Unusual association of diseases/symptoms

Bilateral hypogeusia caused by a small lesion in the lower midbrain tegmentum

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Summary

We report a case with multiple sclerosis which showed bilateral hypogeusia due to a small lesion in the lower midbrain tegmentum. Sweet taste was diminished only on the contralateral side in the territory of the chorda tympani, and salty, sour and bitter tastes were diminished bilaterally. All taste modalities were preserved in the territory of the greater petrosal nerve. The findings in our patient and in the literature suggest that the second gustatory fibres ipsilaterally ascend from the nucleus of the solitary tract to the midbrain and partially cross at the inferior border of the midbrain. The features of hypogeusia in our case suggest segregated channels in the gustatory pathway conveying taste perception of distinct taste modalities and from distinct innervation territories.

BACKGROUND

The central gustatory pathway in humans has been estimated based on the clinical evidence to ascend ipsilaterally from the medulla to the pons, branch at the upper pons and then ascend bilaterally from the midbrain to the thalamus;^{1–3} however, the precise branching level and the intrinsic structure of the pathway have not yet been determined. We report on a case with a small lesion in the lower midbrain tegmentum, manifesting bilateral hypogeusia associated with differences in taste disturbance depending on the taste modality and the innervation territories.

CASE PRESENTATION

A 49-year-old woman presented with sudden onset of dizziness, diplopia, dysarthria and alteration of gustatory perception which developed 2 days prior to admission. She had no history of diabetes mellitus or hypertension. On neurological examination, there was a mild diplopia on right gaze without apparent ophthalmoplegia, along with dizziness and mildly slurred speech. There was no motor or sensory abnormality, and deep tendon reflexes were normal with flexor plantar responses. Coordination of the extremities and gait were normal. She complained of a significant loss of taste. The results of routine blood tests, including cell counts, chemistry and C reactive protein, were unremarkable. Cerebrospinal fluid (CSF) was normal, and oligoclonal immunoglobulin G band in CSF was negative.

INVESTIGATIONS

Gustatory perception was semiquantitatively examined by the method⁹ using filter-paper discs impregnated with solutions of five concentrations of four basic taste modalities (table 1): sugar, salt, tartaric acid (sour) and quinin hydrochloride (bitter), at three points of the nerve territories, the chorda tympani (anterior two-thirds of the

tongue), greater petrosal nerve (soft palate) and glossopharyngeal nerve (posterior one-third of the tongue). There was bilateral hypogeusia or ageusia in the territories of the chorda tympani and glossopharyngeal nerve. In detail, sweet taste was diminished on the left (contralateral) side; salty, sour and bitter tastes were diminished on both sides. Taste perception was normal in the territory innervated by the greater petrosal nerve, but it was severely disturbed in the territories innervated by the chorda tympani and glossopharyngeal nerve.

MRI taken on admission, axial diffusion-weighted image and axial, coronal and sagittal T2 images revealed a small lesion of high signal in the right tegmentum of the midbrain (figure 1A–D). The lesion was nearly spherical and approximately 3 mm in diameter, and its centre was located at the level just above the inferior border of the midbrain. The lesion appeared to include the bulbothalamic tract and the brachium conjunctivum, but not the medial lemniscus. There was no other lesion in the brain.

OUTCOME AND FOLLOW-UP

She was diagnosed with possible multiple sclerosis and treated with a 3-day course of intravenous methylprednisolone, 1000 mg/day, followed by oral prednisolone, 20 mg/day, which was tapered off over the next 10 days. Her

Table 1 Results of taste test

Test sites	Sugar (sweet)		Salt (salty)		Tartaric acid (sour)		Quinin hydrochloride (bitter)	
	R	L	R	L	R	L	R	L
Chorda tympani	2	6	6	6	6	6	6	5
Greater petrosal nerve	2	2	2	2	3	2	2	2
Glossopharyngeal nerve	2	1	4	6	5	3	4	3

Evaluation grade: 1, hypergeusia; 2 and 3, normal range; 4 and 5, hypogeusia; 6, ageusia.

Figure 1 Brain MRI of our patient. MRI taken on admission, (A) axial diffusion-weighted image and (B) axial, (C) coronal and (D) sagittal T2 images, revealed a small lesion of high signal in the right tegmentum of the midbrain. The lesion was nearly spherical and approximately 3mm in diameter, and its center was located at the level just above the inferior border of the midbrain. The lesion appeared to include the bulmothalamic tract and the brachium conjunctivum, but not the medial lemniscus.

dizziness and dysarthria disappeared 1 month later, but subtle diplopia and mild loss of taste persisted more than 3 months. The lesion on MRI was almost resolved 3 months after onset. She had a relapse manifested by dysarthria and diplopia associated with another brainstem lesion 1 year and 9 months after the first attack; then she was diagnosed with clinically definite multiple sclerosis.

DISCUSSION

The patient's hypogeusia was remarkable and sustained for a long period as compared with other symptoms, suggesting that the lesion contained the pathway of gustatory perception. Her dizziness, dysarthria and diplopia may have been due to partial involvement of the brachium conjunctivum and the nucleus of the fourth nerve.

Bilateral disturbance of gustatory perception by a unilateral small lesion in our patient suggests that the ascending gustatory fibres branch at the level of the lesion in the lower midbrain or in the more caudal part. Taking the results of our case and the study of Onoda *et al*⁸ together,

it turns out that the second gustatory fibres branch at the level of the inferior border of the midbrain and ascend bilaterally to the thalamus. The parabrachial taste nuclei may be located close to or involved in the lesion.

All taste modalities were preserved in the territory of the greater petrosal nerve in our patient, suggesting that the secondary gustatory fibres from the different innervation territories are somatotopically organised in the course of the brain stem. Furthermore, in our case, sweet taste was diminished only on the contralateral side in the territory of the chorda tympani, and salty, sour and bitter tastes were diminished bilaterally. This difference in taste disturbance with regard to taste modalities implies the possibility that the gustatory fibres of different taste modalities may be segregated in the gustatory pathway. This assumption is supported by the evidence that taste modalities are encoded separately by the activation of distinct taste cell types.¹⁰

The findings in our patient and in the literature suggest that the second gustatory fibres ipsilaterally ascend from

the nucleus of the solitary tract to the midbrain and partially cross at the level of the lower midbrain near its inferior border. The features of hypogeusia in our case suggest segregated channels in the gustatory pathway conveying taste perception of distinct taste modalities and from distinct innervation territories.

Learning points

- ▶ A small lesion in the lower midbrain tegmentum can cause bilateral hypogeusia.
- ▶ The second gustatory fibres ipsilaterally is suggested to ascend from the nucleus of the solitary tract to the midbrain and partially cross at the level of the inferior border of the midbrain.
- ▶ The gustatory pathway may be composed of segregated channels conveying taste perception of distinct taste modalities and from distinct innervation territories.

Competing interests None.

Patient consent Obtained.

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