ORIGINAL ARTICLE

Surgical Complications of Submandibular Gland Excision

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KEYWORDS
Submandibular gland excision; Salivary gland neoplasm; Marginal facial nerve paralysis

Abstract
Introduction and objectives: Submandibular gland excision is the treatment of choice in chronic pathology resistant to medical treatments or in oncological cases. The aim of this study was to analyse its current postoperative complications.
Materials and methods: Retrospective study on submandibular gland excisions performed at our University Hospital between 2004 and 2010.
Results: A total of 29 submandibular gland excisions were performed: 44.8% (13) for chronic sialadenitis, 37.9% (11) for salivary gland neoplasm and 17.2% (5) for adjacent tumours. Median length of hospital stay was 2 days. Complications were more common after gland excision due to inflammatory causes. There were only 2 cases of paralysis of the marginal facial nerve branch (6.8%); 1 was due to neoplastic pathology and 1 from inflammatory pathology.
Conclusion: Despite marginal facial nerve paresis being one of the most relevant issues after submandibular gland excision, this type of surgery is a safe technique in our experience.
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PALABRAS CLAVE
Submaxilectomía; Neoplasia salivar; Paresia marginal

Complicaciones quirúrgicas de la cirugía submaxilar

Resumen
Introducción: La submaxilectomía es el tratamiento de elección en afección crónica resistente a tratamiento médico o en sospechas tumorales. El objetivo de este estudio es evaluar la morbilidad actual de la submaxilectomía.
Resultados: Se realizaron 29 submaxilectomías, 44,8% (13) por sialadenitis crónica, 37,9% (11) por tumores submaxilares y en 17,2% (5) casos por tumoresadyacentes a la glándula. El tiempo medio de ingreso posquirúrgico fue de dos días. Las complicaciones fueron más numerosas en...

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Introduction

The removal of the submandibular gland has been a well-established surgical procedure for over 40 years, but it still remains a challenge for surgeons due to the risk of damaging the marginal branch of the facial nerve and the hypoglossal and lingual nerves. Surgical resection is typically the treatment of choice in the submandibular gland, both when affected by a tumour and by a treatment-resistant, chronic medical condition. However, there has been a decline in its use during recent years.

Tumoral involvement of the salivary gland is rare, accounting for 3% of all head and neck tumours, although the incidence of these tumours is increasing with respect to epithelial lesions of the upper aerodigestive tract. Moreover, while in the parotid gland only 1 in 6 tumours is malignant, in the submandibular gland this percentage is higher, reaching over one third of cases.

Modern imaging techniques are being introduced in cases of sialolithiasis or inflammatory diseases that enable endoscopic diagnosis and treatment of salivaryolithiasis with a low number of complications. However, it still remains unclear whether the recurrence rates and complications are equivalent to those of conventional excision of the gland.

The objective of this study was to assess the current morbidity of submaxillectomy, by reviewing a number of submaxillectomies performed in our area over the past 5 years, with an emphasis on surgical complications.

Materials and Methods

We retrospectively reviewed the records of all patients who had undergone submaxillectomy, due to both benign and malignant aetiology, at a university hospital during the period between 2004 and 2010, with a minimum follow-up of 6 months after surgery.

During this period, our hospital performed 36 submaxillectomies on 35 patients: 36% (13) due to chronic sialadenitis, 30.5% (11) due to submandibular tumours and 33% (12) due to tumours adjacent to the submandibular gland.

The group of tumours adjacent to the submandibular gland does not include those submaxillectomies performed for carcinomas in common surgical protocols (7 submaxillectomies performed on 2 carcinomas of the mouth floor and on 5 lip carcinomas). The series does include the submaxillectomies performed on a deferred basis on 3 patients with tongue carcinoma from repeated submaxillaritis related to scarring/stenosis of the Wharton duct.

Complying with these criteria, we finally reviewed the medical records for 29 submaxillectomies in 29 patients: 44.8% (13) due to chronic sialadenitis, 37.9% (11) due to submandibular tumours and 17.2% (5) due to tumours adjacent to the submandibular gland or a chronic submandibular condition clearly related to previous cancer surgery (stenosis by scarring).

We reviewed all records available, including surgical protocols, anatomical pathology reports and notes on evolution during hospital admission and consultation during review.

We analysed data from the clinical histories (age, gender and time course of the symptoms before arrival at our clinic), additional tests (fine needle aspiration [FNA] report, ultrasound/computed tomography [CT] and their correlation with the final anatomopathological diagnosis), as well as patient outcomes (mean time of admission, immediate [within 1 month] and late [persistence at 6 months after surgery] postoperative complications).

The submaxillectomy technique used was the habitual, by trachelectomy more than 2 cm away from the mandibular branch (Risdon incision), dissection of the capsule, facial artery and vein ligation and Wharton duct ligation, preserving the lingual nerve. We did not use facial nerve monitoring on a regular basis.

For surgical complications we can include: postoperative haemorrhage/haematoma, wound necrosis or dehiscence, fever or wound infection, sialocele, paresis or paralysis of the marginal, lingual or hypoglossal nerves, both immediate (within 1 month) and permanent (persistent at 6 months after surgery). Marginal nerve function was assessed preoperatively to confirm its integrity and was also evaluated postoperatively, first at the hospital, 24 h after the operation, and then in follow-up controls for 6 months.

Results

Taking into account the inclusion criteria already mentioned, a total of 29 submaxillectomies were performed on 29 patients in the period between April 2004 and May 2010. In 13 patients (44.8%), submaxillectomy was performed due to inflammatory and/or lithiasic disease unresponsive to conventional medical treatment. In the remaining 16 cases (55.2%), it was performed in relation to tumour involvement. Submaxillectomies due to tumours were performed in 68.7% (11/16) of cases due to tumours of salivary origin, and in 31.25% (5/16) due to tumours in the ENT area or due to cases of non-salivary submaxillaritis derived from Wharton duct scarring/stenosis in patients operated on for tongue carcinoma.

Of the 13 submaxillectomies indicated by salivary inflammatory condition, 54% (7/13) were on the right side and 46% (6/13) on the left side. The mean age of patients was 38 years, ranging from 21 to 60 years. It was much more common in men, with a male:female ratio of 12:1. The mean evolution time of the condition before reaching
consultation was 20 months, ranging from 1 month to 5 years. FNA was performed in 23% (3/13) of cases, all diagnosed with sialadenitis and consistent with the final histopathological diagnosis of the surgical specimen. Imaging tests were performed in 100% of patients: in 11 cases (85%) by ultrasound, of which there was a positive correlation with the final anatomy of the specimen in 90% (10/11) of cases; and in 5 cases (38%), the tests were supplemented by CT scans, all of them compatible with sialadenitis/sialolithiasis, with full concordance with the final anatomy. The mean length of hospital admission was less than 2 days (1.8), with a range between 1 and 4 days. In 15% (2/13) of the submaxillectomies performed, we observed mild marginal paresis during the postoperative period (after 24 h, during the first hospital control), although only 1 of them was maintained beyond 6 postoperative months. There was no evidence of paresis or paralysis of the hypoglossal nerve or the lingual nerve. As for the rest of the immediate postoperative complications, in 31% (4/13) of the submaxillectomies performed we observed infections in the surgical field, which were treated with antibiotics; there was seroma in 15% (2/13); 1 of the cases underwent 2 subsequent surgical revisions due to persistent infection (15%, 2/13); and there were no problems with suture dehiscence except in those cases of postoperative infection mentioned previously (31%).

Of the 11 submaxillectomies caused by salivary tumours, 36% (4/11) were malignant and 64% (7/11) were benign (Table 1). Regarding lesion laterality, the interventions took place on the right side in 64% (7/11) of cases and on the left side in 36% (4/11) of cases. The mean patient age was 47 years, ranging from 10 to 81 years. Women suffered more than twice as many cases as men (73% and 27%, respectively). The mean evolution time of the tumour before reaching ENT consultation was 25 months, ranging from 1 month to 10 years. FNA was performed in 100% of the submandibular tumours, with concordance between FNA diagnosis regarding the specific type of tumour (pleomorphic adenoma, Warthin’s tumour, etc.) and the final histopathological diagnosis of the surgical specimen in 86% of benign tumours (6/7) and in 75% of malignant tumours (3/4). Imaging tests were performed in 100% of patients with salivary tumours; for each of these results, the guidance offered by the radiologist was contrasted with the particular type of tumour (Warthin’s tumour, pleomorphic adenoma, etc.) and the final pathological anatomy. Ultrasound was performed in 54.5% (6 cases), of which there was a positive correlation between the radiology report and the final anatomy in only 33.3% (2/6). CT scans were performed in 63% (7 cases), of which there was a positive correlation between the radiology report and the final anatomy in 28.6% (2/7). The mean hospital stay was less than 2 days (1.7), with a range between 1 and 3 days. One slight case of facial paresis was observed during the postoperative period in 1 of the submaxillectomies performed to remove a benign tumour (at 24 h, during the first hospital control), which persisted at 6 postoperative months. There was no evidence of paresis or paralysis of the hypoglossal nerve or the lingual nerve. As for the rest of the immediate postoperative complications, transient seromas were evident in 2 cases (18%), which were treated by repeated puncture on an outpatient basis without further complications. In 1 case (9%), there was an intra-dermal suture breakage during removal. No complications such as necrosis or surgical wound dehiscence, postoperative bleeding, fever or superinfection of the wound were evident in this patient group.

The group of submaxillectomies performed due to non-salivary ENT tumours included 5 cases. Of these, 3 were operated due to tongue carcinoma and the submandibular gland contralateral to the operated side developed repeat submaxillaritis clearly related to residual scarring at the level of the Wharton duct during the first year after surgery. In all 3 cases, a CT scan was performed, with a final diagnosis of chronic submaxillaritis clearly correlated with the final anatomy. In the 2 other cases included in this group (1 schwannoma and 1 lipoma), submaxillectomy was performed because the FNA report was doubtful and did not rule out malignancy despite the fact that the radiology report was suggestive of benign involvement. There were no cases of facial paresis of the hypoglossal nerve or the lingual nerve. One patient suffered haemorrhage, which required surgical revision.

### Discussion

Classically, submaxillectomy is a surgical technique performed for the treatment of tumours or obstructive conditions of the submandibular gland, especially in the case of hilar-parenchymal obstructions not susceptible to sialendoscopy. Although submaxillectomy is a relatively standardised surgical procedure, there are still complications frequently published by different groups. These complications include: nerve paralysis or paresis, aesthetic sequelae, haematoma, salivary fistulas or sialoceles, wound infections, hypertrophic scars and inflammations caused by residual lithiasis in the salivary duct.

In our series, over one third of the submaxillectomies were still performed due to inflammatory condition, figures similar to those in the literature. Moreover, in our experience, submaxillectomies performed for chronic sialadenitis present figures of infectious complications higher than those reported by other groups (8% by Smith and Christie et al.). We consider that this may be related to the facts that our

### Table 1 Final Anatomical Pathology of Samples From Submaxillectomies of Tumoral Aetiology.

<table>
<thead>
<tr>
<th>Submaxillectomies of Tumoral Aetiology (16 Cases)</th>
<th>Benign salivary tumours</th>
<th>Malignant salivary tumours</th>
<th>Non-salivary tumours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submaxillectomies of Tumoral</td>
<td>Pleomorphic adenomas 6</td>
<td>MALT lymphoma 1 (6.2%)</td>
<td>Lipoma/lymphadenopathy 1 (6.2%)</td>
</tr>
<tr>
<td>Aetiology (16 Cases)</td>
<td>(37.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warthin’s tumour 1 (6.2%)</td>
<td>Cystic adenoid carcinoma 2 (12.5%)</td>
<td>Acinar cell carcinoma 1 (6.2%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cervical Schwannoma 1 (6.2%)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Tongue carcinoma 3 (18.7%)</td>
<td></td>
</tr>
</tbody>
</table>

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centre covers an area with a depressed socioeconomic level, patients with inflammatory disease take longer time to consult their physicians, their tissues are in a worse condition due to the high number of past infections when performing surgery and, finally, therapeutic compliance with postoperative medication is not as regulated as it should be. In any case, we keep this information in mind when obtaining informed consent from our patients.

For many surgeons, there is an impression that submaxillectomy is associated with significant neurological complications relatively frequently. Of these neurological complications,9-21 the most common is transient or permanent paresis of the marginal nerve (the transient type being described in up to 36% of cases16 and the permanent in up to 12% of cases15). Temporary or permanent paresis of the hypoglossal nerve is more rare (2%-5%),12,14,17 as are temporary or permanent lingual nerve injuries (2%-5%).9-19 Similarly to other authors, definitive marginal paresis was very rare in our series (6.8%), and the only evidenced cases in this series were not complete cases, but rather mild marginal paresis (in terms of degree of impairment of lower lip mobility). There were no lesions of the hypoglossal nerve or the lingual nerve.

There are many methods to reduce the risk of marginal nerve paralysis. Shaheen16 defined 3 manoeuvres to minimise nerve damage:

1. A low approach with "non-identification" of the gland at the level of the hyoid bone, in which no attempt is made to identify the marginal branch.
2. A clear identification and, therefore, protection of the marginal nerve at the level at which it leaves the parotid tail.
3. A division of the facial vessels in a low cervical area and traction of the upper ends, thus retracting the nerve upwards and removing it from the surgical site.

All of these methods to minimise the risk of nerve damage are appropriate and direct visualisation of the nerve also provides important guidance for surgeons in training. However, like other authors,18 we believe that faced with equal results regarding nerve integrity, the most useful manoeuvres and those which we perform in our usual technique are: placing the head of the patient in neck hyperextension to improve visualisation, making an incision more than 2 cm away from the mandibular branch to avoid its path (in 40% of cases, the nerve passes up to 1 cm below it17), and protecting the nerve when raising the fascia covering it.

When using the technique of "non-identification", we must take into account that the traction on the upper surgical margin to expose the gland must be done delicately to avoid damaging the marginal nerve. We must be careful to avoid an inappropriate use of electric scalpels in that area, and sectioning cervical nerve branches that provide function to the platysma should also be avoided whenever possible. In addition, we should attempt to enable a proper confrontation of the sectioned platysma muscle to avoid or at least minimise the duration of the temporary weakness of the lower lip that may stem from these causes. In fact, faced with what seems like a slight marginal paresis maintained over time, we believe that the performance of an EMG should be considered, so as to rule out the involvement of marginal nerve function. As in 1 of our cases of mild marginal paresis was maintained for over 6 months, the patient refused to complete the proposed study; consequently, we were unable to rule out the possibility that the weakness in lower lip mobility was not due to other causes. Intraroral resection of the submaxillary gland has recently been proposed to reduce the neurological sequelae of submaxillectomy. The small number of patients treated means that we cannot reach a clear conclusion on its validity as an alternative to the traditional approach.23-27

Following the literature,4,16 at present, despite the fact that sialendoscopy9 or lithotripsy9 are techniques seeking to offer a suitable alternative to submaxillectomy in the treatment of symptomatic lisiastic sialadenitis, there is still a role for sialoadenectomy as a treatment for obstructive disease. This is especially true in patients with a history of multiple balloon dilations of ductal stenosis via endoscopy or in recurrences of those stenosis, various unilateral large stones or bilateral intraparenchymal stones with recurrent symptomatic sialadenitis, inability to remove a hilar-parenchymal lissiasis with transoral or transcervical removal techniques, persistent and symptomatic cases of sialadenitis in patients with Sjögren’s syndrome who do not respond to systemic treatment or to local endoscopic washing with steroids, and persistent symptomatic sialadenitis in irradiated patients.

Consequently, given that submaxillectomy remains the most commonly used technique at the end of most algorithms for the treatment of inflammatory disease and in a regulated manner for the treatment of cancer, we believe that this technique is sufficiently relevant for the ENT specialty training program to contemplate a minimum number of submaxillectomies as the primary surgeon, which is currently not the case. In fact, it is not even mentioned in the list of surgical minima to be undertaken during the resident training period in otolaryngology.

Conclusion

Submaxillectomy is a surgical procedure with known risks. In our series, cases of marginal paresis were rare, with our main complication being postoperative infections in cases of chronic sialadenitis. Because it is a technique with clear indications that remain valid despite technological innovations, we believe that it should be included in the teaching program for resident otolaryngology physicians in a structured manner.

Conflict of Interests

The authors have no conflicts of interest to declare.

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10. Gallo.


12. submandibular

13. ease.

14. Guntinas-Lichius

15. Maxillofac


