ACTA OTORHINOLARYNGOLOGICA ITALICA 2010;30:277-280

ONCOLOGY

Submandibular approach and use of the harmonic instrument in lateral oral cavity and oropharyngeal oncologic surgery

Via submandibolare e strumento harmonic nella chirurgia del cavo orale laterale ed orofaringe

L. BARZAN, J. ANTONIO, S. SANTINI, R. DI CARLO, M.G. SAVIGNANO, D. POLITI, M. PIN, G. GRANDO, A. PAVIN

Unit of Otorhinolaryngology, "S. Maria degli Angeli" Hospital, Pordenone, Italy

SUMMARY

The approach to the surgical treatment of lateral oral cavity and oro-pharyngeal cancer has undergone many changes over the years, passing from a demolitive approach involving segmental resectioning of the mandible to a conservative approach with temporary mandibulotomy. The complications resulting from these two different approaches invited further review of the various indications related to them. The present report considers, through a retrospective analysis, whether the sub-mandibular approach, which envisages the use of the harmonic instrument, is an oncologically correct alternative and whether it actually reduces the number of early and late complications. From 2003 to 2009, 259 patients underwent surgery for lateral oral cavity and oro-pharyngeal cancer. A sub-mandibular approach was used in 163 patients, and a conservative trans-mandibular approach in 12. The results showed that the number of late complications and T recurrences was significantly lower in those patients in whom the sub-mandibular approach was carried out. There was no difference in the microscopic examination of the resection margins. The use of the harmonic instrument made it possible to perform "en bloc" (T+N) operations working in narrow spaces with less intra-operative bleeding, which contributed to adequate oncological radicality.

KEY WORDS: Oral cavity cancer • Oro-pharyngeal cancer • Harmonic instrument • Sub-mandibular approach • Trans-mandibular approach

RIASSUNTO

L'approccio chirurgico ai tumori del cavo orale laterale e dell'orofaringe si è modificato nel corso degli anni, passando da un approccio demolitivo con resezione segmentale della mandibola ad un approccio conservativo con mandibulotomia temporanea. Le complicanze che i tipi di approccio comportano, hanno portato ad una rivalutazione delle indicazioni. Questo studio valuta, con analisi retrospettiva, se la via submandibolare con l'utilizzo dello strumento "harmonic", sia un'alternativa oncologicamente corretta e limiti il numero di complicanze precoci e tardive. Tra il 2003 ed il 2009, sono stati operati 259 pazienti per carcinoma del cavo orale laterale ed orofaringe. Di questi, 163 hanno ricevuto un approccio submandibolare, 12 transmandibolare conservativo. Sono occorse complicanze tardive e recidive di T significativamente minori con la via submandibolare, mentre non vi è stata differenza nei margini microscopici di resezione. L'utilizzo sistematico dello strumento "harmonic" ha consentito di eseguire interventi in monoblocco (T+N), pur lavorando in spazi ridotti, con minimo sanguinamento intraoperatorio ed ottenendo una adeguata radicalità oncologica.

PAROLE CHIAVE: *Carcinoma del cavo orale • Carcinoma orofaringeo • Strumento harmonic • Via submandibolare • Via transmandibolare*

Acta Otorhinolaryngol Ital 2010;30:277-280

Introduction

The aims in the management of cancer of the oral cavity and oropharynx are eradication of the cancer with preservation, or restoration, of both form and function.

There is no general consensus regarding the type of surgical approach to be used in the case of lesions of the lateral oral cavity and oropharynx requiring "en bloc" neck dissection. While in the past, segmental mandibular resection was accepted as a suitable surgical approach, current indications for segmental resection are either cancer surrounding the bone on the medial and lateral region, or massive bone invasion. Moreover, when there is only focal involvement of the cortical bone, non-discontinuous resection may be performed. In much the same way, in the past few years, surgeons in most institutions used to perform a lip-chin-splitting incision as a systematic approach

to the oral cavity and oropharyngeal cancer, an approach which is not widely applied today. Temporary mandibulotomy anterior to the mental foramen can be performed to obtain better exposure for resection of the primary tumour (T) and, indeed, this approach has been suggested even in recent surgical reviews [1], but the complications [2-8] involved confirm the need to re-examine the indications for the use of this technique.

The aim of this report is to evaluate, through a retrospective review, based on a mono-institutional experience, whether the sub-mandibular approach, combined with the use of the harmonic instrument for resection-coagulation of the tissues, might represent an oncologically correct alternative to the conservative trans-mandibular approach, thus reducing the complications related to the latter.

Patients and methods

From July 2003 to December 2009, 259 patients (pts) underwent surgery for squamous cell carcinoma of the lateral oral cavity and oropharynx at the Unit of Otolaryngology, "S. Maria degli Angeli" Hospital, Pordenone, Italy.

Pts in whom a trans-oral approach was used (with or without discontinuous surgery on N) and pts submitted to a trans-mandibular approach with resection and segmental removal of the mandible (demolitive trans-mandibular approach) are not taken into consideration. A total of 163 pts were treated using a sub-mandibular approach, while a conservative trans-mandibular approach was performed in 12 pts (with pT classes equally allocated in the 2 groups).

In the group submitted to the trans-mandibular technique, a paramedian mandibulotomy was performed through a "wedge" (in edentulous pts) or through a stair-step section and at the end of the operation, 2 titanium reconstruction plates were fitted: one on the external cortical bone and one on the lower part of the mandible.

The medical records of the pts were analysed to obtain the following data: post-operative early or late complications (within 30 days of surgery or after this period) related to the T resection, histopathology of surgical resection margins (subdivided into "free", when the distance between T and the surgical section was > 5 mm, "close", i.e., when the distance was ≤ 5 mm, or "involved" by the tumour), T recurrence, vital state.

Findings were up-dated until 10/5/2010 and the statistical significance of the different results was tested using χ-square distribution (permutation technique) [9].

Submandibular surgical technique with harmonic instrument

Monolateral or bilateral neck dissection is performed (depending upon the site of T lateral, median or paramedian) on a selective basis or including all levels (according to the N class).

The continuity between T and N is preserved through lateral parapharyngeal spaces in the case of oropharyngeal tumours and by sectioning the mylohyoid muscle in oral cavity tumours. Internal mandibular periosteum is elevated from the bone and included in the resection when the lesion is 1 cm from the gum or less. Working trans-orally, mucosal incisions are initiated (using the cold scalpel or the thinnest tip of the electro-scalpel to reduce to a minimum the thermal effect on the surface of the tissue) and then made deeper using the harmonic instrument. The direct application of the harmonic instrument for sectioning of the mucosal surface produces a blistering effect (due to tissue evaporation) which is minimal in the deep tissue. If the tumour has penetrated into the periosteum or focally into the bone, adequate radical extirpation may be obtained by marginal resection of the upper part of the mandible ("rim resection") or by an internal mandibular corticotomy. Marginal mandibulectomy should be extended posteriorly to include the coronoid and section of the bone is performed in the lateral-medial direction by moving down obliquely. Surgical dissection continues through the soft tissues using the harmonic instrument with a combined trans-oral and sub-mandibular approach, firmly elevating the mandible with a retractor. Regular use of the frontal cold light by the operator allows good visualization of all the details. The surgical specimen is carefully removed "en bloc", avoiding any squeezing/stretching during the passage below the mandible. Frozen sections and microscopic examination of the margins are performed. When the harmonic instrument cuts and coagulates one of the branches of the external carotid artery (lingual, facial), a titanium vascular clip is applied for greater safety. The surgical site can be closed primarily or by using flaps for reconstruction depending on the magnitude of the defect. Although the use of the harmonic instrument produces minimal thermal damage, a reduction in the vitality of the section plane is to be expected and sutures must be carried out using a suitable technique in order to prevent possible dehiscences. When a mandibular internal cortical resection or rim resection is performed, a titanium plate can be applied to strengthen the part of the mandible which is thought to be weakened.

Results

Early post-operative complications, related to resection of T, occurred in one pt treated with the conservative trans-mandibular approach and in 5 pts in whom the sub-mandibular approach was adopted.

Late post-operative complications (fistula, osteitis, osteonecrosis) occurred in 7 pts operated upon using a conservative trans-mandibular approach and in 18 pts in whom the sub-mandibular approach was used.

The difference was statistically significant and fewer late complications occurred when the sub-mandibular approach was used (χ-square 18.1, $p = 0.00$).

Table I. Complications, margins, vital state in patients with transmandibular and submandibular approach.

	Conservative transmandibular approach (12 pts)		Submandibular approach (163 pts)		
	No.	(%)	No.	(%)	p
Early complications	1	(8.33)	5	(3.06)	ns
Late complications	7	(58)	18	(11.04)	0.00
Margins					
Free	11	(91.66)	139	(85.27)	
Close	1	(8.33)	16	(9.81)	
Involved	0	(0)	8	(4.9)	ns
T recurrence	4	(33.3)	19	(11.6)	0.01
Vital state					
Alive with T	1	(8.3)	10	(6.13)	
Dead by T	2	(16.66)	18	(11.04)	ns

Margins: with the conservative trans-mandibular approach, free margins were obtained in 11 pts (91.6%), close in 1 pt (8.3%), and involved in none. With the sub-mandibular approach, free margins were obtained in 139 pts (85.2%), close in 16 (9.8%) and involved in 8 pts (4.9%). The differences are not statistically significant.

Recurrence of T occurred in 4 pts (33.3%) in whom the conservative trans-mandibular approach was applied and in 19 pts (11.6%) in whom surgery was performed applying the sub-mandibular approach (χ-square 4.54, $p = 0.01$).

Vital state: considering only the outcomes referred to as "alive with T" (1 pt submitted to the conservative trans-mandibular approach and 10 to the sub-mandibular approach) and as "death caused by T" (2 pts in whom the trans-mandibular approach was used and 18 in whom surgery was performed following the sub-mandibular approach), there is no statistical difference between the two approaches (Table I).

Discussion

For some years, the use of instruments employing ultrasounds, allowing section-coagulation of tissues has been widespread in otolaryngology and head and neck surgery. This technology is applied not only in cases of tonsillectomy, oropharyngeal surgery for obstructive sleep apnoea syndrome, parotidectomy and thyroidectomy [10 11], but also in oncologic surgery of head and neck [12 15]. The advantage is to obtain more efficient coagulation compared with the CO_2 laser or with the electro scalpel, with less thermal lateral damage (especially in comparison with the electro scalpel), without electric neuromuscular stimulations, and obtaining faster and more accurate operations thanks to bloodless dissection. This bloodless technology enables the surgeon to work in narrow spaces, ensures constant visual control during dissection and consequently helps to avoid the trans-mandibular approach.

Mandibulotomy causes complications, which are described in 5-59% of the most recent series in the literature [2-8]: dehiescences, fistula, exposure of the plates, osteitis, lack of osteosynthesis, osteonecrosis. Probably the complications are more frequent because most advanced tumours need adjuvant radiation therapy and osteitis, occurring where osteosynthesis took place may be evident even a long time after radiotherapy.

There are two types of alternative approaches with mandibular preservations: "visor flap" and "lingual release". The first [1 16] often requires sectioning of the mental nerves and as it involves exposure of the external surface of the mandible, reduces bone vascularization, which could increase the risk of complications when radiation therapy is necessary. The "lingual release" technique [17] consists of temporary detachment of all the structures of the floor of the mouth, sectioning mylohyoid, geniohyoid and genioglossus muscles. The incision-suture line is much longer therefore a slower functional rehabilitation should be expected.

Marginal mandibulectomy [18] and resection of the inner table of the mandible are probably better known for the anterior oral cavity and indicated for tumours without massive bone invasion, but they can also be applied successfully in the posterior oral cavity and oropharynx.

Despite all the possible bias regarding the retrospective series, the surgical cases mentioned here have the peculiarity of being homogeneous for T classes, without considering the non "en-bloc" operations (very early T or pts who received other forms of treatment on the neck for other reasons) or the demolitive trans-mandibular approaches (in the case of massive bone invasion). This series is unbalanced due to a predominant number of sub-mandibular approaches and one may argue that only the more difficult cases were treated by the conservative trans-mandibular approach, but the aim of this report is not to demonstrate that the former approach is better, but only to suggest that

it is feasible without compromising the immediate and late outcomes for the pts. The differences in the number of late complications, the non-significant comparison of the margins, the vital state, as well as the differences, in recurrences confirm the safety and the oncologic accuracy of the sub-mandibular approach.

One of the aphorisms of the surgeons preceding our generation used to be that "surgery is light", which suggested that a wide, solar exposure of the surgical field was mandatory. Recently, all the technological innovations have enabled practitioners to reconsider some surgical techniques without forgoing principles such as adequate resection, radical oncological procedure, "en bloc" resection of T and N in advanced tumours.

The aim of the combined trans-oral and sub-mandibular approach is to obtain the preservation of tissues and to prevent the complications derived from mandibular section: although this approach might seem to involve narrow spaces, the efficacy of the harmonic instrument in performing the bloodless cut of all the tissue planes makes it possible to obtain "en bloc" operations with adequate radical oncological removal of the tumour.

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Received: July 21, 2010 - Accepted: September 16, 2010

Address for correspondence: Dr. L. Barzan, Az. Ospedaliera "S. Maria degli Angeli", via Montereale 24, 33170 Pordenone, Italy. Fax +39 0434 399753. E-mail luigi.barzan@aopn.fvg.it