

Taste disturbance after mastoid surgery: immediate and long-term effects of chorda tympani nerve sacrifice

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Abstract

Objective: To determine the immediate and long-term taste effects of chorda tympani nerve sacrifice in patients undergoing open cavity mastoidectomy.

Design, setting and participants: A retrospective, questionnaire survey of patients receiving follow up and aural toilet following open cavity mastoidectomy, over a four-month period. The questionnaire assessed taste disturbance, both immediately post-operative and current. Available surgical records were reviewed for chorda tympani references.

Results: Of 57 patients, six had undergone surgery to both ears. Of those who could recall (37/57), 24.3 per cent were aware of taste disturbance immediately after surgery, while 8.7 per cent reported current disturbance (median post-operative interval, 28.5 years; range, one month to 67 years). No bilateral surgery patients were aware of taste disturbance.

Conclusion: Mastoidectomy consent procedure emphasises the risk of hearing loss and facial nerve injury, yet in open cavity surgery chorda tympani division is almost inevitable. Reassuringly, most post-operative taste disturbance resolves, and most patients are not aware of long-term disturbance. However, a small percentage suffer ongoing taste disturbance; this could be significant for professional chefs and wine-tasters. The risk of taste disturbance should be addressed in the consent procedure.

Key words: Chorda Tympani; Mastoidectomy; Ear, Middle; Complications; Taste

Introduction

Taste is mediated via three cranial nerves: the sensory component of the facial nerve, the glossopharyngeal nerve and the vagus nerve. Taste sensation from the anterior two-thirds of the tongue is relayed to the tractus solitarius in the pons via the fibres which make up the chorda tympani. These fibres initially travel with the lingual nerve, and leave this nerve, at the lower border of the lateral pterygoid muscle, as the chorda tympani. This nerve passes through the petrous temporal bone and middle ear to join the facial nerve in the stylomastoid canal. The cell bodies of these fibres are in the geniculate ganglion, with their central connections travelling to the pons in the facial nerve. This sensory component of the facial nerve is sometimes referred to as the nervus intermedius.

Some taste fibres from the geniculate ganglion also pass peripherally in the greater petrosal nerve and supply taste buds on the oral surface of the palate.

The glossopharyngeal nerve supplies taste buds in the posterior one-third of the tongue, including the

vallate papillae, and the palatoglossal folds. There are also some taste buds in the epiglottis and hypopharynx, which are supplied by the superior laryngeal branch of the vagus nerve.

During open cavity mastoid surgery, the posterior and superior wall of the bony external meatus is removed and the bone over the vertical part of the facial nerve (i.e. the facial ridge) is lowered. This allows full visualisation and clearance of the cholesteatoma. Lowering of the facial ridge also ensures good access to the mastoid bowl, allowing easier inspection and aural toilet in the out-patient clinic. Lowering the facial ridge also promotes a drier and more stable mastoid cavity.

The chorda tympani leaves the vertical part of the facial nerve and passes through the posterior wall of the bony meatus, lateral to the main trunk of the facial nerve, to enter the middle ear at the level of the annulus of the tympanic membrane. Therefore, it is almost inevitable that the chorda tympani will be sacrificed during adequate lowering of the facial ridge.

In our experience, taste disturbance is rarely discussed with patients when obtaining consent for mastoid surgery. This study aimed to determine whether or not taste disturbance is a significant consequence which warrants greater consideration during the mastoid surgery consent procedure.

Materials and methods

Over a four-month period (June to October 2009), 57 patients with open mastoid cavities attended the out-patient department for a follow-up appointment and aural toilet. Six patients had undergone surgery to both ears, giving a total of 63 mastoid cavities.

Children under 12 years and patients with other potential causes of taste disturbance were excluded. We also excluded patients who had undergone a more limited atticotomy procedure, or mastoid surgery preserving the bony meatus.

Patients were given a simple questionnaire (see Appendix 1) assessing their awareness of taste disturbance both immediately after surgery and at the time of their current appointment.

Where surgical notes were available, we recorded the presence or absence of documentation regarding chorda tympani division.

Results

All 57 patients completed the questionnaire. There were 40 male and 17 female patients (a male:female ratio of 2:1), with ages ranging from 13 to 95 years (median, 60.5 years). The time interval between mastoid surgery and questionnaire completion varied from one month to 67 years, with a median of 28.5 years.

Thirty-seven of the 57 patients surveyed were able to recall whether or not their sense of taste had been affected in the immediate post-operative period, while 20 could not remember. Twenty-eight of these 37 (75.7 per cent) reported no change in their taste sensation immediately following surgery, while nine (24.3 per cent) did notice some taste disturbance. The

nature of this taste disturbance varied: a metallic taste was described by five patients, reduced taste sensation by three, and a bitter taste by one.

At the time of questioning, 52 (91.2 per cent) patients reported being unaware of any taste disturbance. However, five (8.8 per cent) still experienced some alteration in their sense of taste: three patients had reduced taste sensation and two described a metallic taste. Interestingly, none of the six patients with bilateral mastoid cavities complained of any taste disturbance.

Of the nine patients who reported altered taste immediately post-operatively, six (66.6 per cent) reported that the problem had subsequently resolved and that their taste sensation was currently normal, while three (33.3 per cent) reported persistently altered taste sensation. Two patients, who had undergone surgery over 20 years ago and who could not recall whether they had experienced taste disturbance at the time of surgery, did feel that their taste sensation was now reduced (Table I).

We did not specifically ask the six patients whose immediate taste disturbance had resolved how long it took for their taste sensation to recover. However, it was interesting to observe that one patient, who had been operated on a month previously and who reported initial post-operative taste disturbance, had none at the time of questioning.

Twenty-four of the 57 patients had undergone surgery in Southend Hospital, and their surgical records were thus available for review. In only two cases was any comment made about the chorda tympani; in both patients, the notes stated that it was divided. This illustrates the lack of importance given to this nerve by most ENT surgeons.

Discussion

The incidence of taste disturbance immediately following open cavity mastoidectomy has been reported to be as low as 2 per cent and as high as 31 per cent for adults, with a higher incidence (approximately 50 per cent)

TABLE I
SHORT-TERM AND PERSISTENT POST-OPERATIVE TASTE CHANGE: PATIENT DATA

Sex	Age (y)	Op side	Post-op change		Current change		Time since op (mth)
			Present?	Type	Present?	Type	
F	85	Right	Yes	Reduced	No		672
F	50	Right	Yes	Metallic	No		480
M	66	Right	Yes	Metallic	Yes	Metallic	8
F	33	Right	Yes	Metallic	No		13
M	69	Right	Yes	Reduced	No		576
M	71	Right	Yes	Metallic	No		540
M	54	Right	Yes	Bitter	No		1
M	59	Right	No recall		Yes	Metallic	No recall
F	66	Left	Yes	Reduced	Yes	Reduced	108
F	74	Left	No recall		Yes	Reduced	720
M	58	Left	Yes	Metallic	Yes	Metallic	No recall

Y = years; op = operation; post-op = immediate post-operative; mth = months; F = female; M = male; no recall = patient unable to remember

reported in children.^{1–4} However, in the long term it is thought that younger patients (i.e. less than 20 years at the time of surgery) are more likely to recover their taste sensation.⁵ Our results certainly point to the incidence of taste disturbance being at the lower end of the reported range, particularly in the long term.

Let us consider why division of the chorda tympani seems to have little effect on the patient's perception of taste. Taste sensation from the taste buds supplied by the greater petrosal, vagus and glossopharyngeal nerves, may compensate. Indeed, it has been proposed that cutting the chorda tympani may abolish some inhibition of the glossopharyngeal nerve^{1,4,6} and the greater petrosal nerve.⁷ Studies in rats have demonstrated different neural responses in the greater petrosal nerve versus the chorda tympani, with the former producing higher response frequencies to sucrose stimulation, and the latter producing higher response frequencies to salt stimulation in a small subset of neurons.⁷

There is also the possibility of cross-innervation from the contralateral chorda tympani; however, this is not supported by the fact that all six of our patients with bilateral cavities reported no taste disturbance.

Another reason why patients may not be aware of a change in taste sensation after surgery is that the chorda tympani may have already been damaged by disease. Even if the chorda tympani is intact at the time of surgery, it may have been stretched by cholesteatoma. Michael *et al.*² demonstrated that taste disturbance is more likely when the chorda tympani is stretched rather than divided.

Taste sensation is very subjective and is influenced by factors other than the taste buds and their neural connections, specifically the patient's sense of smell. To some extent, this limits the clinical value of objective assessment of taste sensation.

- **Chorda tympani nerve injury is very common during open cavity mastoid surgery, yet taste disturbance is rarely discussed with patients pre-operatively**
- **This retrospective questionnaire of 57 post-mastoidectomy patients (open cavity surgery) found that immediate post-operative taste disturbance occurred in 24 per cent**
- **This usually resolved; only 9 per cent had long-term taste disturbance**
- **The risk of taste disturbance should be discussed during the mastoid surgery consent process**

There has been interest in objective assessment of taste disturbance, mostly by the use of electrogonometry. However, unlike objective tests for hearing, this test is not widely available, and is currently only used in a few centres for research purposes. Furthermore, electrogonometry results often correlate poorly with the

patient's subjective sensation of taste. Leung *et al.*⁴ found that, despite electrogonometric evidence of chorda tympani dysfunction, none of their subjects had subjective symptoms of taste disturbance.

The current study has enabled us to feel more confident in reassuring patients that the consequences of chorda tympani division during mastoid surgery will be negligible in the great majority of cases. In a small percentage of patients, there will be some long-term taste disturbance. Even so, we noted that none of the patients in our study had raised this as a cause for concern during previous out-patient appointments.

However, in patients who are chefs or wine tasters, the consequences of permanent taste disturbance could be significant. Such patients will need careful counselling prior to surgery. Some surgeons might consider that an operation preserving the bony meatus (e.g. combined approach tympanoplasty) may be more appropriate in such cases, in the hope that the chorda tympani can be preserved. However, the nerve will inevitably be stretched significantly during cholesteatoma clearance; as discussed above, this may actually produce greater taste disturbance.

It is difficult to comment on taste recovery time, although one of our patients reported complete improvement within one month of surgery. As with most cases of neurotmesis, however, a waiting period of up to 12 months is advised before any definitive decisions are made regarding expected nerve function recovery.

Conclusion

Chorda tympani injury during mastoid surgery tends to recover long term and most patients don't notice any substantial functional defect. We are now able to advise our patients more reliably before mastoid surgery on the short and long term effects of chorda tympani transection.

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Appendix 1. Audit of mastoidectomy and taste

Thank you for filling in this brief questionnaire, it should take no longer than a minute.

You have had an operation to create a mastoid cavity. During the operation, a small nerve called the chorda tympani will have been divided. This nerve carries taste sensation from your tongue. The purpose of this audit is to determine if patients are aware of any change in taste sensation as a consequence of mastoid surgery.

We would be very grateful if you could complete the top section of this questionnaire, and answer questions 1 and 2. Question 3 will be answered by the medical staff.

Thank you

Patient name:

Age (now):

Sex: M F

Mastoidectomy:

– Left ear date (month/year):

– Right ear date (month/year):

If you have had more than one mastoid operation on an ear, give the date of the *first/initial* mastoidectomy. If you cannot recall the date of your operation, do not worry; the doctors will fill this in from your medical notes.

Q1 Immediately *after* your initial mastoidectomy, were you aware of any change in your sense of taste?

Yes No Can't remember

If yes, was it:

– Reduced/loss of taste

– Altered taste (e.g. aware of a metallic taste)

– Other (please specify):

Q2 Are you *now* aware of any change in your sense of taste?

Yes No

If yes, is it:

– Reduced/loss of taste

– Altered taste (e.g. aware of a metallic taste)

– Other (please specify):

Thank you. Please return this questionnaire to the doctor or nurse who sees you in the clinic.

Q3 (To be answered by medical staff)

Is the operation note relating to the initial mastoidectomy available?

Yes No

If yes, is the chorda tympani recorded as being:

– Preserved/intact

– Divided

– No comment

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