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Clinical Records

The need for excessive dietary sodium chloride following tympanoplasty

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Abstract
Loss of a single nerve function in the peripheral network responsible for taste perception is traditionally considered clinically insignificant. However, we report the case of a 27-year-old woman who experienced significant selective taste loss for salt after manipulation of the chorda tympani during tympanoplasty. This effect may be explained by disorder of the functional neuroanatomy of salty taste perception together with strong lateralization of mastication to the affected side in this patient. Recently described inhibition of cranial nerve IX by cranial nerve VII is hypothesized as contributing to the contradiction between this case and the commonly accepted role of the chorda tympani in taste perception.

Key words: Taste threshold; Chorda tympani, nerve; Diet, sodium chloride

Introduction

Because of the great complexity and many interconnections of the peripheral nerve network mediating taste perception, loss of a single nerve function from this system is usually not considered clinically important. Selective and significant hypogeusia for salt, which leads to a clear increase in salt intake, has not been described before as a complication of a unilateral tympanoplastic operation. The mechanism of this peculiar disorder cannot be explained without taking into account certain aspects of taste perception and mastication.

Case report

A 27-year-old woman was surprised by her impression that all her friends and acquaintances were on a low salt diet. Also she thought that the canteen food was less salty than previously. She added larger amounts of salt to her food than previously although she had usually had a distaste for salty meals. Otherwise she did not notice any change in her ability to taste: meals were not tasteless but saltless. Wines, sweets, and desserts tasted the same as previously.

A few weeks earlier the patient, who was otherwise healthy, had undergone a right-sided tympanoplasty, the aim of which was to repair an old perforation of the tympanic membrane. The operation was reported to be uncomplicated, although the chorda tympani of the facial nerve had been manipulated. Subjectively, the patient reported having felt a transient numbness of the right side of her tongue after the operation, but in about a week all abnormal sensations had disappeared.

Clinical examination, using standard sodium chloride solution, showed a very clear hypogeusia for salty taste on the right side of the patient's tongue when compared to the left side. Because the trigeminal nerve was intact, it was obvious that the 'numbness' reported by the patient was illusory, and was loss of taste rather than sense. When specifically asked, the patient reported that she always chewed her food on the right side of her mouth. She tried to avoid excessive use of salt, and at follow-up after four months, perception of taste as well as salt consumption were completely normalized.

Discussion

Unlike other sensory modalities such as hearing, vision, or smell, which rely on innervation by one nerve, the perception of taste is derived from the interaction of the paired facial, glossopharyngeal, and, to a lesser extent, vagal nerves. In addition to the greater superficial petrosal nerve, the chorda tympani arises from the small afferent portion of the facial nerve (VIIth cranial nerve) known as the nervus intermedius. The chorda tympani receives taste information from the fungiform and filiform papillae on the anterior two-thirds of the tongue, while the greater superficial petrosal nerve is responsible for taste perception from the palate. Taste sensation from the circumvallate papillae and foliate papillae at the posterior one-third of the tongue is mediated by the lingual branches of the glossopharyngeal nerve (IXth cranial nerve). Fibres fom the pharyngeal plexus of the vagus nerve (Xth cranial nerve) also contribute limited information on taste perception through innervation of a portion of the base of the tongue and epiglottis. Taste fibres from both the VIIth and IXth cranial nerves compose part of the fasciculus solitarius and terminate in the ventral sensory nucleus, whch is the uppermost, enlarged portion of the

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nucleus solitarius. This nucleus, also known as the gustatory nucleus, is continuous with a median nuclear mass, the commissural nucleus of the Xth cranial nerve, in which some crossed fibres of the fasciculus solitarius terminate. Secondary fibres from the gustatory nucleus then ascend ipsilaterally distributing fibres to other nuclei. Secondary fibres terminate in the thalamus in the posteromedial ventral nucleus, mainly on the ipsilateral side.

Traditionally as well as in recent reviews it is concluded that loss of a single nerve such as the chorda tympani in this physiological network is not associated with a clinically significant taste loss (Kveton and Bartoshuk, 1994). In our case, a logical explanation of the change can be derived from combining functional neuroanatomy with behavioural neurology.

The unilateral prefence pattern of mastication, the 'habit' of chewing food on one side of the mouth, is common. This asymmetry is one of many behavioural and perceptual asymmetries of which we are seldom aware. It has been traditionally explained by the asymmetrical occlusion of molars and use of the better side (Ramfjord and Ash, 1966). However, a neural mechanism, asymmetry of the afferent innervation of the chewing muscles, is supported by experimental research (Hoogmartens *et al.*, 1980).

Sweet is tasted mostly by the tip of the tongue, salt by the anterior surface of the tongue, sour by the sides of the tongue and bitter by the posterior part. Sour and bitter tastes, however, are tasted by the palate clearly better than sweet and salt. Because of the regional differences in innervation, sour and bitter taste perception is relatively independent of the chorda tympani. Furthermore, because receptors of sweet taste are concentrated on the tip of the tongue, perception of sweet taste is practically unaffected by lateralization of mastication.

There is one more aspect that may contribute to the present view that an isolated chorda tympani dysfunction is clinically insignificant. According to recent experimental research, when unilateral total damage to the nervus intermedius has little effect on the whole mouth taste, the phenomenon is due to release of inhibition of cranial nerve IX by cranial nerve VII in the taste network (Kveton and Bartoshuk, 1994). Our case raises the hypothesis that a functional disorder of the chorda tympani alone, at least in certain circumstances, could affect the ability to taste salt more than total damage of the nervus intermedius.

That one may be specifically deprived of being able to taste salt is far beyond a patients' ability to monitor their experiences. Chemosensory disorders remain often unrecognized by patients, and a natural response to selective hypogeusia is to think that there is no salt in the food. Because excessive use of sodium chloride is a risk factor for essential hypertension, a subclinical dysfunction of the chorda tympani should be considered as a cause of increased salt intake if preceded by middle ear surgery. Use of salt is adapted according to consumption, and among uninformed patients, excessive salt intake might continue beyond the actual chorda tympani dysfunction.

References

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