Complete Facial Palsy Following Surgery for Acoustic Nerve Neurinoma: Evolution and Associated Ophthalmological Complications

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Objective: To evaluate the fraction of patients recovering to normal function after complete facial nerve paralysis secondary to acoustic neuroma surgery, and also to address the ophthalmologic complications associated with it and the therapeutic options.
Material and method: We performed a retrospective review of 30 cases operated on in our department for acoustic neuroma and who, despite anatomical preservation of the facial nerve, developed a complete postoperative facial nerve paralysis (grade VI of House-Brackmann [HB]). We analyzed the evolution of the facial paralysis in relation to the tumour size, patient age, surgical approach, and localization of the tumour. In addition, we studied the ophthalmologic complications and their treatment.
Results: Only 5 of the 30 cases studied (16.6%) recovered to normal facial nerve function (HB grade I). We observed a tendency for a poor recovery of the cases with tumour size bigger than 2 cm, males, those older than 65 years and lesions resected by the translabyrinthine approach. Only 1 patient presented serious ophthalmologic complications.
Conclusions: Our study reveals that only a small percentage of patients achieve total recovery of facial function. We have to be on the alert to ocular complications in this kind of patient.

Key words: Facial nerve. Neurinoma. Facial paralysis. Vestibular schwannoma. Cerebellopontine angle.

Parálisis facial completa tras cirugía de neurinoma del acústico: evolución y complicaciones oftalmológicas asociadas
Objetivo: Averiguar la fracción de pacientes intervenidos de un neurinoma del acústico que recuperan la función normal del nervio facial tras una parálisis facial completa postoperatoria, atendiendo a las complicaciones oftalmológicas asociadas a la falta de recuperación y sus opciones terapéuticas.
Material y método: Se realiza un estudio retrospectivo de 30 pacientes intervenidos de neurinomas del acústico en nuestro servicio que, con preservación anatómica del nervio facial, presentaron una parálisis facial completa (grado VI de House-Brackmann [HB]) postoperatoria. Se analiza la evolución de la parálisis en función del tamaño tumoral, la edad del paciente, el abordaje quirúrgico y la localización del neurinoma. También se estudian las complicaciones oftalmológicas surgidas y su tratamiento.
Resultados: De los 30 pacientes estudiados, sólo 5 (16,6%) recuperaron la función normal facial (grado I de HB). Se observó una tendencia a una peor recuperación en los casos con tamaño tumoral mayor de 2 cm, de sexo masculino, edad mayor de 65 años y abordados por vía translaberíntica. Sólo un paciente presentó complicaciones oftalmológicas graves.
Conclusiones: Nuestro análisis revela que un escaso porcentaje de pacientes recupera de forma completa su función facial, y que es necesario estar alerta ante posibles complicaciones oculares en este espectro de pacientes.

Palabras clave: Nervio facial. Neurinoma. Parálisis facial. Schwannoma acústico. Ángulo pontocerebeloso.

INTRODUCTION

The level of advances in surgery for acoustic neuroma has led to such an improvement, with a decreased mortality rate, that this is no longer a point to be taken into consideration when deciding on the method of treatment for this condition. The goal which centres engaged in this

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type of surgery now seek is to achieve the preservation of the facial nerve and even the cochlear nerve, along with complete removal of the tumour.[1] Although rates of conservation of the facial nerve have improved significantly, functional preservation is still an issue of concern. Performing a perfect surgical technique, with total resection of the lesion and preservation of anatomical integrity of the facial nerve, does not ensure that the patient leaves the operating room with a normal facial function. Given the impact on the psychological status of our patients and their quality of life,[2,3] we believe that this should be studied so as to be able to inform patients in detail on the prognosis of a possible postoperative facial palsy.

The study of this complication is difficult given the differences that can be found when categorizing the degree of paralysis among different professionals. It is not uncommon that, within the House-Brackmann (HB) classification, "sub-classifications" are created to group degrees together; for example, the tendency to group grades III and IV is very striking, even though the differences between them are quite noticeable.

It is important to note that in cases where facial function is not recovered after a period of extensive monitoring, other types of associated complications may arise from it, especially eye complications, which may become very serious and require the patient to face further surgery to address them.

For these reasons we have conducted this study in which we try to reflect the results obtained in our department on the recovery of facial function after complete post-surgery paralysis in cases where the facial nerve had been anatomically preserved. We also intend to identify possible prognostic factors and subsequent ocular complications.

MATERIAL AND METHOD

We conducted a retrospective study of the acoustic neuromas operated on in our department from November 1994, until September 2006. During that period, 120 cases were treated. Cases of residual or recurrent tumours, with type II neurofibromatosis or with lack of documentation about the status of the facial function on the first postoperative day and the first year of follow-up were excluded from the study. Inclusion criteria were a preoperative facial function of HB Grade I, the anatomical preservation of the nerve at the end of surgery and Grade VI facial palsy on the first postoperative day. In all cases, the facial nerve was monitored intraoperatively. We had 30 patients (25% of patients operated on) with these criteria and they were analyzed for the purposes of this study.

Facial function was clinically graded according to the HB scale on the first postoperative day, the day of discharge (17 days later on average) and after 1 year of follow-up. In the immediate postoperative period, all patients received topical treatment with artificial tears, epithelizing ointment and eyelid occlusion in a moist chamber, regardless of the approach used and the facial status in the immediate postoperative period; this treatment was suspended when normal facial function was identified. Patients with persistence of an unsatisfactory facial function were treated conservatively during the first year and facial rehabilitation was carried out in 25 cases (83.3%). When the follow-up was unsatisfactory, protective treatment and eye care were begun, and an evaluation was requested from the ophthalmology service.

Table 1. Long-Term Results (1 Year) of Facial Function, in Patients With Grade VI Postoperative Palsy[a]

HB Degree	*No. (%)*
I	5 (16.6)
II	0 (0)
III	10 (33.3)
IV	8 (26.6)
V	2 (6.6)
VI	5 (16.6)

[a]HB indicates House-Brackmann.

RESULTS

Of the 30 patients included in the study, 16 (53.3%) were operated on through the retrosigmoidal route and 14 (46.7%), through the translabyrinthine route. The size of the tumours (defined as the largest diameter measured in magnetic resonance imaging, including the endomeatal part) ranged from 0.6 to 4.3 cm (mean, 2.25 cm). Patients were between 33 and 72 years of age (mean, 54.2 years). There were 16 women and 14 men. The location of the neuromas was intracanalicular in 4 cases, mixed in 22, and extracanalicular in 4 cases. There were 3 cases of meningitis which responded to antibiotic treatment prescribed and 5 of cerebrospinal fluid fistula that were resolved with the placement of a lumbar drain.

Facial Function

The facial function of our patients after a year is shown in Table 1. Of the 30 patients, only 5 (16.6%) reached grade I on the House-Brackmann scale after a year of monitoring. Most of the patients managed to recover up to grade III (33.3%) or grade IV (26.6%). By contrast, total paralysis persisted in 16.6% of patients and only 6.6% managed to achieve grade V, despite undergoing rehabilitation for facial function.

Table 2 presents the long-term results of facial function based on tumour size. It should be noted that in cases with tumours of 2 cm or more, 6 of the 14 patients (43%) had grades V or VI of facial function after a year, compared with only 1 case (6.2%) of the 16 with tumours under this size.

Other possible prognostic factors for the evolution of facial function in our patients are shown in Table 3. Among these data it should be noted that the best prognosis is present in patients under 65 because we did not find any patient over 65 years of age who recovered grades I or II of facial function, and 60% of patients with grade VI facial function after 1

year corresponded to this group. With regard to gender, 65% of males in the study had a grade IV facial function or worse after a year, compared with 37.5% of women. Looking at the data in terms of approach, we can see a certain advantage in terms of recovery of facial function in those cases operated on via the retrosigmoidal route with respect to those operated on by the translabyrinthine route.

Ophthalmologic Complications

Only 2 patients had corneal ulcers in the immediate postoperative period; in both cases the injury remitted with topical treatment before discharge. During the follow-up 2 patients had corneal complications that required placing a gold weight in the upper eyelid and one of them needed, in addition, a temporary suspension, a tarsorrhaphy, and 2 corneal transplants.

The rest of the patients required only topical eye lubrication.

DISCUSSION

Preserving the integrity of the facial nerve in surgery of the acoustic neuromas has become one of the major priorities in this type of approach[4-8] since the time of Cushing. One of the main reasons for this is the breakthrough in diagnostic methods, which has led to the diagnosis of this condition in progressively younger patients, in whom the facial palsy may be the main factor hampering the return to their preoperative quality of life.

Since anatomical preservation of the facial nerve has been achieved consistently in approximately 90% of cases in most specialized centres, we have decided to concentrate on patients who had a grade VI facial palsy in the immediate postoperative period, despite anatomical conservation of the nerve.

If we analyze the data from Table 1, we may conclude that if a patient has total facial palsy on the day following the surgery, then, in the long term (1 year after surgery), the result will most likely be a grade 3 (33.3%) or grade IV (26.6%) paralysis. In our experience, these patients only recover to grade I in a small percentage of cases (16.6%). The results we have shown in Tables 2 and 3 indicate that women, patients under 65 and with tumours of less than 2 cm have a better prognosis for recovery of facial function. The average age of women was 57.56 years and of men, 50.42 years, therefore the differences in facial recovery are not due to the age difference between the 2 groups. The average age of patients operated on through the retrosigmoidal route was 52.12 years and of those operated on by translabyrinthine route was 56.64, so the differences between them were not due to significant differences in age either. The average size of the lesions in the women's group was 2.43 cm and 2.03 cm for men; in other words, there was no significant difference between them. The average size in patients under 65 years of age was 2.24 cm and in the group aged 65 and over it was 2.26 cm. Lastly, the average size of injuries approached by the retrosigmoidal route was 2.61 cm and that of tumours operated on through the translabyrinthine route was 1.82 cm, so these findings speak in favour of the retrosigmoidal approach, since it presents better facial results despite being used on larger tumours.

In relation to previous studies (Table 4), we found several that discussed postoperative facial function,[9-16] but only 3 which addressed this issue specifically.[7,17,18] Making this comparison was impossible in some cases, given the differences between the authors in the collection of facial

Table 2. Long-Term Results of Facial Nerve Function by Tumour Size in Patients With Grade VI Postoperative Palsy[a]

HB Degree	*<2 cm, No. (%)*	*≥2 cm, No. (%)*	*Total, No. (%)*
I	3 (18.7)	2 (14.2)	5 (16.6)
II	0	0	0
III	6 (37.5)	4 (28.5)	10 (33.3)
IV	6 (37.5)	2 (14.2)	8 (26.6)
V	0	2 (14.2)	2 (6.6)
VI	1 (6.25)	4 (28.5)	5 (16.6)

[a]HB indicates House-Brackmann.

Tabla 3. Patient Data by Degree of Facial Palsy, After a Year of Monitoring[a]

Degree of Facial T Function	*otal*	*<65 Years, No. (%)*	*≥65 Years, No. (%)*	*Males, No. (%)*	*Females, No. (%)*	*RSR, No. (%)*	*TLR, No. (%)*
I	5	5 (20)	0	3 (21)	2 (12.5)	2 (12.5)	3 (21)
II	0	0	0	0	0	0	0
III	10	9 (36)	1 (20)	2 (14)	8 (50)	7 (44)	3 (21)
IV	8	8 (32)	0	5 (36)	3 (19)	4 (25)	4 (29)
V	2	1 (4)	1 (20)	0	2 (12.5)	0	2 (14)
VI	5	2 (8)	3 (60)	4 (29)	1 (6)	3 (19)	2 (14)
Total	30	25	5	14	16	16	14

[a]RSR indicates retrosigmoid route; TLR, translabyrinthine route.

Table 4. Long-Term Results of Facial Function After Surgery for Acoustic Neuroma[a]

Authors	*Year*	*HB Degree I, Patients, %*	*HB Degree I/II, Patients, %*
Arriaga et al[7]	1993	NA	22.4
Jain et al[18]	2004	1.5	8.3
Kunihiro et al[17]	1999	NA	7.4
Coca et al	2008	16.6	16.6
Silverstein et al[9]	1993	0	22.2
Sterkers et al[10]	1994	NA	12.2
Darrouzet et al[11]	1997	0	0
Satar et al[12]	2002	44.4	100
Irving et al[13]	1998	50	83.3
Lalwani et al[14]	1994	NA	57.8
Fenton et al[15]	2002	30	50
Silverstein et al[16]	1994	0	37.5

[a]HB indicates House-Brackmann; NA, not applicable.

function data. There are studies in which the degrees of the HB scale are grouped together,[7,10,14,17] without indication of the individual grades, others which use the Yanagihara scale of facial function to reflect their results,[17] and even differences in specifying the postoperative observation point for facial function, using moments as diverse as the day after the operation up to 3 months later.[12,14,15] Or the consideration of long-term results as those observed after 3 or 6 months, some after a year and some after 2 years.[1,15]

Once the data from the literature are analyzed, the great disparity in outcomes is striking especially since the data are very similar for other parameters such as total tumour resection, rate of complications or anatomical conservation of the facial nerve. If we compare our results with those of the 3 articles focusing on this issue, we find that, in the 1993 study by Arriaga et al,[7] a recovery of function up to grade I or II is reported in 22.4% patients (in our study, 16.6%); however, 30.3% (in our series, 23.2%) continued to have grade V or VI at the end of the first year of follow-up. Kunihiro et al[17] speak of a "good recovery" of function in 71.9% of patients (deemed to be grade IV function or better), which in our series was of 76.5%, and the proportion of patients who reached a grade I or II in the long term was 7.4%. Finally, Jain et al[18] observed a recovery up to grade I in 1.5% and grades I or II in 8.3%.

With the rest of the articles, the comparison is more difficult, since some include only patients operated on through the translabyrinthine route or with small tumour sizes.

Through this review, we wish to highlight the great differences existing between different studies with regard to data collection, giving rise to the idea that the cause lies in a lack of consensus on most of the basic parameters used.

The ophthalmologic treatment of these patients must be aimed at preventing corneal complications, improving the symptoms and the aesthetic appearance. Measures such as protecting the cornea with lubricants are used rather than with artificial tears due to their inability to keep the eye surface continuously covered.[19] Lubricants have to be applied frequently as it is a very important step for the eye dryness usually accompanying such paralyses due to injury in the intermediary Wrisberg nerve.

We must keep the eyelid closed for as long as possible. This can be done manually by the patient, repeatedly, or with the use of botulinum toxin on the lifter of the upper eyelid that will lead to a ptosis lasting approximately one month.[19] Closure with a plaster placed on the skin or a lateral tarsorrhaphy by direct application of cyanoacrylate (lasting only a few days) are valid alternatives. The use of closed goggles to maintain a moist chamber is an additional recommendation.

When maximum medication is ineffective to prevent damage to the cornea, one of the following surgical procedures may be indicated[20,21]:

– Tarsorrhaphy consists in the union of the outermost thirds of the eyelids. It has the advantage of allowing vision, as well as the exploration of the eye, and can be easily reversed. It is indicated in early stages

– Canthoplasty is carried out at later stages, when the lower eyelid presents a secondary ectropion

– Eyelid weights: involve placing a sheet of gold in the tarsus of the upper eyelid. The technique is simple and leads to varying results. The risk of extrusion and infection stand out as possible complications

If we compare the ophthalmologic treatment of our patients with those previously reported, we see that the treatment algorithm is similar when the evolution is inappropriate. According to Sadiq et al,[22] all patients should use topical corneal lubrication, when this is not enough, they must receive additional aids that may be temporary, such as botulinum toxin, or permanent, such as eyelid surgery, although there may be patients requiring multiple procedures. In our series we used topical corneal treatment and, if insufficient, our first option was to use eyelid weights as a long-term solution, and with this we have managed to avoid eye complications in all patients in the series, except one.

In our experience, to the original question that this article sought to answer, about whether our patients recover their facial function after a complete postoperative paralysis, the answer is no. It is only achieved in a small percentage of cases; the most common situation is that recovery is only up to grades III or IV.

CONCLUSIONS

After a grade VI facial palsy in the immediate postoperative period after surgery for an acoustic neuroma, only a small percentage of patients manage to recover complete facial function.

In our study, we observed a trend in various important factors that may influence non-recovery of facial function,

namely tumour size, age, gender, and the route used in microsurgery.

If recovery is not appropriate, we must address the possible eye complications that may occur, trying to prevent them or treat them properly.

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