Abstract

Taste function after preservation of chorda tympani nerve (CTN) in stapes surgery was prospectively investigated with questionnaire and electrogustometry (EGM). Further expression of neurotrophic factors in rat geniculate ganglion (GG) after injury of CTN was examined with in situ hybridization histochemistry (ISSH) and RT-PCR. Among the cases, 15/18 (83.3%) were associated with taste disturbance and 6/18 (33.3%) were associated with tongue numbness 2 weeks after surgery; however, the symptoms ceased in 14/18 cases (77.8%). Two weeks after surgery, the EGM threshold was found to be elevated in 15/18 (83.3%) cases, while in 10/18 cases (55.6%), it did not decrease until 1 year after surgery. Expression of ISSH and amplified bands of BDNF and GFRα1 increased at 7 and 14 days after nerve injury in ipsilateral GGs and also increased at 7 days in the contralateral side. Most of the clinical cases experienced taste disturbance after stapes surgery, and in a few cases this disturbance persisted for a long time. The animal experiment suggested the role of GGs in axonal regeneration.

Our previous morphological study showed that geniculate ganglion (GG) neurons were damaged after CTN injury in rats and they might play a role of axonal regeneration.

Subjects and Methods

Clinical Study

Fifteen patients with otosclerosis were operated from January 2002 to June 2004 and were followed up more than 2 years. They included 1 male and 14 females, and their ages ranged from 27 to 62 years with a mean of 47.6 years. Three female patients suffered from bilateral otosclerosis, and the total number of operated ears was 18.

CTN function was measured by EGM at 2 days before surgery and at 2 weeks and then at 1, 3, 6, 12, 18 and 24 months after surgery. EGM was performed according to the method of Tomita et al. (1986). The stimulation range of EGM was from -8 to 34 dB (normal range -3 to 8 dB). None of the patients complained of any taste disturbance, and their EGM threshold was within the normal range before surgery. In the questionnaire, the patients were asked about symptoms such as taste disturbance and tongue numbness at 2 weeks and then at 1, 3, 6, 12, 18 and 24 months after surgery. The questionnaire also asked patients who cooked at home everyday about their ability to flavor dishes.

Experimental study

Animals and surgical procedures

Twelve male Sprague-Dawley rats (200-250g) were used. In all experiments, the rats were deeply anesthetized with Pentobarbital (40 mg/kg, ip). The CTN in the right middle ear was left open in survival time after surgery. In all experiments, the CTN in the right middle ear was left open in survival time after surgery.

Results

Clinical study

In the postoperative hearing results of 3 speech frequencies, the air-bone (A-B) gap was within 10 dB in 16 ears (88.9 %), between 10 and 20 dB in 1 ears (5.6 %), and between 20 and 30 dB in 1 ears (6.0 %). The patients experienced difficulty in communicating by telephone at the end of the second postoperative year. However, the symptoms were not severe and did not affect daily life.

Clinical study

Fourteen patients were operated for otosclerosis, and their ages ranged from 27 to 62 years with a mean of 47.6 years. Three female patients suffered from bilateral otosclerosis, and the total number of operated ears was 18.

Entire meninges were removed with a chisel to visualize the stapes, the CTN was occasionally touched and rapidly frozen with powdered dry ice and stored at -80°C until used. Extraction of total RNA was done by a single step extraction method using ISOGEN (Nippon Gene, Tokyo, Japan) that was described in previous papers. Amplification cycles for BDNF and GFRα1 were 32, 30 for GFRα1 and 25 for GAPDH. The forward and reverse primers specific for BDNF, GFRα1 and GAPDH were designed as shown in Table 1. The ratio of BDNF and GFRα1 to GAPDH mRNA was considered to indicate the level of each transcript. The mRNA level was expressed as a percentage of the mRNA level in the normal control ganglia. Samples without the addition of reverse transcriptase or without the addition of RNA were used as reference samples or negative controls. No detectable product differences in changes of values over time of each group were tested using one-way ANOVA, followed by individual post-hoc comparisons. A difference was accepted as significant if p < 0.05.

Clinical study

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Clinical study

Eighteen cases were included in the study, and their ages ranged from 27 to 62 years with a mean of 47.6 years. Three female patients suffered from bilateral otosclerosis, and the total number of operated ears was 18. 

Conclusions

Clinical study

Most of the cases experienced taste disturbance after stapes surgery and in a few cases, it persisted this disturbance for a long period of time.

Reference


