British Journal of Oral and Maxillofacial Surgery (2003) **41**, 142–146

doi:10.1016/S0266-4356(03)00077-9, available online at www.sciencedirect.com SCIENCE DIRECT®

BRITISH Journal of Oral and Maxillofacial Surgery

Double mandibular osteotomy with coronoidectomy for tumours in the parapharyngeal space

N. Lazaridis,* K. Antoniades †

Professor of Oral and Maxillofacial Surgery; †Associate Professor of Oral and Maxillofacial Surgery, Department of Oral and Maxillofacial Surgery, G. Papanicolaou General Hospital, Aristotle University of Thessaloniki, 10, Mitr. Gennadiou Street, 546 31 Thessaloniki, Greece

SUMMARY. **Removal of deep-lobe parotid tumours from the parapharyngeal space is often difficult because of limited surgical access and the critical vascular and neurologic structures nearby. Mandibulotomy, when necessary, is useful for improving wider visibility and control of the vascular bundle and facial nerve, but may cause damage to the inferior dental and lingual nerves. The double mandibular osteotomy with coronoidectomy gives excellent access and avoids damage to these nerves.**

Keywords: **Osteotomy; Parapharyngeal space; Parotid tumour**

INTRODUCTION

Tumours in the parapharyngeal space are uncommon,[1] and are diagnosed lately because of the anatomy of the region. The rigid bony walls of the mandible direct tumour growth medially to the parapharyngeal space.[2]

This silent anatomical space allows the tumour to grow large and on routine clinical examination the finding of bulging of the soft palate suggests the diagnosis. Such tumours can be reached by superficial parotidectomy and removed by deep lobectomy after preservation of the facial nerve. Ehrlich[3] proposed a transoral approach through a curved incision through the palatopharyngeal arch, which is deepened until the capsule of the tumour is reached. However, the transparotid and intraoral approaches have limited use.

The styloid process, the stylomandibular ligament and the mandible impede access to parapharyngeal deep-lobe parotid tumours. Division of the mandible was first proposed by Ariel *et al*.[4] They suggested either resection of the posterior aspect of the ascending ramus or actually dividing the ramus with a Gigli saw. Others have suggested alternative mandibular osteotomies (Fig. 1).

Most of these proposed techniques, however, involve resection of the inferior alveolar nerve within the bone. Seward described a mandibular osteotomy distal to the mental foramen without splitting the lip (sometimes combined with osteotomy of the condylar neck), to spare the inferior alveolar nerve (Fig. 2).[5,6]

We now present a modification of this technique to include coronoidectomy, and report its use in two cases of deep-lobe parotid tumours (Fig. 3).

OPERATION

We start with a standard preauricular parotidectomy incision carried anteriorly into the submandibular region that reaches the mandibular symphysis. Reflection of the skin flaps exposes the parotid gland, the sternomastoid muscle, the greater auricular nerve and the cartilage of the external ear canal. The lateral parotid lobe is displaced forwardy and the main trunk of the facial nerve is exposed as in a standard parotidectomy. The external carotid artery is exposed deep within the inferior portion of the parotid. Transsection of this vessel exposes the fan-shaped stylomandibular ligament. This ligament and the digastric and stylohyoid muscles are transsected.

The submandibular flap is dissected down toward the hyoid bone and upwards to the mandibular symphysis, following the plane beneath the platysma muscle. It is important to preserve the marginal mandibular branch of the facial nerve. Next, the periosteum is split along the inferior border of the mandible and subperiosteal dissection allows a mandibular osteotomy to be made anterior to the mental foramen, preferably at the interproximal space of the canine and the first premolar. The inferior dental nerve is undisturbed. The masseter muscle is reflected superiorly to give access to the sigmoid notch.

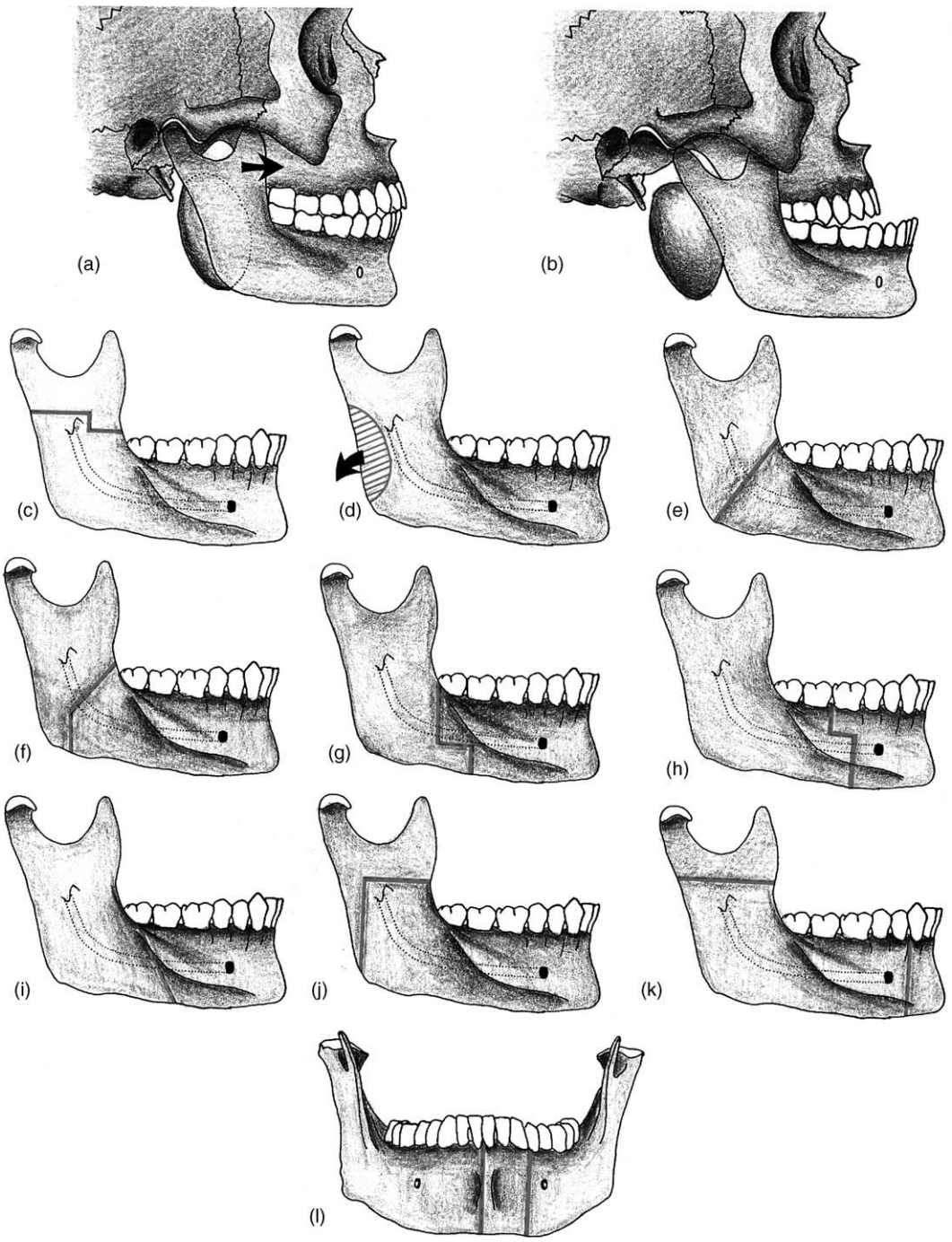

Fig. 1 Diagram showing the most important manoeuvres and osteotomies that have been proposed to improve surgical access to the parapharyngeal space. (a and b) Mandibular dislocation without osteotomy; (c) osteotomy of the ramus above the lingula; (d) osteotomy of the posterior margin of the ramus; (e and f) osteotomy at the angle of the mandible; (g and h) step-like mandibulotomy at the body; (i) oblique osteotomy of the body; (j) inverted 'L' osteotomy; (k) osteotomy anterior to the mental foramen and osteotomy of the ramus above the lingula; (l) symphesial and parasymphesial mandibulotomy.

Bone plates are fitted, and screw holes are drilled before making the osteotomies to facilitate accurate approximation of the mandibular segments at the end of the operation. The medial aspect of the mandible is freed to the lingula, where the neurovascular bundle is isolated and preserved.

Next an osteotomy is made at the base of the condylar process to increase mandibular mobility and allow upward

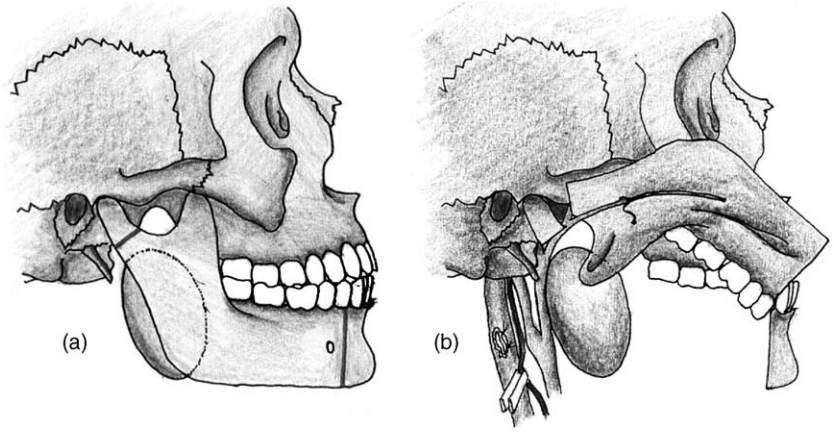

Fig. 2 (a and b) Osteotomy anterior to the mental foramen and condylar neck osteotomy.

rotation of the body and the ramus of the mandible. The coronoidectomy improves the exposure of the tumour, increases the mobility of the mandibular segment, and prevents postoperative trismus (Fig. 3a and b). The periosteum is lifted off on the lingual side to allow upward rotation of the mandible and the oral cavity is not breached. The tumour can now be mobilised and excised.

After the tumour has been removed, the previously fitted plates are reapplied to the mandible, in correct occlusion with maxillomandibular fixation. A few days of maxillomandibular fixation with elastics is usually necessary, followed by the use of loose guiding elastics.

Finally, the surgical incisions are closed in layers and a suction drain is placed. Broad-spectrum antibiotics are recommended for a few days, except when intraoral biopsy specimens are taken or transoral enucleations done. The latter is indicated for tumours arising within the oral mucosa. In such cases the intraoral mucosa is sutured and antibiotics are given for longer.

CASE REPORTS

Case 1

A 63-year-old edentulous woman with a history of carcinoma on the right cheek and ipsilateral palpable lymph nodes was referred to an oral and maxillofacial surgery clinic for evaluation in 1996. The computed tomogram (CT) showed an independent tumour in the deep lobe of the left parotid salivary gland. The patient had a wide local excision of the primary lesion on the cheek and a unilateral radical neck dissection. A superficial parotidectomy was done to remove the tumour of the deep lobe of the parotid gland at the same operation. The body of the mandible was divided anterior to the ascending ramus according to the method of Ariel *et al*.[4] The ramus was then everted upwards and laterally to facilitate access to the deep part of the tumour. Nevertheless the size of the tumour and the abundant haemorrhage during the operation did not allow its removal. The mandible was reduced with an AO reconstruction plate. The postoperative course was uneventful and the patient was discharged on a soft diet. She had a course of radical radiotherapy.

The histopathological examination showed a well-differentiated squamous cell carcinoma of the primary cheek tumour and two invaded lymph nodes of the 19 lymph nodes in the specimen. Biopsy of the parotid tumour in the deep lobe showed a pleomorphic salivary adenoma and in some places a low grade adenocarcinoma.

The patient refused a further operation to remove the residual parotid tumour and remained free of squamous cell carcinoma for 4 years. The deep parotid tumour remained unchanged in size. Nevertheless, fibrosis in that area created functional problems such as trismus and difficulties swallowing that finally forced the patient to seek a second operation.

In April 2000, she presented to our clinic where radical excision of the tumour was accomplished by the technique that we have described. Histopathological examination confirmed that the mass was a pleomorphic salivary adenoma. No splints or arch bars were applied and the patient was prescribed a soft diet. One year later she is symptom-free with normal mouth opening.

Case 2

A 38-year-old woman presented to our clinic complaining of a lump in her throat and earache, which she had had for several months. Examination showed a mass on the right pharyngeal wall without ulceration of the mucosa. A CT showed a 7/4 cm mass within the deep lobe of the parotid gland, extending up to the base of the skull, down to the lower border of the tonsillar bed, and crossing the midline of the nasopharynx.

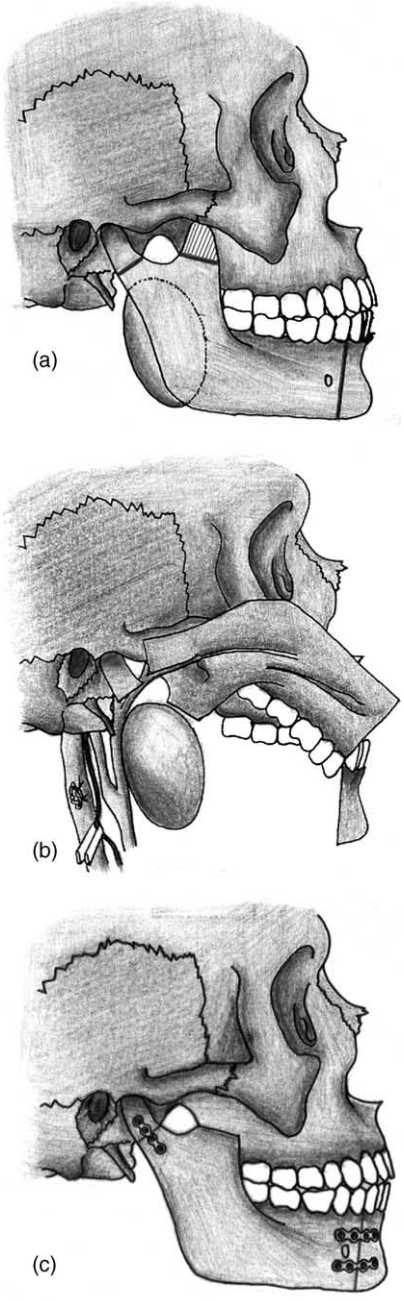

Fig. 3 (a) Diagram showing the design of the bone cuts for the double mandibular osteotomy and coronoidectomy; (b) upward rotation of the cut mandibular segment; (c) after the tumour has been removed the cut mandibular segments are reapproximated and stabilised with adapted bone plates.

Aspiration biopsy cytology showed pleomorphic adenoma. The patient was operated on by the technique that we have described. The tumour was easily mobilised and delivered without complications. The mandible was reconstructed with previously designed Luhr miniplates. No splints or arch bars were applied and the patient was given a soft diet for 5 days postoperatively. The postoperative course was uneventful and the patient was discharged on a soft diet. Microscopic examination confirmed the cytological diagnosis. A transitory facial nerve palsy and sensory impairment lasted about 2 months but had completely recovered 1 month after that.

DISCUSSION

The approach of choice to the parapharyngeal space to allow adequate removal of these tumours should meet two criteria: wide intraoperative visibility for safe, radical dissection and minimal functional or cosmetic after-effects.

The intraoral approach was described by Ehrlich in 1950.[3] It is indicated for small tumours as the surgical exposure is often poor, preventing adequate vascular control in the event of major haemorrhage. It also provides little control of the adjacent neurovascular structures, and the limited visibility can lead to rupture of the tumour and spillage into the operative field.

Because the mandible lies lateral to the parapharyngeal space it prevents direct surgical access to this region, so a considerable number of surgical techniques have been described to overcome this problem.[7] There are two surgical options: one involves anterior dislocation of the mandible by division of the stylomandibular ligament and forward traction of the mandible,[8] and the second involves mandibular osteotomies.

Mandibular dislocation sometimes entails resection of the styloid process and the stylomandibular ligament.[9]

Ariel *et al*. described resection of the posterior margin of the ramus of the mandible.[4] Both approaches make the isolation of the upper portion of large tumours difficult.

Osteotomy of the mandible provides excellent access to the entire parapharyngeal space up to the base of the skull, enabling complete removal of a tumour and vascular control.

Various osteotomies through the angle,[10] the ascending ramus[11] or the horizontal ramus proximal to the mental foramen give good access but result in section of the inferior alveolar nerve. Several authors have reported recovery of the function of the inferior alveolar nerve when the mandible is reconstituted with bone plates,[10] but nerve recovery is unlikely to be reliable. This view is supported by Robinson who continued to have altered sensation 2 years after the initial nerve section.[12]

Osteotomies medial to the mental foramen avoid damage to the inferior alveolar nerve, but require a lip-splitting incision. The osteotomy may be in the midline or the parasymphyseal area because the tumour lies at the apex of a deep wound, even when the mandible is swung laterally. Seward described the possibility of approaching the parapharyngeal space through a lateral neck dissection and a mandibular osteotomy distal to the mental foramen

without splitting the lip to avoid scarring.[5,6] This allows the mandible to be lifted for access.

Another way to avoid damage to the inferior alveolar nerve is to place the osteotomy horizontally in the vertical ramus above the inferior alveolar canal. The inverted 'L' or 'C' osteotomies provide good access while maintaining sensory innervation to the lower lip. The Attia procedure combines a parasagittal osteotomy and a horizontal vertical ramus osteotomy to give maximum surgical exposure.[13] The oral cavity is not necessarily entered, so salivary leaks are avoided. The Attia technique provides the best access to the parapharyngeal space from skull base to the hyoid bone. It has, however, the disadvantages of scarring caused by lip-splitting, necessary tracheostomy, and the intraoral approach leading to possible wound contamination.

In 1985, Seward described the approach to the parapharyngeal space through a lateral neck incision and a mandibulotomy anterior to the mental nerve without labiotomy. He added osteotomy of the condylar neck to facilitate the upward distraction of the body and ramus.[5,6] Generally, the oral cavity remains intact and this avoids salivary leaks. Preparation of the plates before the osteotomies allows the mandible to be repositioned accurately to maintain preoperative occlusion and limits the need of maxillomandibular fixation to a few days of elastic guidance of the occlusion.[3]

This double mandibular osteotomy with our modification of additional coronoidectomy proved useful in two cases in gaining wide exposure to the parapharyngeal space and provided excellent visibility to secure local neurovascular structures.

It helped to improve exposure and more importantly improved postoperative rehabilitation. A superficial parotidectomy must be done first. This allows the main trunk and the smaller branches of the seventh nerve to be identified and avoided, as the dissection is retrograde in the parapharyngeal space. Some authors[7] think that the submandibular gland should be removed rather than mobilised, because that eliminates the possibility of postoperative adenitis after the manipulation required for mobilisation. In our first case, the submandibular gland had been removed during the previous unilateral radical neck dissection. In the second of our cases the submandibular gland was not mobilised to remove the tumour. Nevertheless, we think that the removal of submandibular gland allows the surgeon to follow and protect both the lingual and the hypoglossal nerves.

REFERENCES

1. Lawson VG, LoLiever WC, Makerewich LA. Unusual parapharygeal lesions. J Otolaryngol 1974; 8: 241–246.
2. Carr RJ, Bowerman JE. A review of tumours of the deep lobe of the parotid salivary gland. Br J Oral Maxillofac Surg 1986; 24: 155–168.
3. Ehrlich H. Mixed tumors of the pterigomaxillary space: operative removal, oral approach. J Oral Surg 1950; 3: 1366–1370.
4. Ariel IM, Jerome AP, Fack GT. Treatment of tumors of the parotid salivary gland. Surgery 1954; 35: 124–128.
5. Seward GR. Nodular enlargements of the salivary glands. In: Moore JR, ed. Surgery of the Mouth and Jaws. Oxford: Blackwell Scientific Publications, 1985: 694.
6. Seward GR. Tumors of the parapharyngeal space. J R Coll Surg Edinb 1989; 34: 111–117.
7. Biedlingmaier JF, Ord R. Modified double mandibular osteotomy for tumors of the parapharyngeal space. J Oral Maxillofac Surg 1994; 52: 348–356.
8. Wise WP, Baker HW. Tumors of the deep lobe of the parotid gland. Am J Surg 1960; 100: 323–327.
9. Nanson EM. The surgery of deep lobe of the parotid salivary gland. Surg Gynaecol Obstet 1966; 122: 811–819.
10. Carr RJ, Bowerman JE. A review of tumors of the deep lobe of the parotid salivary gland. Br J Oral Maxillofac Surg 1986; 24: 155–160.
11. Pogrel MA, Kaplan MJ. Surgical approach to the pterygomaxillary region. J Oral Maxillofac Surg 1986; 44: 183–187.
12. Robinson PP. Observations on the recovery of sensation following inferior alveolar nerve injuries. Br J Oral Maxillofac Surg 1988; 26: 177–181.
13. Attia EL, Bentley KC, Head T *et al*. A new external approach of the pterygomaxillary fossa and parapharyngeal space. Head Neck Surg 1984; 6: 884–888.

The Authors

N. Lazaridis
Professor of Oral and Maxillofacial Surgery
K. Antoniades
Associate Professor of Oral and Maxillofacial Surgery
Department of Oral and Maxillofacial Surgery
G. Papanicolaou General Hospital
Aristotle University of Thessaloniki, 10
Mitr. Gennadiou Street, 546 31 Thessaloniki, Greece

Correspondence and requests for offprints to: N. Lazaridis, Professor of Oral and Maxillofacial Surgery, Department of Oral and Maxillofacial Surgery, G. Papanicolaou General Hospital, Aristotle University of Thessaloniki, 10, Mitr. Gennadiou Street, 546 31 Thessaloniki, Greece. Tel: +30 310 244177; Fax: +30 932 413337; E-mail: kostalfi@b-online.gr

Accepted 9 April 2003