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Morbidity study of submandibular gland excision

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Summary

Submandibular gland excision is an operation frequently performed by many different surgical specialists It is often associated with a variety of postoperative complications, the commonest being neurological deficits related to damage to the marginal mandibular, lingual or hypoglossal nerves. Other patients develop further problems at a later date due to the development of calculi from gravel retained in the duct remnant.

This study aims to discuss how these complications can be avoided.

Introduction

Submandibular gland surgery is performed by many different surgical specialties for a variety of indications, the commonest of which is chronic sialadenitis with or without calculus formation. Less common indications include surgery for submandibular neoplasia and non-specific lymphadenopathy in relation to the gland *(1)*. Unsuspected pathology may only become manifest on histological examination.

The submandibular gland lying within the submandibular fossa is closely related to several important structures, both nervous and vascular *(2)*.

The initial skin incision must be suitably placed to avoid damage to the marginal mandibular branch of the facial nerve which lies superficial to the investing layer of the deep cervical fascia, and has a variable course in relation to the mandible. The typical course in a cadaver dissection is shown in Fig. 1, although considerable variability may be encountered as discussed later. Following incision of the fascia, the facial veins are encountered which can cause considerable operative problems unless carefully dissected and ligated. Whilst freeing the gland from its fossa, the facial artery may be encountered deep to the gland or intimately related to it, and may require division in order to allow the dissection to proceed.

The hypoglossal nerve lies deep to the gland running superficial to hyoglossus and deep to digastric (Fig. 2). The submandibular gland is related superiorly to the lingual nerve which supplies the gland with secretomotor fibres

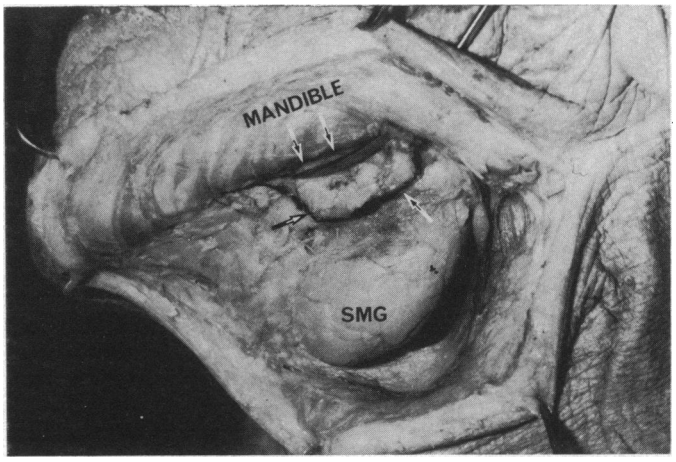

FIG. 1 Course of the marginal mandibular branch of the facial nerve in a cadaver dissection.

(Fig. 3). The submandibular duct runs forwards between the hyoglossus and myelohyoid to reach the floor of the mouth.

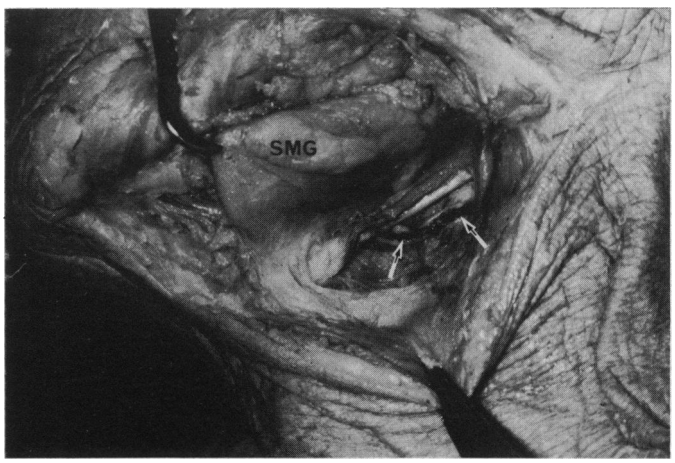

FIG. 2 Course of the hypoglossal nerve across the floor of the submandibular fossa.

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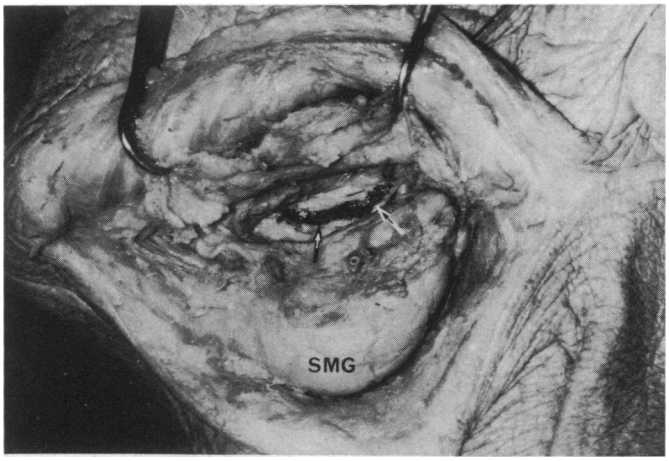

FIG. 3 Relationship of the submandibular gland to the lingual nerve.

This study is concerned with the morbidity associated with submandibular gland excision together with a discussion of how a detailed knowledge of the anatomy of the region can reduce this morbidity.

Method

The case notes of all patients who had undergone submandibular gland excision since 1962 were obtained from the medical records department of the Royal National Throat Nose and Ear Hospital, Gray's Inn Road.

In total, 134 case notes were examined, which documented submandibular gland excision in 137 operations, bilateral procedures being performed in three patients. The following information was recorded for each patient.

1 Name, age, sex
2 Symptoms and signs on presentation
3 Preoperative investigations
4 Histological diagnosis
5 Perioperative and long term morbidity.

Results

In this series, the sex ratio of patients undergoing submandibular gland excision was 1.6:1 (M:F). The age distribution is shown in Fig. 4, the range being 12–88 years.

The main presenting symptom was swelling of the submandibular gland. This was associated with pain in approximately 25%. A calculus could be palpated within the duct in 23 cases. The relative frequency of presenting symptoms and signs are displayed in Table I.

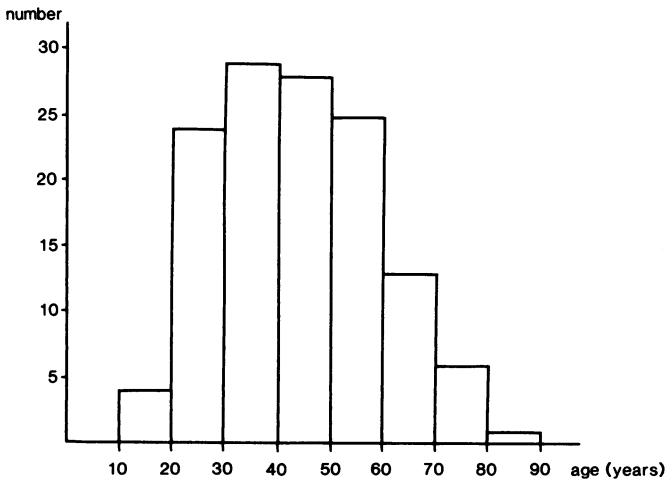

FIG. 4 Age distribution of patients undergoing submandibular gland surgery.

TABLE I *Symptoms and findings on examination in 134 patients*

	Pain	*Swelling in neck*	*Stone in duct*	*Swelling in floor of mouth*	*Discharge from duct*
Number of patients	35	121	23	7	3

Radiological investigations included plain X-rays of the submandibular region in 93 patients, sialography being performed in only a minority of patients. A radio-opaque mass was visualised in 65 X-rays and in 46 of these had not been diagnosed clinically. In 36 cases, the stone appeared to lie within the substance of the gland and in 21 cases, within the duct. In eight cases there were multiple stones in both the gland and duct.

All specimens excised were submitted for histological examination and reports were available in 124 cases. Histopathological diagnosis of these specimens is shown in Table II. Histologically, sialadenitis with stone formation was identified in 57 specimens from the 65 patients with suspected calculus on X-ray, 47 cases showed sialadenitis alone. 12 normal glands were removed and unsuspected pathology was detected in the remaining 8 cases.

From each case history operative and postoperative complications were recorded (Table III).

Neurological complications were recorded separately and are discussed in detail (Table IV). Damage to the marginal mandibular nerve was recorded in 25 cases and the deficit was permanent in 10. Four patients suffered permanent damage to the lingual nerve and one patient temporary damage to the hypoglossal nerve.

Discussion

In view of the frequency of damage to those nerves lying close to the submandibular gland during surgery for removal of this structure, a detailed discussion is required in order to try to reduce the morbidity associated with the procedure.

TABLE II *Histopathological findings, n=125*

Condition	*n*
Sialadenitis	47
Sialadenitis+stone	57
Normal gland	12
Pleomorphic adenoma	4
Cyst	1
Malignant lymphoma	1
Dermoid	1
Reticulosarcoma	1

TABLE III *General complications following submandibular gland excision*

Complications	*n*	*%*	*Comments*
Wound infection	12	9	All settled within weeks
Haematoma	14	10	2 patients required return to theatre and transfusion
Recurrent disease	3	2	Stones found in duct at follow up requiring further surgery
Miscellaneous	3	2	(i) Neuroma related to silk suture (ii) Chorda tympani syndrome
Sinus	4	3	Discharge continued for several weeks or months. No surgery.
Scarring	6	4	Not significant

TABLE IV *Neurological complications following submandibular gland excision*

Neurological deficit	*Temporary*	%	*Permanent*	%
Marginal mandibular nerve (n=25)	15	11	10 3 anaesthesia	7
Lingual nerve	0	0	4 1 parasthesia	3
Hypoglossal nerve	1	7	0	0

Temporary damage to the marginal mandibular nerve occurred in 11% of cases, a further 7% suffering permanent damage to the nerve. Almost certainly some cases of damage resulted from an ignorance of the variability of the course of the nerve in relation to the inferior border of the mandible. Shaheen describes the nerve as running 2 cms below the ramus of the mandible *(3)*. The nerve generally crosses the facial vessels at their point of contact with the lower border of the mandible.

However, in a study of 110 facial halves, Ziarah found that in 6% of cases, the nerve did not pass upwards at this point but continued a course below the mandible for some distance before turning superiorly to supply depressor anguli oris *(4)*. Where the nerve did cross the mandible at the level of the facial vessels, there was a variable relationship of the nerve to the facial artery. The nerve passed either superficially or deep to the artery and in 12% of cases bifurcated around the vessel. In some cases, there were multiple divisions of the branch, passing on either side of the facial artery. Ziarah also found that the nerve lay up to 0.65 cms above the inferior border of the mandible and as far as 1·2 cms below.

Therefore, in order to avoid damage to the marginal mandibular nerve at any point in its course, it is essential to position the initial incision at least 2 cms below the mandibular ramus and to ensure that the anterior extension of this incision is not allowed to pass above this 2 cm limit in view of the variability at this point.

Various techniques have been described to avoid damage to the nerve whilst mobilising the submandibular gland from its fossa, including first identifying the nerve as it leaves the tail of the parotid and passes anterior to the retromandibular vein. In view of the variability in the course of the nerve, this technique may well be most desirable.

Other techniques include dissecting deep to the fascia covering the gland by approaching the operative field from below, at the level of the hyoid bone. Another technique described involves ligating the facial vessels well below the mandible and using the upper end to retract the nerve out of the operative field. However, as previously discussed, the nerve may be running well below the mandible at this point, and could therefore be damaged if this technique was applied.

Theoretically a nerve stimulator may help in aiding identification of the marginal mandibular branch of the facial nerve *(5)*. However, it is likely that the distal nature of the stimulus may result in inadvertent stimulation of local musculature. Differentiating between these two effects may be difficult peroperatively.

In all 3 cases of the damage to the lingual nerve during submandibular surgery, there had been inflammation and the nerve may well have become adherent to the gland, and was damaged during the superior part of the dissection. Great care must therefore be taken when dissecting in this area in cases of chronic sialadenitis.

Other complications relevant to the procedure included retained stones in the residual duct in three patients. This complication can be avoided if the punctum of the submandibular duct is dilated at the end of the procedure and is then irrigated to remove any remaining calculi. Radiologically there had been evidence of calculi in the duct in 21 patients, so a case can be made for including this step in all operations where sialadenitis with calculus formation is suspected.

The chorda tympani syndrome was recorded in one patient and is thought to be due to misdirected autonomic re-inervation of the overlying skin following division of the secretomotor supply to the gland *(6)*.

Of concern in this study, is the finding of 12 normal glands on histological examination. Full preoperative evaluation of patients with a history suggestive of submandibular disease should include plain X-rays of the submandibular region to identify any calculus. Sialography may also be of limited value in identifying any abnormality within the gland such as sialectasis or narrowing of the main duct.

When the underlying diagnosis is unclear needle aspiration cytology may be of value although this will depend on the availability of an experienced cytologist. Its use in this situation has not yet been established.

Conclusion

From this discussion, it is apparent that great care must be exercised when performing excision of the submandibular gland in cases where inflammatory changes have taken place, to avoid neurological complications. The dissection will be facilitated by a detailed knowledge of the local anatomy and of the variability encountered in this area.

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