

Chorda Tympani Nerve Function after Myringoplasty

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SUMMARY

This is a cross-sectional study design aimed to determine the prevalence of Chorda Tympani Nerve (CTN) injury and related symptoms following myringoplasty. Thirty patients were included in this study. The methods used were measuring taste thresholds using electrogustometer to map taste threshold on the anterior two-third of the tongue on the operated side with the non operated side as the control. Reading is taken when the subject experiences sour/metallic taste. All corresponding threshold values and findings were recorded and compared to control. Results showed 50% of patients had elevated threshold levels suggestive of CTN injury. However, none of the patients reported subjective taste loss. This study concludes that the prevalence rate of CTN injury in post myringoplasty patients is about 50% but this is not associated with altered taste sensation.

KEY WORDS:

Chorda Tympani Nerve, Electrogustometry, Myringoplasty, Taste threshold

INTRODUCTION

The Chorda Tympani Nerve (CTN) has important functions, namely two components: pre-ganglionic secretomotor fibres to the submandibular ganglion for supply to submandibular and sublingual salivary glands; and fibres carrying the taste sensation from the anterior two thirds of the tongue. Because CTN is between the ossicular bones and is in close proximity to the tympanic membrane, it is not always easy for otolaryngologists to preserve this nerve during middle-ear operations. During middle-ear surgery, the CTN is typically exposed. It is subject to considerable surgical stress by stretch, injury, or dryness, or it is directly sectioned to facilitate the surgical approach to the ossicles. Accordingly, middle ear surgery has been reported to cause lesions of gustatory system, producing symptoms such as dysgeusia, hypogeusia, or ageusia. These postoperative gustatory affections are believed to be transitory, although long-lasting dysgeusia have been observed¹. This study is about the effects of Myringoplasty on the Chorda Tympani Nerve and hence the effect on taste sensations using the electrogustometer to check taste threshold. It is also hoped that this study will help in understanding and managing the subsequent complications due to myringoplasty.

The objective of this study is to map the taste threshold for patients who underwent myringoplasty using electrogustometer on the tongue. The main aim is to determine the prevalence of injury of Chorda Tympani Nerve

post myringoplasty and to determine if injury to the CTN causes clinical symptoms and signs.

MATERIALS AND METHODS

Design of study

This is a cross-sectional study design and was conducted at the Department of Otorhinolaryngology, University Malaya Medical Center which has been actively performing myringoplasty in Day-Care surgery and major operating theatre.

Study Population

All patients included in this study have had their myringoplasty surgery performed between the months of October 2004 to October 2005 in Day Care Surgery and major Operating theatre at University Malaya Medical Centre. The assessment on patients was carried out within a period of less than three months. A total of 35 patients of all ages were assessed in this study but in the end, only 30 patients who matched the study criteria (13 females and 17 males) were included in the study.

Data Collection

Data collection were done by retrospective review of case records, data of patients that have had myringoplasty operations performed at day care surgery and major operative theatre while appointments were made for electrogustometer (EGM) assessment. Prospectively checking of the operation theater (OT) lists were also done to find patients scheduled for myringoplasty surgery and to look for the follow up dates at the Ear, Nose and Throat (ENT) clinic and to assess them subsequently.

Inclusion and Exclusion Criteria

The inclusion criteria were male and female, in the age group ranging from 18-55, all myringoplasty cases performed during a period of less than three months and all patients who satisfied the selection criteria and consented.

The exclusion criteria were patients who had undergone surgery more than three months, patients who had taste disorders, patients who had middle-ear surgery (mastoidectomy, tympanotomy, tympanoplasty, etc), patients with active otitis media and patients who are not willing to cooperate with the study.

Methods of Electrogustometer (EGM) Assessment

The post myringoplasty patients were reviewed in ENT clinic. Each subject was informed about the nature of the study in

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terms of methodology and possible adverse effects of EGM. After knowing and understanding all possible advantages and disadvantages of the study, consent was taken. The patients were specifically asked about CTN related symptoms only if they failed to mention CTN-related symptoms spontaneously.

The EGM is used in order to map taste threshold on the anterior two-third of the tongue. Typically, the cathode is placed on the subject's hand or neck and the anode placed on the specific spot on the tongue. Low-ampere currents are introduced by the electrogustometer and its associated equipment for few seconds. The patient has been taught of familiarization of the equipment and tasting sensation. It has also explained to the subject that immediately upon experiencing a sour/metallic sensation to raise his/her hand. Reading is taken when the subject experiences sour/metallic taste. All corresponding threshold values and findings were recorded and analyzed.

Statistical Methods and Analysis

All variables obtained were coded and entered in SPSS 12.0 and appropriate statistical analysis such as Mann-Whitney test was performed. The results were analyzed to determine any significant difference between threshold values and operated and non-operated side.

RESULTS

A total of 35 patients were assessed but only 30 were recruited into this study based on the criteria set in this study. Upon reviewing the post operative notes of the patients, there were no documentation of the clinical assessment and injury of CTN.

The males are slightly more than the females in terms of the myringoplasty in this study (Table I). There was a different in terms of distribution of myringoplasty patients among the major races of Peninsular Malaysia. The highest was seen among the Malays followed by the Chinese, Indian and Others (Table I). The age distribution of this study is between 18 to 55 years old with a mean age of 40.0 years and a standard deviation of 11.07 with the highest was seen in the age group of 45-55 years (Table I). The post-op duration of myringoplasty range from 7 days to 88 days while the mean duration is 37.1 with standard deviation of 26.63.

Patient symptoms

Among myringoplasty patients in this study, no one had altered taste sensation or dry mouth. The chorda tympani nerve injury and related symptoms following myringoplasty are as following (Table I).

Table I : Socio-demographic characteristic and clinical assessments

Socio-demographic and clinical assessments	n (%)
Gender	
Male	17 (56.7)
Female	13 (43.3)
Ethnicity	
Malay	13 (43.3)
Chinese	10 (33.3)
Indian	6 (20.0)
Others	1 (3.3)
Age group	
Less than 30	7 (23.3)
30 -39	9 (30.0)
40 -49	4 (13.3)
≥ 50	10 (33.3)
Mean	40.0
SD	11.07
Operation sides	
Left	17 (56.7)
Right	13 (43.3)
Post-operation duration (days)	
Mean	37.1
SD	26.63
Range	7 – 88
Non-operative sites(control)	
Mean	15.3
SD	6.06
Taste loss	
No	30 (100.0)
Operative sides threshold range	
8-30 (normal)	15 (50.0)
30-40	5 (17.0)
55-95	15 (33.0)

Non operative side threshold as control group

The threshold in the non-operative side, which is considered as the control group of this study ranges from 8 to 30 μ A with the mean threshold at 15.3 and standard deviation of 6.06.

Operation side threshold

In comparison to the control group (non-op side), the operation side threshold in this study showed that the prevalence were 50% (15/30 pts) within normal threshold values ranging between 8-30 μ A, 17% (5/30 pts) had slightly increased threshold values, above 30 and \leq 40 and 33% (10/30 pts) with high threshold between 55-95 μ A (Table I).

There is a significant difference in the threshold value of the right between the surgically treated side and the non-operative sides ($p < 0.005$).

DISCUSSION

The sense of taste unlike other sensory modalities depends on interactions within a complex neural network. The CTN carries taste from the anterior two thirds of the tongue. The GSPN, which is also a branch of facial nerve, mediates taste from the palate. Lingual branches of the glossopharyngeal nerve carry taste from posterior third of the tongue. The fibers from the pharyngeal plexus of the vagus nerve form special visceral afferents from the tongue base and epiglottis².

Glossopharyngeal nerve is normally inhibited by the CTN in the taste network. This inhibition is abolished when CTN is damaged, which can serve as a compensatory mechanism to taste loss. Because of this complex network injury to any one of these nerve is unlikely to produce a significant or permanent in taste sensation^{2,3}. The human tongue is a relatively symmetrical and anatomical structure and is generally assumed functionally equivalent on both sides^{4,5}. Electrogustometer (EGM) is widely used by clinician to examine taste acuity. Anodal DC current are delivered to focal region of the dorsal area of the tongue to elicit a unique and electric taste that consists mainly of sour and metallic taste. This equipment provides a quantitative evaluation of taste in μ A^{6,7}.

Threshold current intensities for eliciting taste sensation varied considerably among subjects. This might have been due to the difficulty of identifying the electric taste even after familiarization to it through pre experimental practice. Consequently, in the present study, different current intensities had to be delivered to different patients to elicit this electric taste. Generally, subjects felt three types of sensations depending on the strength of the current delivered; a weak tingling during weak stimulation (<25 μ A), electric taste during mild stimulation (25-50 μ A) and tingling or irritation without any taste sensation during strong stimulation (>50 μ A).

During middle ear surgery, CTN is typically exposed this subjects to considerable surgical stress by stretch, injury of dryness or it is directly sectioned to facilitate the surgical approach to the ossicle. Accordingly, middle ear surgery has been reported to cause lesions of gustatory system^{3,8,9}. There was no occurrence of subjective post operative complaints

such as dysgeusia, hypogeusia, ageusea or mouth dryness in this study despite it being reported in previous studies that there is CTN related symptoms after myringoplasty².

One of the main reasons for the low frequency of complaints appears to be related to the release of inhibition phenomenon or cross innervation. Upon reviewing the post operative notes of the patients, there were no documentation of the clinical assessment and injury of CTN. From the data of operative side threshold value, it can be seen that almost half of the patients are within normal threshold range and the rest showed much increase in the threshold values. There was no significant elevation of threshold indicating CTN section. This could be due to pre-existing chronic inflammatory middle ear disease which affects ipsilateral gustatory infection. Possible explanation for increased threshold could be a minor trauma to the nerve during the elevation of the flap and transposition of the graft.

One study strongly argues for the alteration of the taste function through inflammatory process of the middle ear. The severity of the inflammatory process tends to influence the extent of gustatory function in comparison with healthy subjects¹.

CONCLUSION

Based on increased threshold values, 50% of patients had possible injury of CTN. From this study, it can be concluded that although 50% had possible injury to CTN, however no patients complained of altered taste or dry mouth. Although there were no clinical symptoms and signs, care should be taken during surgery. While requesting consent from patients for myringoplasty operation, it is important to mention the incidence and prognosis of possible complications associated with CTN injury.

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