Iatrogenic facial nerve palsy: lessons to learn

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ABSTRACT

Introduction: This study aims to review the management and discuss the outcome of patients with iatrogenic facial nerve palsy.

Methods: 11 patients with iatrogenic facial nerve palsy (FNP) were evaluated retrospectively in a tertiary centre between June 1995 and September 2008. All the cases were referred from other centres.

Results: Ten patients had iatrogenic immediate FNP secondary to mastoidectomy and one had FNP secondary to superficial parotidectomy. Of the ten cases, three had concomitant profound sensorineural hearing loss and one had concomitant labyrinthine fistula. Ten patients underwent facial nerve exploration and one patient was managed conservatively. The second genu was the commonest site of injury (60 percent). Facial nerve recoveries were achieved to Grade I House Brackmann classification in five cases, Grade II in two cases and Grade III in two cases postoperatively. One case defaulted follow-up. One patient, managed conservatively, recovered to FNP Grade II after five months post-injury.

Conclusion: Mistakes that most likely occurred during mastoid surgery are drilling towards the antrum, causing injury to the facial nerve at the second genu. Early facial nerve exploration and neurolysis resulted in good facial nerve recovery.

Keywords: exploration surgery, facial nerve palsy, mastoidectomy, parotidectomy, sensorineural hearing loss

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INTRODUCTION

Facial nerve paralysis represents the most outward and noticeable cranial neuropathy. It causes an obvious facial deformity and has an emotional impact that leads to social isolation and reduced self-esteem. Iatrogenic facial nerve injury is one of the ear, nose and throat surgeon's greatest fears during ear surgery. Despite technological advances, such as the introduction of the operating microscope and motorised surgical drill, and the availability of preoperating imaging, the overall risk of iatrogenic facial nerve palsy (FNP) remains considerably high. The incidence of iatrogenic FNP associated with otology surgery has been estimated to be 0.6%–3.7%.[1] In revision mastoid surgery, the frequency may be as high as 4%–10%.[2] Following ear surgery, FNP may present immediately postoperation or develop with delayed onset. There may be complete paralysis or partial loss of function. Facial nerve exploration surgery is often necessary to restore facial nerve functions. The indications and the timing of exploration surgery are sometimes controversial. In general, facial nerve exploration by means of decompression with or without restoration of the continuity of the nerve is performed when there is immediate complete facial nerve injury after mastoidectomy or parotid surgery. However, when the palsy is incomplete, a wait-and-see policy is generally indicated.[3] Close evaluation with neurophysiological examinations is helpful in deciding the timing for surgery for those who experience incomplete and delayed onset FNP.

It is recommended to proceed to exploration surgery within three weeks when clinical and neurophysiological observations predict an unfavorable prognosis.[3] Several criteria should be considered for re-exploration cases of postoperative FNP after ear surgery. John House and his group re-explored cases where there was complete postoperative paralysis or when electroneuronography findings showed a degradation response of more than 90% within the first six days.[4] The aims of this study were to review the management and discuss the outcome of patients with iatrogenic FNP in our institution.

METHODS

The medical records of 11 patients with iatrogenic FNP seen at Universiti Kebangsaan Medical Centre, Malaysia, between June 1995 and September 2008, were reviewed. All the cases were referred from other centres. Ten patients underwent facial nerve exploration and one patient had conservative management. The preoperative hearing loss, intraoperative findings, such as the site of injury

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Table I. Summary of type of primary operations, site of injuries, facial nerve function at the time of presentation and facial nerve recoveries.

Patient no.	Primary surgery performed	Site of injury; grading of facial nerve using HB grading at presentation	Recovery of facial nerve after 3–6 months follow-up using HB grading of facial nerve paralysis
1	MRM	HB VI; tympanic segment	Unknown – patient lost to follow-up
2	MRM	HB V; 2nd genu and mastoid	HB I
3	MRM	HB V; dehiscent of FN tympanic segment	HB I
4	CM	HB IV; 2nd genu, LSC fistula noted	HB III
5	CM	HB V; 2nd and mastoid segment	HB II
6	CM	HB V; 2nd genu	HB I
7	CM	HB V; 2nd genu	HB I
8	CM	HB VI; mastoid segment	HB II
9	CM	HB V; 2nd genu	HB III
10	MRM	HB III; conservative management EnoG 35.3% axonal degeneration	HB II
11	Superficial parotidectomy	HB V; extra temporal (at bifurcation of the nerve trunk)	HB I

HB: House Brackmann; MRM: modified radical mastoidectomy; CM: cortical mastoidectomy; FN: facial nerve; LSC: lateral semicircular canal; EnoG: electroneuronography

and presence of labyrinthine fistula, and postoperative facial nerve recovery, were evaluated. Our institutional research board had approved this study.

RESULTS

Ten patients had iatrogenic complete FNP secondary to mastoidectomy and one patient had FNP secondary to superficial parotidectomy (Table I). All had > 90% degeneration based on preoperative electroneuronography (EnoG). One patient who was managed conservatively, had immediate FNP following left modified radical mastoidectomy for cholesteatoma. He was initially given steroids for three days postoperatively, with no improvement of facial nerve function. He was referred to us with left lower motor neuron FNP Grade III House Brackmann (HB). The EnoG study showed a 35.2% degeneration of the left facial nerve (right ear amplitude 1.7 mV vs. left ear amplitude 1.1 mV). This result indicated a good prognosis for recovery, and facial nerve exploration was deferred. On follow-up two weeks later, a repeat EnoG showed an improvement, with only 5% axonal degeneration. On follow-up five months later, his FNP had improved to Grade II HB.

Of the ten cases that underwent exploration, three had concomitant profound sensorineural hearing loss (SNHL) and one had concomitant labyrinthine fistula. Another patient had intraparotid facial nerve trunk injury following parotidectomy. Out of the ten cases, the three earliest cases were explored without facial nerve monitoring, as it was not available in our centre at that time.

In the first three cases, the primary surgery was modified mastoidectomy and tympanoplasty for chronic otitis media with cholesteatoma. In the other six cases, cortical mastoidectomies were performed for chronic otitis media secondary to mastoiditis. During revision surgery, we converted all six cases of cortical mastoidectomy to canal wall down mastoidectomy after facial nerve decompression.

During the facial nerve exploration, intraoperative findings revealed that out of the nine cases, six cases had incomplete mastoidectomy in which a complete exenteration of mastoid air cells needed to be performed again. In the other three cases, there was a presence of granulation tissue in the middle ear and the mastoid antrum; and in one of these three cases, there was residual cholesteatoma over the mastoid tip and hypotympanum. The second genu was the commonest site of injury (60%). The second genu of the facial nerves were severely injured, swollen and surrounded by bone dust. In all these cases, it was noted that drilling for the antrum was performed too inferiorly and posteriorly in relation to the actual position of the antrum. This led to drilling into the second genu unintentionally. Another two cases had injury to the tympanic segment, which was swollen and inflammed. Another patient had partial transection of the facial nerve at the mastoid segment.

One of the cases of tympanic segment injury was due to facial nerve dehiscence in which the FNP was secondary to thermal injury. In this case, the surgeon used unipolar diathermy to control the bleeding. The case of iatrogenic facial nerve injury secondary to superficial parotidectomy for pleomorphic adenoma required cable graft reconstruction using sural nerve. Facial nerve recovery was achieved to Grade I HB classification in five (55.6%) cases, Grade II in two (22.2%) cases and Grade

III in two (22.2%) cases. One case defaulted follow-up (Table I).

DISCUSSION

In this review, the commonest site of iatrogenic FNP during mastoid surgery was at the second genu. In one case, there was concomitant injury to the lateral semicircular canal. In all these cases, the injury was due to drilling of the nerve at the second genu. It is postulated that the surgeon had mistakenly drilled more inferiorly and posteriorly to the actual site of the antrum. The antrum could also have been obscured by granulations or by fibrous bands in this area. Therefore, we advocate that for identification of the antrum, the surgeon needs to start drilling strictly over the MacEwan's triangle and then enlarge the mastoid bowl. If the surgeon still fails to identify the antrum, we suggest that the drilling be directed more anterosuperiorly towards the attic. Adequate bony exposure of the superior part of external canal is helpful to expose the attic region. We also advocate an adequate bony exposure of the posterior canal which serves as a good guide to the direction and depth of the antrum and attic.

Once the attic and its contents have been identified, further drilling is done posteroinferiorly to identify the aditus, short process of incus, lateral semicircular canal and second genu area of the facial nerve. Failure to accurately identify the antrum and subsequent further drilling inferiorly and medially, may also risk drilling into the lateral semicircular canal, causing labyrinthine fistula, as was found in Case 3. The tympanic and mastoid segments are also easily injured. In the tympanic segment, vulnerability of the facial nerve is associated with a high percentage of dehiscence of the fallopian canal.[5,6] In the tympanic segment, the nerve which lies over the stapes footplate may, to varying degrees, bifurcate around or even run below the level of the oval window.

Selesnick and Lynn-Macrae reported the incidence of facial nerve dehiscence during the primary procedure to be 88% in the tympanic segment, none in the 2nd genu and 12% at the vertical segment.[6] A recent study by Wang et al showed that the incidence of facial nerve dehiscence was 29.7% (46/155 ears) in cases of mastoidectomy for cholesteatoma.[7] In our series, the incidence of facial dehiscence was 10% (1/10 patients). Whether or not there is facial nerve dehiscence, the surgeon should never use the diathermy to stop any bleeding in the middle ear. Facial nerve injuries can also occur when the facial ridge is lowered.[8] This fear may induce inexperienced surgeons to leave unexenterated cells or cholesteatoma, which may increase the likelihood of a postoperative discharging ear.

We believe preoperative computed tomography (CT) in primary mastoid surgery for cholesteatoma or chronic mastoiditis does not have much benefit in avoiding facial nerve injury. However, for revision mastoid surgery, high-resolution CT (HRCT) of the temporal bone can show the surgeon the extent of the disease and guide the procedures performed during the first surgery. Kumar et al reported that when the injury occurs at the intratemporal course of the facial nerve, the study of choice is CT of the temporal bone. The scan will define the site of the injury, and this will particularly help the second surgeon to manage the case.[9] The usage of facial nerve monitor intraoperatively will certainly help the surgeon identify the facial nerve, but it is not a substitute for thorough knowledge of the anatomy of the temporal bone.

Three cases had profound SNHL, of which two had immediate profound SNHL. These two patients had no history of severe vertigo and fever to suggest acute labyrinthitis. There was also no injury to the semicircular canal noted intraoperatively. We postulate that their profound SNHL might be due to intraoperative manipulation over the round or oval window during the removal of granulation tissue or cholesteatoma in these areas. This may have resulted in a perilymph leak. However, another patient experienced severe vertigo, which was treated conservatively for a week by the primary surgeon before he was referred to our centre for facial nerve decompression. We also noted from this study that the primary surgeon usually took 5–7 days before referring the patient to the tertiary centre for facial nerve decompression. We postulate that the most possible reason for the delayed referral is the anticipation of spontaneous facial nerve recovery by the primary surgeon.

We suggest that if the facial nerve landmarks were not identified intraoperatively, and if the patient had complete immediate FNP, with or with suspicion of labyrinthine fistula or profound SNHL, the patient should be referred early. The benefits of an early referral are early decompression, which has a better prognosis, and the prevention of further complications such as mastoid abscess. The timing of facial nerve decompression is very pertinent. If immediate FNP occurs with an uncertain event or difficult pathology during mastoid surgery, urgent exploration and decompression are indicated. All parameters need to be considered for facial nerve exploration, including the onset and degree of FNP, intraoperative pathology such as granulation tissue in the middle ear, the confidence of the primary surgeon regarding the preservation of facial nerve

intraoperatively, and the postoperative EnoG.

In all of our patients, EnoG showed more than 90% degeneration prior to surgical exploration. However, EnoG should not be the mainstay of investigation to decide for facial nerve decompression. HRCT is necessary in revision mastoid surgery with or without facial nerve exploration. The surgeon may benefit from HRCT by knowing the remaining disease left from the first surgery and the anatomy of the facial nerve. It helps the surgeon to decide whether the remaining areas of the diseased mastoid need further clearance. The two main aims of revision surgery with facial nerve decompression are to decompress the facial nerve by neurolysis and to evacuate the disease. As this is a retrospective study, we cannot predict the best timing for facial nerve exploration which will give the best result. Further multicentred prospective studies should be carried out.

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