

# Centripetal approach to the facial nerve in parotid surgery: personal experience

## *Approccio centripeto al nervo facciale nella chirurgia della parotide: la nostra esperienza*

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### Key words

Surgery • Parotidectomy • Facial nerve

### Parole chiave

Chirurgia • Parotidectomia • Nervo facciale

### Summary

There is particular interest in parotid surgery on account of the close relationship between the gland and the extrapetrous facial nerve. The seventh cranial nerve is generally located by means of an anterograde or proximal surgical identification technique aimed at identifying the facial nerve at its point of exit from the stylomastoid canal. There are very few reports in the literature on retrograde or centripetal identification techniques, which may be adapted to the morphology of the neoformation limiting surgical access, in order to isolate the nerve from its peripheral rami. The present report deals with personal clinical experience, describing a technique for retrograde detection of the facial nerve. Between 1990 and 2001, 313 parotid surgery procedures were performed at the ORL Clinic of the Università del Piemonte Orientale in Novara. In 308/313 cases, corresponding to 98% of the operations, the technique chosen for the identification of the extrapetrous facial nerve was anterograde, proximal or centrifugal; in 5 cases alone, retrograde or centripetal exploration of the orbicular branch was undertaken, on account of difficulty in locating the main trunk, due to the presence of a post-inflammatory fibrosis in three patients and a stylomastoid emergency, arising from a malignant neoformation, in the other two. The decision to resort to the identification of the orbicular nerve of the eye is supported by the regular course and adequate size of this facial branch in its peripheral area, which enable it to be easily located.

### Introduction

Parotid disorders of surgical interest are heterogeneous as far as concerns histology and clinical development, and may involve all age groups of either sex. Parotid surgery is of particular interest on account of the close relationship of the gland with the extrapetrous facial nerve, as this noble structure conditions the outcome of the operation. In the presence of a preoperatively intact VII cranial nerve (CN), the surgeon must simultaneously preserve the patient's aesthetic and functional integrity, yet pursue the objective of controlling the pathological condition, whether it be benign or malignant.

### Riassunto

*Il particolare interesse della chirurgia parotidea è legato agli stretti rapporti che la ghiandola contrae con il nervo facciale extrapetroso. Generalmente il VII n.c. extrapetroso viene reperito con una tecnica chirurgica di identificazione anterograda o prossimale, che mira ad identificare il tronco nervoso alla sua uscita dal canale stilomastoideo. In letteratura più raramente si parla delle tecniche di individuazione retrograda o centripeta, che sono applicabili in funzione della morfologia delle neoformazioni che limitano l'accesso chirurgico, e contemplano l'isolamento del nervo dai suoi rami periferici. Gli Autori presentano, in questo lavoro, la loro casistica clinica, esponendo una variante della tecnica di reperimento retrograda del nervo facciale. Nel periodo 1990-2001 presso la Clinica Otorinolaringoiatrica dell'Università del Piemonte Orientale di Novara sono stati effettuati 313 interventi di chirurgia parotidea. In 308/313 casi, pari al 98% degli interventi, si è ricorsi alla tecnica di individuazione del nervo facciale extrapetroso per via anterograda o prossimale o centrifuga, mentre solo in 5 casi ci si è avvalsi di una ricerca retrograda o centripeta della branca orbicolare dell'occhio a causa della difficoltà di reperimento del tronco principale per la presenza di una fibrosi post-infiammatoria in tre pazienti e di una neoformazione maligna all'emergenza stilomastoidea negli altri due. La scelta di ricorrere alla ricerca del nervo orbicolare dell'occhio è legata al decorso costante ed alle dimensioni adeguate in periferia di tale ramo facciale, che ne permettono una facile identificazione.*

The most frequent morphology of the facial nerve is reported, in the literature<sup>1-5</sup>, to be dichotomous, with cervicofacial and temporofacial divisions. The superior temporofacial branch runs upwards and medially and is generally larger. Several Authors have attempted to codify subdivision patterns for VII CN<sup>2-4</sup>. These anatomo-surgical evaluations reveal that the tempo-fronto-zigomatic branch is covered by glandular acini and rests on the aponeurosis of the masseter muscle, with its frontozigomatic component running to a thin adipic layer upon its emergency from the cranial pole of the gland. VII CN is identified by means of an anterograde or centrifugal surgical technique aimed at isolating the

main nerve trunk where it emerges from the stylo-mastoid foramen, and three classical reference points are used to identify it: the mastoid tympanic solcus, the "pointer", and the posterior belly of the digastric muscle<sup>14578</sup>.

Retrograde or centripetal identification techniques, are rarely described in the literature, these being adapted, as necessary, by the surgeon, depending on the localisation of the neoplasm, and approach the isolation of the nerve beginning from its peripheral branches<sup>910</sup>.

## Materials and Methods

Aim of the present investigation was to effect a retrospective analysis of our surgical case reports, with particular attention being focused on those cases in which it was necessary to resort to retrograde identification of the facial nerve. The strategy employed in the surgical approach to the facial nerve in cases of difficult identification during a mastoid emergency is thus re-examined, in the light of recent reports in the literature, evaluating the option of peripheral isolation of the orbito-zigomatic branch.

Between 1990 and 2001, 313 parotidectomies were carried out at the ORL Clinic of the University of Piemonte Orientale, in Novara, Italy.

The study population comprised 141 males and 172 females, mean age 48.5 years range 2-89, median 46. In the case of a difficult approach to the nerve, a loupe and/or operative microscope was used; in one patient, electrophysiological monitoring of VII CN was undertaken.

## Results

Epithelial benign parotid neoplasm was the most frequent finding, i.e., 234/313 cases, representing 74% (Table I).

With regard to malignant neoplasms, there were 21 primary epithelial tumours of the parotid (Table II). The other malignant neoplastic conditions included 3 non-Hodgkin's lymphomas, 8 MALTomas and 13 intraparotid lymph node metastases (Table III).

**Table I.** Primary benign epithelial tumours of the parotid.

Histology	Number (%)
Pleomorphic adenoma	118 (50.4%)
Cystoadenolymphoma	80 (34.2%)
Other histology	36 (15.4%)

**Table II.** Primary malignant epithelial tumours of the parotid.

Histology	Number (%)
Mucoepidermoid carcinoma	5 (23.9%)
Adenocystic carcinoma	4 (19%)
Undifferentiated carcinoma	4 (19%)
Ex-pleomorphic carcinoma	3 (14.3%)
Acinic cell adenocarcinoma	3 (14.3%)
Epithelial/Myoepithelial carcinoma	2 (9.5%)

The study also comprised 16 sialadenites, 4 sialithiases, 2 intraparotid cystic hygromas and 1 fistula of the first branchial cleft.

Overall 61 total parotidectomies and 252 partial parotidectomies were performed; the anatomical and functional preservation of VII CN was secured in 94.8% of the cases. In 308/313 cases, 98% of the procedures, the extrapetrous facial nerve was located by means of an anterograde technique.

In 5 patients, a preoperative deficit of VII CN, was present being due to neoplastic infiltration in 4 patients, and to previous facial trauma in one case.

Postoperatively, there were 59/313 (19.9%) cases of partial paralysis, which in 48 of the 59 cases was limited to stupor of the marginalis mandibulae; functional recovery occurred spontaneously in periods varying from 5 days to 6 months after operations performed with the anterograde approach.

In 10/21 patients (47.6%) presenting parotid neoplasms with a preoperatively intact facial nerve, total parotidectomy was performed, with sacrifice of the nerve (partial 8/10, total 2/10) since perineural infiltration would not allow oncologically correct cleavage.

In 5/313 cases, a retrograde or centripetal investigation was undertaken, with a peripheral approach to the orbito-zigomatic branch (Table IV). In patient D.M., a 68-year-old male with a highly malignant mucoepidermoid carcinoma with pre-existing post-traumatic hare's eye, total parotidectomy was carried out, with anatomical preservation of the facial nerve. The outcome was permanent paralysis, House-Brackman grade IV.

**Table III.** Extraparotid tumours of the parotid area.

Histology	Number (%)
Metastases	13 (36.1%)
LNH	3 (8.3%)
MALTomas	8 (22.2%)
Other histology	12 (33.3%)

**Table IV.** Clinical cases in which retrograde exploration of facial nerve was employed.

Patient	Age (yrs.)	Sex	Pathology	Functional recovery
G.M.	2	M	Fistula, 1 <sup>st</sup> branchial cleft	No deficit
D.M.	68	M	Highly malignant mucoepidermoid carcinoma	Paralysis, House-Brackman grade IV
B.P.	49	M	Undiff. salivary duct type carcinoma	Paralysis, cervicofacial branch
D.F.	52	M	Chronic sialoadenitis	No deficit
S.E.	31	F	Mickuliz's disease	Functional recovery in 5 days

In patient B.D., a 49-year-old male with an undifferentiated salivary duct type carcinoma, total parotidectomy was extended to the preauricular skin infiltrated by the neoplasm, together with classical radical neck dissection, as numerous clinically palpable adenopathies were present. In this situation, it was necessary to sacrifice the cervico-facial branch of the seventh cranial nerve, which was engulfed in the neoplastic mass and uncleavable.

In the 3 other cases in which a centripetal approach technique was used, only in one 31-year-old female, S.E., suffering from Mickuliz's disease, was there a temporary deficit of the orbicular of the eye.

Although a centripetal approach was employed in relatively few cases, this peripheral isolation technique enabled us to safeguard nerve function in the presence of benign disease, and to partially preserve facial motor activity in scenarios of malignant disease.

## Discussion

The classic approach to VII CN requires that the following points of reference be identified: the posterior belly of the digastric muscle, to determine the exact depth; the mastoid tympanic solcus ("valley of the facial nerve") and the "pointer" (Shwalbe's triangular process) to establish where the principal nerve trunk emerges from the stylomastoid foramen. This technique, used by most Authors, is generally held to be the safest for anatomical and functional nerve preservation<sup>4 5 7 11</sup>. Numerous reports have appeared in the literature, presenting satisfactory results after partial or total conservative parotidectomy procedures with an anterograde approach, in which the percentage of permanent nerve paralysis is less than 1-2% in cases of benign pathologies<sup>12-15</sup>, while the rate of temporary deficits ranges from 20-55%<sup>16-18</sup>.

In a very few cases, the proximal approach to VII CN is extremely difficult, even with the use of an operative microscope and with intraoperative monitoring of the facial nerve, and it is, therefore, necessary to use the retrograde technique of localisation. The technique of identifying the facial nerve by means of the isolation of its peripheral branches has been cod-

ified for years: in the 80s, even Work and Bailey presented several examples of the retrograde approach from the buccal, mandibular and temporal rami in those cases in which they reach the surface of the parotid gland. These Authors recommend following the deep parotid vein as reference for the mandibular rami, which cross it laterally<sup>10</sup>.

Parotidectomy, with a retrograde technique, is more often performed by maxillofacial and plastic surgeons, who sometimes use it as their option of choice<sup>14 19</sup>. In our opinion, peripheral exploration should not be the approach of choice and that this cannot be decided preoperatively, but only when anterograde isolation is found to be extremely difficult, with the risk of nerve damage; this possibility is not correlated to a specific pathology, as demonstrated in the cases presented here: in fact, in the three non-neoplastic diseases, after the preparation of the skin flap, a subversion of the normal anatomy of the parotid region was found, due to the presence of fibrosis, the result of recurrent parotid and periparotid inflammation preoperatively; and in two malignant tumours, their origin in close proximity to the point of exit of VII CN from the main trunk had displaced the nerve and engulfed it in the tumour mass.



**Fig. 1.** Approach to the orbigo-zigomatic branch of seventh cranial nerve during left partial parotidectomy.



**Fig. 2.** Orbito-zigomatic branch presents an adequate calibre in peripheral area, and crosses zygomatic process at an acute angle.

Although there is general agreement, in the literature, regarding peripheral exploration from the temporal and mandibular branches of the facial nerve, in our opinion isolation of the orbito-zigomatic nerve is easier and safer, as localisation of this branch can always be traced to the anterosuperior emergence of the parotid, with an oblique course towards the lateral cantus of the eye. This nerve branch, of adequate calibre in its peripheral portion, crosses the zygomatic process at an acute angle and, since most parotid pathologies develop in the medio-inferior portion of

the gland, is easier to identify (Figs. 1, 2). This technique, furthermore, presents a lower risk of nerve injury, at least judging from our limited number of cases studied.

Intraoperative monitoring of facial nerve function, using electromyographical techniques, has been routinely employed, for some time, in surgery of the pontocerebellar angle, and several Authors have recently proposed its use in parotid surgery as well as to identify the principal nerve trunk and its peripheral branches in complex cases or during retrograde approaches<sup>15-20-24</sup>. Following parotidectomy employing VII CN monitoring, Terrell et al.<sup>25</sup> achieved a low percentage of early post-operative facial nerve paralysis in the group monitored, albeit there was no significant statistical difference in long-term nerve function; Witt<sup>18</sup>, on the other hand, demonstrated a high rate of facial paralysis in a group monitored during superficial parotidectomy, concluding that electrophysiological monitoring is optional and must not be considered a standard technique in such surgery. The validity of facial nerve monitoring can play an important and advantageous part in the surgical treatment of recurrent parotid neoplasms<sup>18-25</sup>.

In conclusion, in our opinion, the main points of reference in the isolation of the facial nerve remain the "pointer", the mastoid tympanic solcus and the posterior belly of the digastric muscle; when, however, anterograde exploration is difficult, isolation of the nerve via the centripetal approach from the orbito-zigomatic branch may be indicated.

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