the correct identification of the regional nodal stations it is imperative that the position of key muscles of the neck are identified. The anatomic subsites are delineated by landmark muscles of the neck.

The sternocleidomastoid divides the neck into anterior and posterior triangles. The inferior belly of omohyoid marks the boundary between stations III and IV. The anterior belly of digastric forms the border between the submental and submandibular triangles.

Images for this section:
**Fig. 1:** Axial STIR image demonstrating the lesion confined by the medial and lateral rectus muscles, centred over the optic nerve and outside the globe classifying it as an intraconal lesion.
**Fig. 2:** Coronal T1 (above) and axial T2-weighted images across the orbits demonstrating an inflammatory pseudotumour of the left lateral rectus muscle. The proptosis is best appreciated on the axial imaging while the coronal image demonstrates which compartment the lesion is located in.
Fig. 3: Coronal CT demonstrating the asymmetric soft tissue (*) in the roof of the right orbit displacing the superior rectus (SR) muscle caudally. This is a subperiosteal phlegmon arising from the sinusitis seen to opacify the right nasal and maxillary sinuses.
Fig. 4: Axial T1-weighted images. The upper nasopharynx (A) demonstrates levator veli palatini (long arrow) which lies medial to the Pharyngobasilar fascia (PBF). The tensor veli palatini (arrowhead) and styloglossus (arrow in image B) muscles lie lateral to the PBF. The PBF is shown in pink in image A.

Fig. 5: Two different cases of Nasopharyngeal SCC A: axial T1-weighted MR image showing a nasopharyngeal mass (*). The tensor veli palatini, and adjacent parapharyngeal fat appear intact. PBF intact = T1 grade tumour B: axial T1-weighted MR image demonstrating a mass invading through tensor veli palatini thus breaching the PBF and invading the parapharyngeal space. T2b grade tumour.
Fig. 6: Axial T1 weighted MR image demonstrating the locations of palatoglossus and palatopharyngeus muscles
Fig. 7: Axial T1-weighted MR image demonstrating oropharyngeal cancer arising from the posterior tonsillar pillar and creeping up along the palatopharyngeus (wide arrow) towards the uvula. The normal palatopharyngeus is seen on the left (thin arrow).
**Fig. 8:** The mylohyoid muscle has a gap at the posterior border which enables the deep lobe of the submandibular gland to wrap around and lie in the sublingual space. This gap allows spread of disease between the submandibular and sublingual spaces.
Fig. 9: Coronal T1-weighted MR image demonstrating a right buccal mucosal tumour displacing the buccinator but not invading it. SCC Stage T2.
**Fig. 10:** Coronal T1-weighted images demonstrating a buccal mucosal SCC tumour invading through the buccinator and masseter muscles into the dermis. SCC Stage T4.
Fig. 11: Defining the sublingual space. G = genioglossus; forming the medial border of the sublingual space. H = Hyoglossus; divides the sublingual space in medial and lateral compartments. M = Mylohyoid; separates the sublingual space from the submandibular and submental spaces.
**Table 1:** A finite list of possible differential diagnoses for the sublingual space.

<table>
<thead>
<tr>
<th>Differential Diagnoses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranula (simple/diving)</td>
</tr>
<tr>
<td>Submandibular duct calculus</td>
</tr>
<tr>
<td>Dermoid/Epidermoid</td>
</tr>
<tr>
<td>Sublingual gland tumour</td>
</tr>
<tr>
<td>Lipoma</td>
</tr>
<tr>
<td>Ludwig’s Angina</td>
</tr>
<tr>
<td>Haemangioma</td>
</tr>
<tr>
<td>Cystic Hygroma</td>
</tr>
</tbody>
</table>
Fig. 12: Surgical subsites for cervical lymph nodes. US images at three different levels of the neck. Image A: Level 3 lymph node. The sternocleidomastoid (arrow/SCM) muscle is the useful landmark. Image B: At the level of the omohyoid muscle (*/OH) level 3 becomes level 4 caudally. Image C: Cluster of lymph nodes in level 4. Schematic diagram demarcating the surgical subsites (modified from
Conclusion

Identifying the landmark muscles of the head and neck can allow the radiologist to:

1. define the anatomical compartments which aid in formulating a differential diagnosis
2. locate certain structures which may not be readily visible
3. understand the spread of malignant disease
4. stage tumours accurately for the most appropriate management

Personal Information

Dr Rekha Swamy and Dr Subhadip Ghosh-Ray are Specialist Registrars at Northwick Park Hospital Department of Radiology ESOR Head & Neck Subspecialty Fellowship Training Centre

References


