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Are the Current Treatment Strategies for Facial Nerve Schwannoma Appropriate Also for Complex Cases?

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Facial nerve schwannoma · Facial nerve neuroma · Management · Surgery

Abstract
Objectives: To describe the decision-making strategies for complex facial nerve schwannomas (FNSs). ***Materials and Methods:*** Charts belonging to 103 consecutive patients with facial nerve tumors managed between 1990 and 2011 were examined retrospectively to identify complex FNSs. To be classified as complex, at least one of the following criteria had to be met: (1) FNS with large intraparotid tumor component and preoperative good facial nerve function (3 cases); (2) multiple-segment FNSs with extension to both the cerebellopontine angle and the middle cranial fossa in patients with preoperative good hearing (5 cases); (3) fast-growing FNS with preoperative good facial nerve function (4 cases), and (4) large FNS compressing the temporal lobe with preoperative normal facial nerve function (1 case). ***Results:*** Thirteen patients were classified as complex; 12 patients had total tumor removal with sural nerve grafting and 1 patient had partial tumor removal. Two patients with intratemporal-intraparotid FNS underwent a transmastoid-transparotid approach. One patient with a tumor extending from the geniculate ganglion to the parotid portion of the facial nerve underwent a combined middle fossa transmastoid-transparotid approach. A transcochlear approach with temporal craniotomy was performed in all the patients with multiple-segment FNS as well as in patients with fast-growing tumors extending both in the cerebellopontine angle and middle cranial fossa. A partial tumor removal through the middle fossa approach was performed in 1 patient with a large tumor compressing the temporal lobe. ***Conclusions:*** Therapeutic options for patients with FNS include surgical intervention, observation and radiotherapy. Nowadays, surgical resection with facial nerve repair is usually the standard management for patients with poor facial function (House-Brackmann grade III or worse). In patients presenting with normal or near-normal facial nerve function, initial observation with periodic examination and imaging is usually recommended. However, on rare occasions surgeons can be faced with a situation in which the management decision-making process is particularly challenging. In these complex cases treatment should be individualized. We recommend early surgical intervention regardless of the preoperative facial and hearing functions in the following cases: intratemporal FNSs extending with a large tumor component into the parotid, multiple-segment FNSs extending in both the cerebellopontine angle and the middle cranial fossa, fast-growing FNSs, and large FNSs with temporal lobe compression.

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Introduction

Facial nerve schwannomas (FNSs) are rare benign tumors which derive from the myelin-producing Schwann cell sheath [Shirazi et al., 2007]. The prevalence of FNS has been estimated to approximate 0.15–0.8% [Saito and Baxter, 1972; Pulec, 1994]. These tumors can arise along any segment of the facial nerve from the cerebellopontine angle to the peripheral branches in the face and usually involve multiple nerve segments [Lipkin et al., 1987; Falcioni et al., 2003a]. The most common locations have been reported to be the geniculate ganglion (68%), the labyrinthine (52%), and the tympanic (43%) segments. Less common locations, in decreasing order of frequency, are as follows: internal auditory canal (34%), mastoid (29%), cerebellopontine angle (22%), and extratemporal (6.8%) [Kertesz et al., 2001]. Facial weakness represents the most frequent symptom, followed by hearing loss. Owing to the rarity of these tumors and the benign and slow-growing nature there is still no universally accepted management. Therapeutic options for the management of FNS include surgical intervention, observation and radiotherapy. Surgical resection with facial nerve repair is usually the standard management for patients with facial nerve function of House-Brackmann (HB) grade III or worse. In patients presenting with good facial nerve function (HB grade I or II), initial observation with periodic examination and imaging is advocated by the majority of authors [Angeli and Brackmann, 1997; Liu and Fagan, 2001; Kim et al., 2003; McRackan et al., 2011]. The rationale of this attitude is based on the belief that patients can retain normal or near-normal facial function for long periods. In fact, surgical tumor removal requires facial nerve repair in the majority of cases and, until now, no reconstruction method has been able to guarantee facial function recovery better than HB grade III [Falcioni et al., 2003a; McMonagle et al., 2008; Wilkinson et al., 2011]. To maximize facial nerve function as long as possible in asymptomatic patients various facial nerve preservation approaches have been proposed [McMonagle et al., 2008; Wilkinson et al., 2011]. These procedures comprise subtotal tumor removal, facial nerve decompression, and fascicle preservation surgery. Recently, radiotherapy has been advocated as a primary therapeutic option in patients with FNS [Kida et al., 2007; Litre et al., 2007; McClelland et al., 2007; Hillman et al, 2008; Madhok et al., 2009]. During the last decade various management algorithms have been developed in order to standardize treatment of FNS [Marzo et al., 2009; Bäck et al., 2010; Wilkinson et al. 2011; Gross et al., 2012]. However, on rare occasions surgeons can be faced with complex cases of FNS in which the management decision-making process is particularly challenging and current management guidelines cannot be applied.

The aim of this study is to report our experience in the management of 13 patients with complex FNS, highlighting the decision-making strategies. The study was conducted at the Gruppo Otologico, Piacenza, Italy.

Materials and Methods

The charts from those patients affected by facial nerve tumors managed at the Gruppo Otologico between 1990 and 2011 were examined retrospectively. There were 103 facial nerve tumors, 78 of which were FNSs. From 1990 and through the following 5 years, all patients with FNS (n = 11) were operated on regardless of facial nerve function. Since 1995, patients with FNS and normal facial function have usually been assigned to observation by annual magnetic resonance imaging (MRI). Out of a total of 78 cases of FNS, 64 (82%) underwent surgery and 14 (18%) were conservatively managed through a 'wait and scan' policy. Of the 64 surgically treated FNSs, 13 were considered to be complex cases either in the decision-making process or surgical approach selection and constitute the object of this study. To be classified as complex the following criteria had to be met: (1) FNS with a large intraparotid tumor component and preoperative good facial nerve function; (2) multiple-segment FNSs involving both the cerebellopontine angle and the middle cranial fossa with preoperative good hearing; (3) fast growing FNS with preoperative good facial function, and (4) large FNS involving the middle cranial fossa with preoperative normal facial function.

All patient charts were retrospectively analyzed for age, sex, presenting symptoms, preoperative and long-term facial function, hearing level, tumor location, surgical strategy, tumor recurrence and outcomes. Facial nerve function was assessed pre- and postoperatively using the HB grading system [House and Brackmann, 1985]. All patients underwent pure-tone audiometry and imaging studies including either gadolinium-enhanced MRI or high-resolution computed tomography with bone windows. Pure-tone average was calculated as the mean of 500, 1000, 2000 and 3000 thresholds. The location and the extent of the lesions were determined preoperatively using the radiology reports, which were subsequently confirmed intraoperatively.

All the patients in our series were informed of the risks and benefits of surgical excision, radiotherapy, or observation with serial imaging.

Results

General Characteristics and Clinical Manifestations

The group included 10 female and 3 male patients. Mean age at surgery was 40 ± 15.7 years, with a range from 18 to 64 years. Nine tumors (69.2%) were on the left side, and 4 (30.8%) were on the right. The follow-up (con-

Table 1. Summary of patients

Group	Case	Age/ Sex	Side	Symptoms and signs	Preoperative HB grade	Location	Approach	Final HB grade	Preoperative PTA BC/AC	Postoperative PTA BC/AC	Follow-up (months)
Large intraparotid component	1	25/M	R	parotid mass	I	MS, ET	TM + TP	III	10/10	10/10	14
	2	36/M	L	otalgia, hemifacial spasm	II	GG, TS, MS, ET	TM + MCF + TP	IV	10/10	10/10	34
	3	47/F	R	parotid mass	I	MS, ET	TM + TP	III	10/10	10/10	28
Multiple-segment involvement	4	21/M	L	progressive FN weakness, tinnitus, RM	III	IAC, L, GG, TS, MS	TC + temporal craniotomy	III	10/10	DE	24
	5	42/F	L	progressive FN weakness, tinnitus, vertigo	V	CPA, IAC, L, GG, MCF	TC + temporal craniotomy	III	10/10	DE	26
	6	21/F	L	HL	VI	IAC, L, GG, TS MCF	TC + temporal craniotomy	IV	15/35	DE	51
	7	18/F	L	progressive FN weakness, vertigo	VI	IAC, L, GG, TS, MS, ET, MCF, PA	TC + temporal craniotomy	III	10/10	DE	25
	8	43/F	L	progressive FN weakness, HL, tinnitus	VI	IAC, L, GG, TS, MS, MCF	TC + temporal craniotomy	VI	15/30	DE	24
Fast-growing FNS	9	56/F	L	progressive FN weakness, hemifacial spasm, HL, vertigo	II	CPA, IAC, L, GG, TS, MS, MCF	TC + temporal craniotomy	III	DE	DE	35
	10	51/F	L	sudden FN palsy, HL, tinnitus	II	CPA, IAC, L, GG, MCF	TC + temporal craniotomy	III	20/40	DE	63
	11	64/F	L	hemifacial spasm, HL, vertigo	II	IAC, L, GG, TS, MCF, PA	TC + temporal craniotomy	III	20/65	DE	12
	12	35/F	R	sudden FN palsy	II	IAC, GG, MCF	TC + temporal craniotomy	IV	10/10	DE	12
Huge middle fossa component	13	62/F	R	HL, RM	I	GG, MCF	MCF approach	II	20/45	20/45	13

sisting of clinical evaluation, hearing tests and serial MRI scans) of the series ranged from 12 to 63 months (mean 27.7 ± 15.3 months). Relevant information on the subjects is provided in table 1.

The most common symptoms at the time of presentation included facial nerve weakness (53.8%), hearing loss (46.1%), tinnitus (30.7%), vertigo (30.7% of cases) and hemifacial spasm (23%). Preoperatively, 3 cases had normal facial function, 7 had partial deficit, and 3 had complete palsy. Among the 10 cases affected by preoperative paresis or palsy, the mean duration of the deficit was 31.4 ± 39.7 months, ranging between 1 and 120 months. Facial nerve deficit lasted for more than 1 year in 6 of these cases. Seven patients had preoperative normal hearing and 6 patients were affected by hearing loss caused by tumor (5 demonstrated a conductive type and 1 case showed a preoperative dead ear). On otoscopic examination, 2 patients (15.4%) were found to have a retrotympanic mass; 2 patients (15.4%) presented with a palpable parotid mass.

Treatment

FNSs with a Large Intraparotid Tumor Component and Preoperative Good Facial Nerve Function

Three patients had intratemporal-intraparotid FNS with a large tumor component into the parotid (cases 1, 2 and 3). The intraparotid tumor component was considered 'large' when it was ≥1.5 cm in its largest diameter. The tumor involved the extratemporal main trunk of the facial nerve reaching the proximity of the bifurcation. Preoperatively, 2 patients had normal facial function and 1 had HB grade II. A combined transmastoid-transparotid approach was used in 2 cases. These were the cases in which the patients had tumors confined to the mastoid and parotid segment of the facial nerve (fig. 1a, b). A middle fossa transmastoid-transparotid approach was used in 1 case with a tumor extending from the geniculate ganglion to the parotid portion of the facial nerve. Cable grafting using the sural nerve was accomplished in all 3 cases. All patients maintained their preoperative hearing

(Footnote for Table 1.)

M = Male; F = female; R = right; L = left; PTA = pure-tone average; BC = bone conduction; AC = air conduction; FN = facial nerve; RM = retrotympanic mass; HL = hearing loss; CPA = cerebellopontine angle; IAC = internal auditory canal; L = labyrinthine segment; GG = geniculate ganglion; TS = tympanic segment; MS = mastoid segment; ET = extratemporal segment; MCF = middle cranial fossa; PA = petrous apex; TM = transmastoid approach; TP = transparotid approach; TC = transcochlear approach; DE = dead ear.

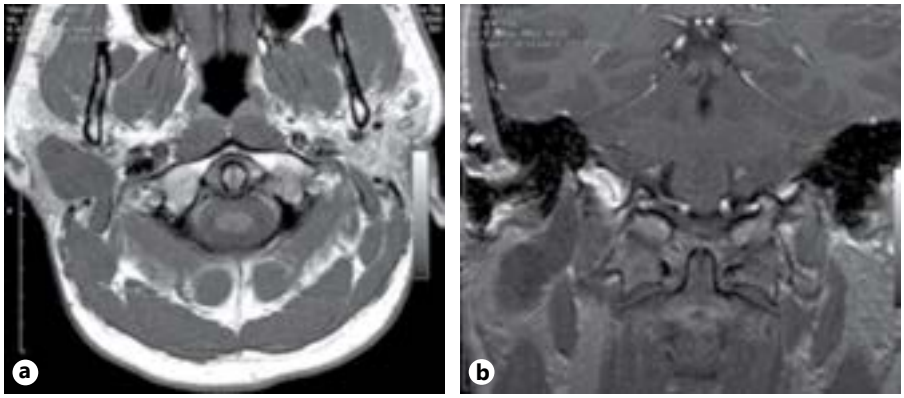

Fig. 1. a, **b** MRI: axial and coronal views (case 1) showing a right-sided tumor involving the mastoid portion of the facial nerve and extending through the stylomastoid foramen into the parotid.

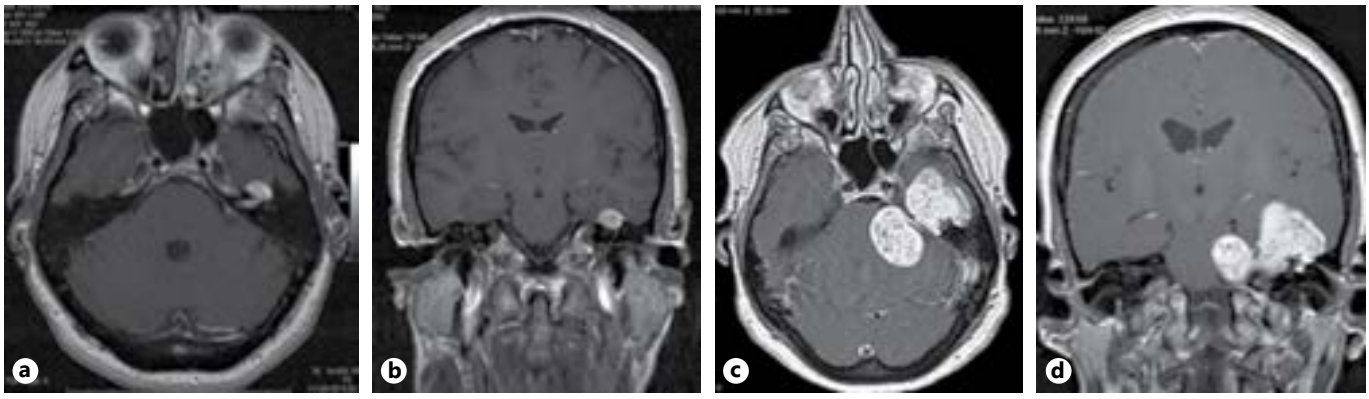

Fig. 2. a, **b** MRI: axial and coronal views (case 7) demonstrating a small tumor in the region of the left geniculate ganglion (2003). **c**, **d** Axial and coronal views of the same patient 3 years after first presentation showing a huge dumbbell-shaped tumor extending into both the posterior and middle cranial fossa.

level. At long-term follow-up, 2 patients achieved satisfactory facial function (HB grade III). The remaining patient who had preoperative facial paresis (HB grade II) reached HB grade IV.

Multiple-Segment FNSs Involving Both the Cerebellopontine Angle and the Middle Cranial Fossa with Preoperative Good Hearing

Five patients were found to have tumor involvement of multiple segments of the facial nerve (cases 4, 5, 6, 7 and 8). All 5 patients had tumors involving both the cerebellopontine angle and the middle cranial fossa. To be included in this group, the size of at least 1 tumor component had to measure ≥2 cm in its greatest dimension. All the patients in this group had good preoperative hearing. Preoperatively, 3 patients had HB grade VI facial nerve function, 1 had HB grade V, and 1 had HB grade III. A transcochlear approach with a temporal craniotomy was used in all cases. All patients had nerve reconstruction with a sural nerve graft. At final follow-up, 3 patients had grade III, and 1 had grade IV. The patient who had preoperative long-standing HB grade VI (lasting for 6 years) did not recover facial nerve function.

Fast-Growing FNSs with Preoperative Good Facial Function

Four patients (cases 9, 10, 11 and 12) who were initially managed conservatively with repeated MRI at twelve-monthly intervals had radiologically documented fast-growing dumbbell-shaped tumors involving both the middle cranial fossa and the cerebellopontine angle (fig. 2a–d). All patients had preoperative HB grade II facial nerve function. Two patients had conductive hearing loss, 1 patient had a dead ear and 1 had normal hearing. All patients underwent a transcochlear approach with

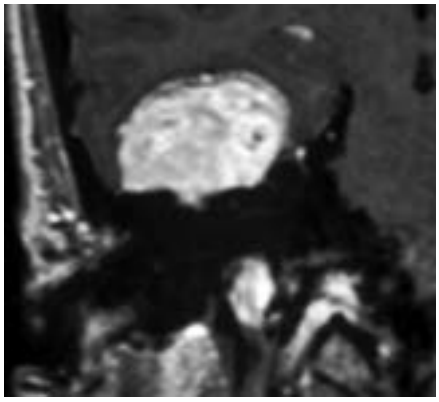

Fig. 3. Coronal MRI showing a large right-sided FNS (case 13) compressing the temporal lobe.

temporal bone craniotomy. Cable grafting using the sural nerve was accomplished in all cases. At 1-year follow-up, 3 patients reached grade III and 1 had grade IV.

Large FNS Involving the Middle Cranial Fossa with Preoperative Normal Facial Function

One patient presented with a large tumor compressing the temporal lobe (fig. 3). A partial removal by the middle cranial fossa approach was performed in an attempt to preserve preoperative normal facial function. This patient experienced HB grade VI facial nerve function immediately after surgery that improved to HB grade III by 13 months. The patient maintained her hearing at the preoperative level.

Complications and Tumor Recurrence

One patient operated on by a combined middle fossa transmastoid-transparotid approach experienced a resorption of the bony posterior canal wall requiring revision surgery. No other complications were encountered in this series. Serial follow-up MRI demonstrated that the 12 patients with total removal had no evidence of tumor recurrence after an average of 29 months.

Discussion

Until 1995, surgical removal with nerve grafting was considered the treatment of choice for FNS regardless of facial nerve function [Wilkinson et al., 2011]. Nowadays, gross tumor resection with facial nerve grafting is usually reserved to patients with poor facial nerve function, or when serious intratemporal or intracranial complications become imminent [Marzo et al., 2009; Wilkinson et al., 2011]. In fact, the almost inevitable sacrifice of the facial nerve during surgery requires nerve reconstruction with subsequent postoperative paralysis which is followed by some degree of recovery that will never be better than HB grade III. Since FNSs are generally slow-growing tumors and facial function is often normal and remains stable for long periods, observation with repeated imaging is reasonable as initial management until facial function deteriorates to HB grade III [McMonagle et al., 2008; Marzo et al., 2009]. On the other hand, late surgery performed when facial function is lost (HB grade V–VI) could diminish the chance of successful function recovery [Saleh et al., 1995; Angeli and Brackmann, 1997; Lee et al., 2007; McMonagle et al., 2008]. Based on the fact that the preoperative presence and duration of the facial deficit represent the main prognostic factors that adversely affect the successful postoperative recovery, it is clear that early diagnosis and proper timing of surgery are fundamental to increase the chances of a good recovery and are important in patient counseling. In previous publications [Falcioni et al., 2003b; Ozmen et al., 2011], the duration of the preoperative deficit as an indicator of the final prognosis was closely analyzed. To achieve a high rate of good postoperative recovery, the cutoff point should be considered to be 6–12 months after the occurrence of the preoperative clinical deficit. This result seemed to be independent of the entity of the dysfunction itself. This can be explained by the combination of pathophysiological processes after the onset of dysfunction: (1) the body of the neurons in the pons progressively loses the ability to regenerate; (2) the motor endplates progressively retract and may be obliterated if reinnervation does not occur within a reasonable period; (3) denervated muscle fibers degenerate and become fibrotic, and (4) degeneration and regeneration of the peripheral nerve fibers can result in fibrosis of the nerve [Bacciu et al., 2009].

A number of facial nerve preservation surgical procedures that include partial removal, decompression, and fascicle preservation surgery have been developed to treat FNSs in the presence of good facial function [Wilkinson et al., 2011].

Partial tumor removal [Nadeau and Sataloff, 2003; Perez et al., 2005; Mowry et al., 2012] has the advantage of anatomic preservation of the nerve, but has the risk of postoperative facial palsy. The main drawback of partial removal is the difficulty of establishing where the removal should be stopped to preserve facial function.

Facial nerve decompression was first prosed by Angeli and Brackmann in 1997 in order to reduce interfascicular pressure produced by a growing tumor and to sta-

bilize facial function. Both the decompression and partial tumor removal procedures leave the tumor on the facial nerve with the need for serial postoperative MRI to assess for tumor regrowth.

Surgical resection with nerve preservation, also termed 'fascicle preservation surgery', aims to preserve the main trunk of the facial nerve and was first reported by Pulec in 1972 for the treatment of small intratemporal FNSs. McMenomey et al. [1994] and Sataloff et al. [1995] used this technique for selected cases of FNSs involving the cerebellopontine angle. Since then, other authors have performed fascicle preservation surgery for resection of selected FNSs in patients with good preoperative facial nerve function [Nadeau et al., 2003; Perez et al., 2005; Lee et al., 2007; Lee and Kim, 2011]. This technique is based on the finding that at the beginning of their growth FNSs grow eccentrically from the nerve involving only a small portion of nerve fibers. In larger tumors, the nerve fibers are often found within the tumor mass. Unfortunately, the possibility of finding a plane between the tumor and the facial nerve cannot be determined until the time of surgery [Nadeau et al., 2003]. We were unable to separate the tumor from the perineurium of the facial nerve in any of our patients.

Recently, radiotherapy has been advocated as a less invasive alternative primary treatment in patients with FNSs [Mabanta et al., 1999; Kida et al., 2007; Litre et al., 2007; McClelland et al., 2007; Hillman et al., 2008; Madhok et al., 2009; Nishioka et al., 2009, Wilkinson et al., 2011]. The efficiency of radiotherapy in long-term tumor control is still unknown, and further studies with longer follow-up are necessary [Marzo et al., 2009]. The advantages of radiotherapy include avoidance of surgery and possible arrest of tumor growth. The disadvantages include persistence of the tumor, risk of failure to control the growth, and malignant degeneration [Wilkinson et al., 2011]. To date, there are 47 reported cases of FNSs that received radiotherapy as primary treatment. The tumor size remained stable with no sign of growth in 44.5% of the patients, decreased in 42.5%, and increased in 6.4%. Malignant transformation of intracranial schwannoma following stereotactic radiotherapy is an emerging topic in the worldwide literature [Norén, 1998; Hanabusa et al., 2001; Shin et al., 2002; Demetriades et al., 2010]. In 2011, a review of the literature by Husseini et al. documented 26 cases of malignant transformation of irradiated vestibular schwannomas. In 2007, Shirazi et al. reported the first case of malignant transformation of an FNS 10 years after stereotactic radiation. This corresponds to the 2.1% of all irradiated FNSs. Therefore, although radiotherapy is considered as an attractive conservative treatment modality in FNS, the above-mentioned suspicions should be considered in the counseling and decision-making process for the treatment of such patients. Patients who receive radiotherapy for the treatment of FNS should be aware of the rare, yet possible, risk of radiation-induced malignancy. Long-term follow-up is mandatory after stereotactic radiation, because most of the malignant transformation appears at least 5 years after the initial radiotherapy. We do not consider radiotherapy an adequate primary treatment of these tumors. However, radiotherapy may constitute a good alternative to surgery in selected patients in whom there are serious contraindications to surgery (i.e. critical general medical conditions, elderly patients) as well as in patients who refuse surgery.

We believe that the recently proposed algorithms [McMonagle et al., 2008; Bäck et al., 2010; Wilkinson et al., 2011; Gross et al., 2012] for the management of FNSs are useful in the majority of cases. However, there are some cases that we called 'complex FNSs' in which both the management decision making and the choice of surgical approach are particularly challenging.

Over a 20-year period we dealt with 13 complex FNSs that were grouped into the following categories: (1) intratemporal FNSs extending with a large tumor component into the parotid in patients with preoperative good facial nerve function; (2) multiple-segment FNSs extending both in the cerebellopontine angle and middle cranial fossa with preoperative good hearing; (3) fast-growing FNSs, and (4) large FNS with temporal lobe compression.

There were 3 patients in our study with good preoperative facial nerve function and intratemporal FNS extending into the parotid; 2 tumors limited to the mastoid and extratemporal segments of the facial nerve were managed with a transmastoid-transparotid approach; 1 tumor extending from the geniculate ganglion to the extratemporal portion of the facial nerve was managed with a combined middle cranial fossa transmastoid-transparotid approach. In all 3 cases, the tumor involved the extratemporal segment of the facial nerve almost reaching the bifurcation. The tumor was resected and the facial nerve was repaired using a sural nerve graft. Recently, Gross et al. [2012] proposed a management algorithm to treat isolated parotid FNS and parotid gland FNS with intratemporal extension. For those patients with intratemporal-intraparotid FNS and preoperative poor facial nerve function (HB grade IV–VI), en-

block tumor removal with interposition nerve graft is suggested. For patients with preoperative good facial nerve function (HB grade I–III) a wide decompression mastoidectomy without tumor resection and subsequent 'watchful and waiting' with serial imaging is proposed [Gross et al., 2012]. A conservative management has been suggested also by others [Elahi et al., 1995; Caughey et al., 2004; Kreeft et al., 2007; Metha and Deschler, 2008; Li et al., 2012]. We usually prefer early surgical intervention even in patients presenting with good preoperative facial nerve function as the lesions are likely to grow, with possible nerve bifurcation and peripheral branch tumor involvement. The benefit of early surgery for intraparotid-intratemporal FNS in cases of good facial nerve function was supported by Fyrmpas et al. [2008], as nerve grafting can be technically more demanding and has a less favorable outcome when surgery is delayed. If surgery is delayed and performed when facial nerve bifurcation is involved by the tumor, facial nerve reconstruction requires splitting of the sural nerve and 3 anastomoses (1 to the main trunk and 1 for each of the peripheral branches). Cross-facial nerve grafting is another option. These techniques reduce the chance of restoring satisfactory function (HB grade III) and increase the likelihood of severe facial synkinesis. Unfortunately, current imaging cannot predict if the tumor is limited to the main nerve trunk or has already reached the bifurcation.

The second group of complex FNSs included 5 patients with tumors involving several segments of the facial nerve. These tumors were dumbbell-shaped having both cerebellopontine angle and middle cranial fossa extension with a component in the geniculate ganglion. Preoperatively, all 5 patients had poor facial nerve function but good hearing. We did not attempt hearing preservation surgery in any of the 5 cases despite the presence of good hearing. A transcochlear approach combined with a temporal craniotomy was performed in all 5 patients. The transcochlear approach provides adequate exposure of all the segments of the facial nerve allowing total tumor removal. Another advantage offered by the transcochlear approach is the possibility to easily reconstruct the facial nerve in the cerebellopontine angle. The middle cranial fossa approach is unsuitable for such huge dumbbell-shaped tumors with significant cerebellopontine angle extension because it does not allow reconstruction of the facial nerve in the cerebellopontine angle, and the retrosigmoid approach does not offer the possibility to control the labyrinthine segment of the tumor.

The third group of our study included 4 cases of fast-growing tumors. Although the vast majority of FNSs are slow growing [O'Reilly et al., 2004; Perez et al., 2005], a small proportion of tumors show rapid growth. All 4 patients presented with dumbbell tumors involving both the cerebellopontine angle and the middle cranial fossa and were resected through a transcochlear approach associated to a temporal craniotomy. In these cases we strongly recommend surgical removal even in the presence of normal facial nerve function to avoid temporal lobe and/or brainstem compression-related problems. It should be noticed, however, that some authors [Wilkinson et al., 2011] propose the use of stereotactic radiation even in this group of fast-enlarging tumors if facial nerve function is HB grade ≤III. This attitude is based on the belief that controlling tumor growth with radiation may prevent complications from further tumor growth.

Finally, 1 patient of our series presented with a large tumor causing temporal lobe compression. Taking into account the normal preoperative facial nerve function and the advanced age of the patient we decided to opt for a subtotal resection through a middle cranial fossa approach. Unfortunately, the patient experienced immediate postoperative facial palsy with a further recovery to HB grade III.

Conclusion

Management of FNS still remains a delicate and critical process. Nowadays, surgical resection is usually reserved for patients with facial function of House-Brackmann grade III or worse. In patients presenting with good facial nerve function (HB grade I or II), initial observation with periodic examination and imaging is usually recommended. However, on rare occasions surgeons can be faced with particular and complex cases in which the management decision-making process is particularly challenging and treatment should be individualized. We recommend early surgical intervention regardless of the preoperative facial and hearing functions in the following cases: intratemporal FNSs extending with a large tumor component into the parotid, multiple-segment FNSs extending both in the cerebellopontine angle and middle cranial fossa, and fast-growing FNSs and large FNS with temporal lobe compression.

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