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A PROSPECTIVE STUDY OF IATROGENIC FACIAL NERVE PALSY: THE LEARNING INSIGHTS.

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Abstract

Introduction
This study aims to review the causative factors and various treatment modalities for iatrogenic facial nerve palsy.

Methods
This is an analytical prospective study carried out at a tertiary care hospital in Department of ENT at Seth GS Medical College & KEM Hospital between Jan 2013 to Jan 2017 with a sample size of 12 patients.

Results
6 patients developed iatrogenic facial nerve palsy after mastoidectomy, 3 secondaries to parotidectomy, 1 post stapedotomy, 1 after cochlear implant and 1 secondary to acoustic neuroma excision. 7 out of them were surgically re-explored and rest were given conservative management. 10 patients had partial recovery and 2 of them have complete return of facial nerve function.

Conclusion
There is no substitute for thorough knowledge of anatomy of facial nerve during otologic surgeries. In cases of iatrogenic facial nerve palsy surgical exploration should be considered when there is an immediate onset complete facial nerve palsy.

Recommendation
Intraoperative facial nerve monitoring is a recommended technique during mastoidectomy, despite the fact that it cannot replace anatomical identification of the facial nerve or surgical expertise.

Keywords: *Iatrogenic facial nerve palsy, mastoidectomy, parotidectomy, stapedotomy, cochlear implant, acoustic neuroma*
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Introduction
Iatrogenic facial nerve injury is one of the dreadliest impediment of an Otorhinolaryngologist. With technological advent of high quality operating microscopes, motorized surgical drill, intraoperative facial nerve monitors and availability of pre-operative imaging, the risks of iatrogenic facial nerve palsy have reduced drastically. However there is always a possibility that an Otologist will encounter this complication at some point of time. The incidence of iatrogenic facial nerve palsy has been estimated to be 0.6-3.7%.[(1)] In revision mastoid surgery, the frequency may be as high as 4-10%.[(2)]

Facial nerve palsy may present in immediate post-operative period or have a delayed onset. There may be complete palsy or paresis. The onset and grade of palsy has a significant role in decision regarding surgical intervention versus conservative management.

Facial nerve exploration is indicated in cases of immediate onset with complete palsy. However a wait-and-see policy may be considered in cases presenting with delayed onset or paresis.[(3)] The aim of this study is to understand the different causative factors for iatrogenic facial nerve trauma, the various treatment modalities and their prognosis.

Materials And Methods

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Study design and setting: This is an analytical prospective study carried out at a tertiary care hospital in Department of ENT at Seth G.S. Medical College and KEM Hospital between January 2013 to January 2017.
Study Size: A sample size of 12 patients was included in this study.

Inclusion Criteria

All patients who visited in the out-patient department or were admitted at a tertiary care center with iatrogenic facial nerve palsy.

Exclusion Criteria

All patients who were diagnosed to have lower motor neuron facial palsy following etiologies other than iatrogenic trauma including idiopathic, congenital causes, inflammatory conditions, neoplasms, systemic causes.

Methodology

Patients were selected as per inclusion / exclusion criteria. Details of all patients were noted in the case sheet typed for study. We have analyzed the grade of facial nerve palsy and the time of onset, the intraoperative surgical details and the possible mishaps, the necessary investigations and the management of all patients. We have followed the patients to their convenience, and we have indicated the status at a particular point of time i.e. on the 2nd week, 1st month and after 6 months.

Ethical Consideration

Written informed consent was taken in the format approved by ECARP from the institution.

Results

In the current series, we had 6 patients with iatrogenic facial nerve palsy secondary to mastoidectomy, 3 patients post parotidectomy, 1 patient after stapedotomy, 1 patient post cochlear implant and 1 patient secondary to acoustic tumour excision. 11 patients out of 12 had immediate onset palsy with House Brackmann (HB) grade ranging from II to VI (Table 1).

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Table 1: Summary of the type of primary surgery, site of injuries, facial nerve status at the time of presentation, the treatment given and postoperative recovery

	Primary surgery	Grade of facial palsy, onset, site of injury	Treatment given	Recovery
1	MRM	HB IV, immediate, 2nd genu	Interpositional grafting	Partial (HB III)
2	CM	HB IV, immediate, 2nd genu and 5-6mm defect in vertical segment	MRM + Facial nerve decompression + Interpositional grafting	Partial (HB III)
3	CM	HB IV, immediate, dehiscence at 2nd genu with nerve oedema	MRM + Facial nerve decompression	Partial (HB III)
4	MRM	HB III, immediate, 2nd genu and tympanic segment	Facial nerve decompression	Partial (HB II)
5	MRM	HB III, delayed, granulation over 2nd genu	Initial conservative followed by facial nerve decompression	Partial (HB II)
6	MRM	HB IV, immediate, 2nd genu	Facial nerve decompression + Interpositional grafting	Partial (HB III)
7	Stapedotomy	HB III, immediate, overhanging facial nerve	Removal of stapes piston	Complete (HB I)
8	Cochlear implant	HB III, immediate, intra-operative dehiscent vertical segment of facial nerve	Intraoperative facial nerve decompression +postoperative conservative therapy	Complete (HB I)
9	Parotidectomy	HB IV, immediate	Conservative	Partial (HB III)
10	Parotidectomy	HB III, immediate	Conservative	Partial (HB II)
11	Parotidectomy	HB III, immediate	Conservative	Partial (HB II)
12	Acoustic neuroma excision	HB VI, immediate	Conservative	No recovery (HB VI)

HB: House Brackmann; MRM: Modified Radical Mastoidectomy; CM: Cortical Mastoidectomy

Post mastoidectomy

Only one patient had presented with delayed onset post mastoidectomy after a duration of 2 weeks. Initially conservative management trial was given for this patient and in view of inadequate improvement, surgical exploration with facial nerve decompression was done with intraoperative findings suggestive of granulations and nerve oedema over second genu.

Rest of the 5 patients with iatrogenic facial nerve palsy post mastoidectomy underwent High Resolution Computed Tomography and were surgically explored in view of immediate onset with complete palsy. 3 of them had to undergo interpositional grafting as there was inadequate

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stump for the possibility of end-to-end anastomosis. The other 2 patients underwent facial nerve decompression due to oedema in the dehiscent segment of facial nerve. There was partial recovery of facial nerve function in the all the above 6 cases.

Post cochlear implant

This patient had an exposed vertical segment of facial nerve and so underwent intra-operative facial nerve decompression. Conservative management with steroids, eye care and physiotherapy in the postoperative period helped in the complete recovery of facial nerve function (Fig. 1).

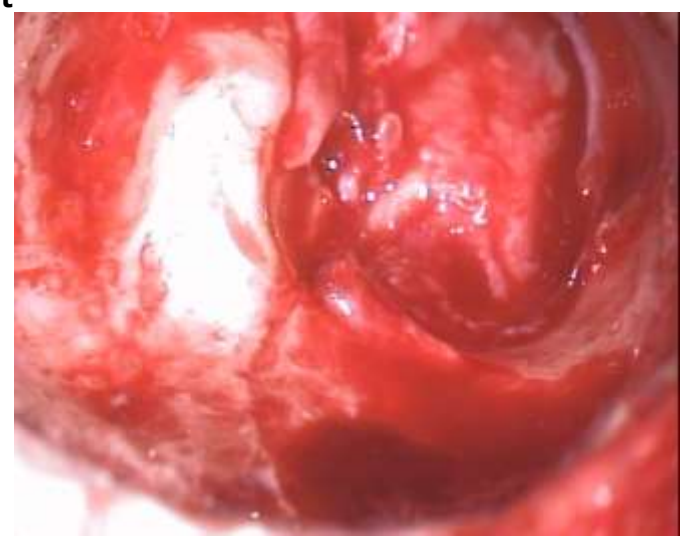

Fig. 1: Inadvertent nerve transection at second genu and vertical segment during mastoidectomy

Post stapedotomy

The patient with iatrogenic facial nerve paresis post stapedotomy was immediately surgically re-explored as there was an overhanging facial nerve identified intra-operatively. There was complete recovery of facial nerve function.

Post parotidectomy

The 3 patients with iatrogenic facial nerve paresis post-parotidectomy were given conservative management as the surgeon was confident regarding the integrity of the nerve. The factors attributing to the trauma could have been thermal injury or intraoperative inadvertent stretch on the nerve or any missed aberrant branch of facial nerve. There was partial recovery in all these patients (Fig. 2).

Fig. 2: Greater auricular nerve used as interpositional nerve graft

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Post acoustic neuroma excision

Facial nerve had to be intentionally sacrificed during the surgery and this patient was given supportive therapy in the post-operative phase (Fig. 3).

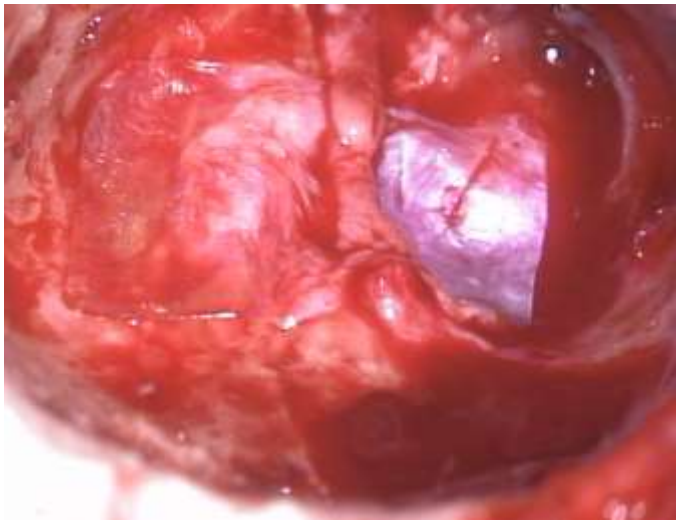

Fig. 3: Interpositional nerve grafting done by greater auricular nerve

Discussion

Iatrogenic trauma to facial nerve may occur even in the cases operated by the most qualified surgeons and can occur in the absence of direct injury. For example, thermal damage may occur when inadequate irrigation is used while drilling with diamond burr. Similarly, there may be alteration in vascular supply of the nerve during the clearance of disease (cholesteatoma, tumour, granulations) adjacent to nerve. In this study, the commonest site of injury identified was at the second genu either due to trauma during drilling or due to oedema of the dehiscent nerve. The accidental drilling of the nerve at second genu may happen if a surgeon drills more inferiorly and posteriorly to the actual site of antrum or if the antrum is obscured by granulations or in presence of Koerner's septum. Therefore it is advocated to meticulously identify the antrum and if the surgeon fails to do so then the drilling should be directed more anterosuperiorly towards the attic. Adequate bony exposure of the superior and posterior canal wall serves as a good guide to the direction and depth of antrum and attic. Detailed anatomical knowledge helps a surgeon to adequately lower the facial ridge without damaging the nerve and leaving behind any residual disease. In revision mastoid surgeries, High resolution Computed Tomography should be considered as it helps to define the site of injury and the extent of the disease. 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 injury, and this will particularly help the second surgeon to manage the case. [6]

In the present study mastoidectomy was found to be the leading cause of iatrogenic facial nerve palsy with an incidence of 50%. Douglas JG, Clough S and Derald EB in their study of 22 patients of iatrogenic facial palsy found that the most common surgery leading to facial nerve injury was mastoidectomy accounting for 55% in their study. The second most common surgery was removal of exostosis. [7] However, exostosis is not commonly seen in this clinical practice and hence the surgery is less common.

Parotid gland surgery is another common cause of inadvertent facial nerve palsy owing to the inconsistent variations in the branching pattern of facial nerve after it exits from stylomastoid foramen.

Intentional injury or accidental injury to facial nerve can also happen during resection of a tumour, either on the facial nerve itself or in the tissues in close vicinity of facial nerve, such as acoustic neuroma or facial nerve neuroma.

During stapedotomy a facial nerve overhanging the oval window niche has to be treated with utmost care. Iatrogenic trauma to the nerve is possible during instrumentation on the footplate or because of the prosthesis impinging on the nerve. A longer wire prosthesis is an alternative in such scenarios.

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Intraoperative facial nerve injury during cochlear implant surgery is feared by both patients and surgeons, fortunately, this complication is rare. In posterior tympanotomy approach, thinning of posterior EAC wall is an essential step in opening of facial recess. Using progressively smaller diamond burrs and profuse irrigation the facial recess should be approached. It is extremely important to ensure the shaft of the diamond burr is not touching the vertical segment of facial nerve when passing through facial recess to round window area as this increases the risk of injury to facial nerve.

If the facial nerve disruption is identified intra-operatively, it is best repaired in the primary sitting only. The dilemma arises when there is unanticipated postoperative facial palsy. It has been asserted that the "sun should not set on an immediate postoperative facial paralysis." The implication of the dictum is appropriate, but exceptions do exist. Also it is advisable that the surgeon does wait a day or longer before re-exploration. This delay allows the surgeon to reassess the circumstances of injury and regain the poise needed for the re-operation.

If the nerve is explored and found to be intact, it is decompressed by exposing 5mm on either side of injury site or till normal nerve is visible and the nerve sheath is opened. If >35% of the nerve circumference has been destroyed, the injured segment should be resected. If <1cm of the nerve tissue has been damaged, it may be possible to reroute the nerve and obtain end to end anastomosis. It must be remembered that rerouting disrupts blood supply to the nerve and a trade-off is involved. [8,9] If tension free anastomosis is not possible then interpositional nerve grafting is required using either greater auricular nerve or sural nerve.

In the current study there was complete recovery of facial nerve function in 25% of surgically intervened patients and the rest 75% had partial recovery even after re-exploration. In a study done by Sertac Yetsier, out of 10 patients with severe facial nerve paralysis who underwent surgical intervention, only one patient had normal facial function during follow-up, 6 patients had HB grade II and 3 patients had HB grade III. [10]

Conclusion

Facial nerve is called the 'master organizer of facial orchestra' because it innervates all the mimic muscles of the face, carries taste sensation from anterior two-third of tongue and provides secretomotor fibres to submandibular, sublingual and lacrimal glands. Patients who suffer from facial paralysis experience not only functional consequences but also the psychological impact of a change in self-image and impaired communication ability.

The controversy is in regard to management of patients with immediate versus delayed onset of facial paralysis, the choice of surgical technique to be used and the timing of surgical intervention. Surgical exploration should be considered if a patient presents with immediate onset complete palsy or if the primary surgeon is not confident regarding the preservation of the nerve integrity. In the immediate post-operative period High Resolution Computed Tomography must be done to get an idea about the site of injury or presence of any residual disease. Though electrodiagnostic tests are useful prognostic determinants in decision making for management of facial nerve injury, we have not used it as a part of the present study. Electrophysiological test is one of the supportive tools for the diagnosis of neuromuscular system but not the method to diagnose the disease or confirm the etiology. The purpose of electrophysiological tests is to localize the lesion site, determine the severity of the injury and differentiate whether an injured nerve is still degenerating or regenerating. However, this facility was not available in the present department. Hence we could not use this modality to evaluate facial palsy.

Patients should be followed up regularly to examine the recovery in facial nerve function. There are higher chances of complete recovery with conservative management as compared to surgical intervention as there is always some inadvertent injury to nerve fibres during handling of the facial nerve.

Limitations

The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population.

Recommendation

Intraoperative facial nerve monitoring is a recommended technique during mastoidectomy, despite the fact that it cannot replace anatomical identification of the facial nerve or surgical expertise.

Acknowledgement

We are thankful to the patients; without them the study could not have been done. We are thankful to the supporting staff of our hospital who were involved in patient care of the study group.

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Conflict of Interest

The authors declare no conflicts of interest.

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