THE ANATOMICAL BASIS OF THE SUBMANDIBULAR GLAND AND ITS CLINICAL IMPORTANCE. A CADAVER STUDY

N Basson, MC Bosman

Department of Anatomy, School of Medicine, Faculty of Health Sciences, University of Pretoria

Introduction

The submandibular gland can be involved in a variety of different diseases. Although tumours of the gland are rare, it is difficult to distinguish whether it is malignant or benign and a final diagnosis is often only possible after excision of the diseased gland. Orthopaedic surgeons often favour removal of the gland in anterior surgery of the upper cervical spine to enable them free access to the vertebrae. Excision may cause numerous clinical complications and unwanted side-effects.

Aim

The main aim of this study was to identify and evaluate the anatomy of the submandibular gland and its relations in terms of differences between males and females as well as left and right sides. Another aim was to identify and evaluate the anatomy of the gland in terms of neoplasms or neck surgery where it is often removed even when healthy and to possibly suggest a method to retain the gland or part of it during surgery to the upper cervical spine that involves the anterior retropharyngeal approach.

Materials and Methods

Fifty-six glands (26 cadavers) were dissected. The skin incisions were as follows: From the symphysis mentis to the jugular notch of the sternum and from the symphysis mentis along the body of the mandible up to the angle of the mandible. The third skin incision was made from the jugular notch of the sternum parallel to the body of the mandible up to a point corresponding to the angle of the mandible. The skin was then carefully retracted to expose the neck. This was done on both sides of the neck. The subcutaneous tissue and fat of the neck were then removed to eventually expose the submandibular glands *in situ*.

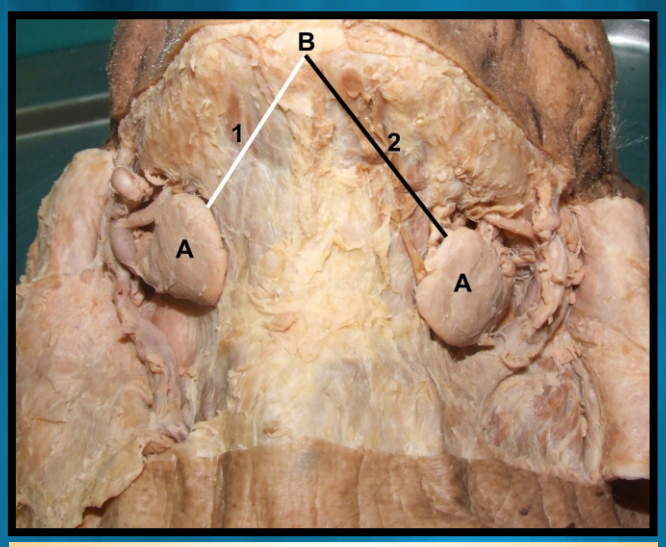

Figure 1: Anterior view of neck with superficial fascia removed to illustrate position of superficial portion of submandibular glands (A). The difference in distance from the symphysis mentis (B) was measured for the right (1) and left (2) sides.

Results

A Vernier calliper was used to measure the distance from the symphysis mentis to the anterior and posterior ends of both glands to determine the length. The width was determined perpendicular to the length. The average distance from the symphysis mentis to the gland was greater on the right than the left side in both males and females (L=33.01±1.49mm, R=34.13±1.46mm). Although the measurements for males were greater, it was not significant (T-test, $p>0.05$). The glands' length (l) and width (w) was slightly larger in males than in females (males l=34.12±1.58mm w=31.36±1.23mm; females l=33.95±1.38mm w=30.02±1.32mm). There was no significant difference between the sexes in this regard (T-test, $p>0.05$).

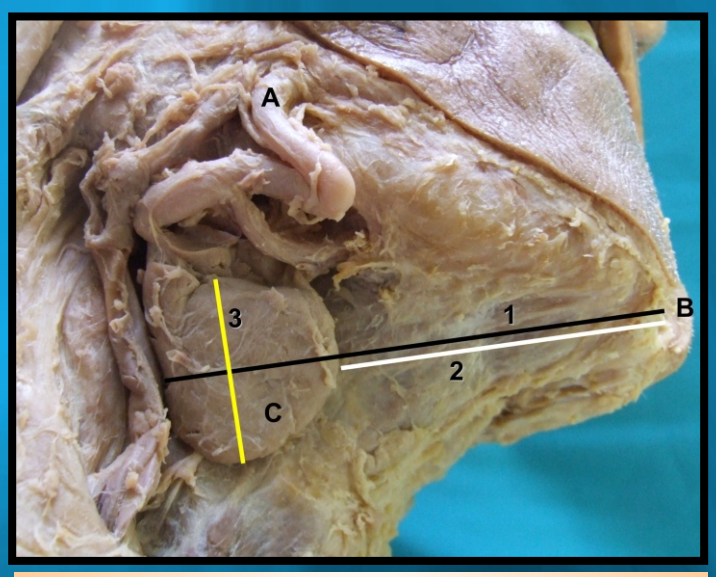

Figure 2: Measurements of submandibular gland. 1: Distance in millimetres from symphysis mentis to posterior edge of gland. 2: Distance in millimetres from symphysis mentis to anterior edge of gland. Length calculated by subtracting 2 from 1. 3: Width of gland. A: Facial artery. B: Symphysis mentis. C: Submandibular gland.

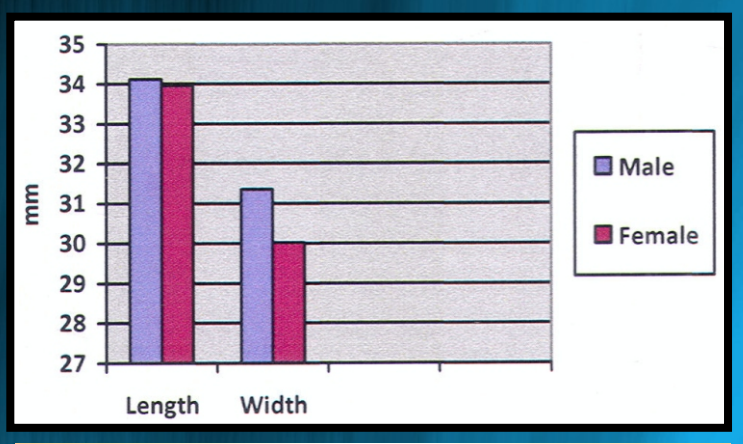

Figure 3: Differences in the length and width between males and females. Although there was almost no difference in the length of the gland between the sexes, the width in females tended to be less than that of males but this was still not significantly different.

Discussion

The submandibular gland has many functions. The glands secrete a tasteless, clear, odourless fluid into the oral cavity. This fluid helps to keep the mucous membranes of the mouth moist for vocalisation and swallowing and serves as an intrinsic "mouthwash". It also lubricates the food during mastication and begins the digestion of starches in the mouth. This fluid also plays an important role in the prevention of tooth decay and the ability to taste[1]. Antibodies are found in the salivary fluid. Secretory IgA does not fix complement, but appears to agglutinate bacteria, making them more readily phagocytosed[2]. Nerve growth factor (NGF) also exists in salivary fluid and this greatly stimulates nerve tissue growth[3]. Without the submandibular gland, all these functions either become impaired or are lost.

Submandibular gland excision is often associated with a variety of postoperative complications. The short-term complications include acute facial, lingual and hypoglossal nerve damage, infection and haematoma[4]. The most common long-term complications are neurological deficits related to damage to the marginal mandibular branch of the facial, lingual or hypoglossal nerves, as well as scar problems.

Conclusion

Surgeons prefer the Anterior Retropharyngeal Approach to avoid the risks of contamination and postoperative complications associated with transmucosal and lateral retropharyngeal approaches. However, their excision of the submandibular gland has its complications and disadvantages, often being very severe and difficult to manage postoperatively. The normal practice to remove the submandibular gland during surgery to the upper cervical spine that involves the anterior retropharyngeal approach should be discouraged, since it may lead to xerostomia in the elderly. The gland's superficial anatomy allows for quick and easy mobilisation, even in patients with short necks (Figure 4), and resection of healthy glands should be avoided at all costs.

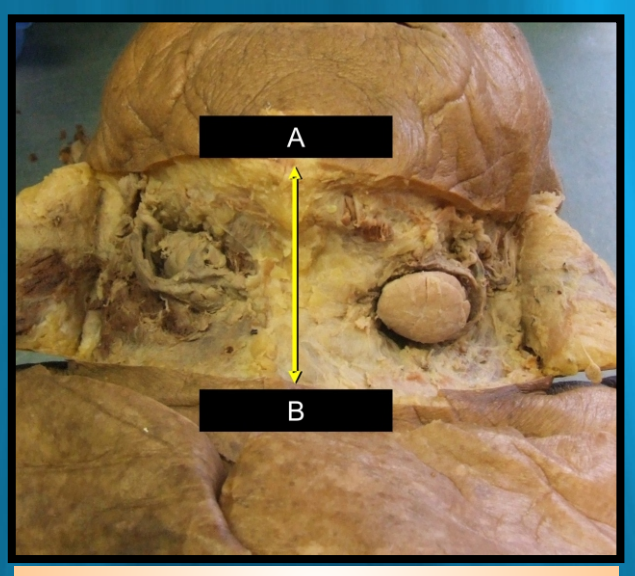

Figure 4: Illustration of a short neck. Note the restricted distance between the symphysis mentis (A) and jugular notch of sternum (B).

References

1. Clinically Orientated Anatomy, 5th Ed. Keith L. Moore; Arthur F. Dalley; p 1008
2. Zergo AN, Mandel ID, Goldman R, et al: Salivary studies in human caries resistance. Arch Oral Biol. (1971) 16:557-560
3. Burdman JA, Goldstein MN: Long-term tissue-culture of neuroblastomas III. JNCI. (1964) 33:123-127
4. Hald J, Andreassen UK: Submandibular gland excision: Short- and long-term complications. ORL J Otorhinolaryngol Relat Spec. (1994) 56:87-91

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Faculty of Health Sciences