Effect of a large-sized silicone sheet upon recovery of mastoid aeration after mastoidectomy - a preliminary report

Kyosuke Kazama, Haruo Takahashi, Satoru Kaieda, Tetsu Iwanaga, Tomomi Yamamoto-Fukuda, Haruo Yoshida, Hidetaka Kumagami, and Kenji Takasaki
From the Department of Otolaryngology - Head and Neck Surgery, Nagasaki University Graduate School of Biomedical Sciences

INTRODUCTION

It would be ideal if an aerated mastoid cavity having a pressure-regulation function for the middle ear was restored even after mastoidectomy, so that it would be possible to avoid the occurrence of a silicone sheet that we have developed, and also to retrospectively examine and preliminarily report its effect upon the recovery of mastoid aeration. Although there have been several literature reporting a good effect of a large-sized silicone sheet upon the epithelial regeneration and prevention of recurrences of cholesteatoma after surgery with canal-wall-up (CWU) procedure, to our knowledge, there have been very few reports about its effect upon the postoperative recovery of the mastoid aeration, and detailed descriptions about the shape and size of the large-sized silicone sheet were not found in the literature.

The purposes of this study are to introduce our unique large-sized silicone sheet that we have developed, and also to retrospectively examine and preliminarily report its effect upon the recovery of mastoid aeration after staged ear surgery with our routine procedure, soft-wall reconstruction (SWR) procedure [7], and mastoidectomy.

MATERIALS AND METHODS

Subjects were 69 patients (72 ears) who underwent staged tympanoplasty using SWR procedure, in which mastoidectomy (excavation of mastoid air cells from the epitympanum to the mastoid) was necessary and done for their chronic otitis media (COM) and then a 0.5-mm-thick large-sized silicone sheet, that we developed, having a unique shape and covering all the way along the ET, tympanic cavity, epitympanum, and mastoid (Koken Co., Ltd. Japan, Fig 1 a, b) was placed at the first-stage operation (large silicone group). Their age ranged from 1 year 11 months to 79 with an average of 37.8 years, containing 22 ears (28%) of children with the age under 15. In 50 ears, a tympanosynostosis tube (modified Goode T-tube) was used during the surgery. Four to 12 months (8.5 months on average) after the first-stage operation, recovery of mastoid aeration was assessed by the axial image of the high-resolution computed tomography (CT) on the level of the lateral semicircular canal. When an airspace was found to recover throughout the entire mastoid cavity or up to mastoid antrum, it was judged as good recovery of mastoid aeration (Fig. 2a, b), while it was defined as poor recovery when the airspace was seen only around the feathers of the silicone sheet or was not seen in any part from the epitympanum to the mastoid (Fig. 2c, d). These results were compared with those of 41 patients (41 ears) who underwent staged tympanoplasty with mastoidectomy and had a 0.5-mm-thick silicone sheet covering from the ET only to the meso- or epitympanum at the first-stage operation (control group). They consisted of 24 males and 20 females with their age ranging from 6 to 72 with an average of 40.6.

For 16 ears in the large silicone group (10 ears in the good aeration recovery group and 6 ears in the poor group) and 1 ear in the control group, it was noted that our unique large-sized silicone sheet placed between these two groups (Fisher’s exact probability test, p=0.5934).

RESULTS

Good recovery of mastoid aeration were observed in 43 of 72 (59.7%) ears in the large silicone group and in 10 of 41 (24.4%) ears in the control group, being significantly more frequent in the large silicone group than in the control group (Chi-square value=11.7146, p=0.0006).

Aeration recovery was observed in 15 of 22 (68.1%) ears in the group of 15 years old or younger compared to 28 of 50 (56.0%) ears in the group of 16 years old or older, with no significant difference, although the younger patients tended to show a better recovery (Chi-square value=0.5041, p=0.4777).

Regarding correlation between use of tympanostomy tube (TT) and recovery of aeration, in cases in which a TT was used, 29 of 50 ears (58.0%) were included in the good aeration recovery group, while in cases in which a TT was not used, 14 of 22 ears (63.6%) were included. They consisted of 24 males and 20 females with their age ranging from 6 to 72 with an average of 40.6.

For 16 ears in the large silicone group (10 ears in the good aeration recovery group and 6 ears in the poor group) and 1 ear in the control group, it was noted that our unique large-sized silicone sheet placed between these two groups (Fisher’s exact probability test, p=0.5934).

DISCUSSIONS

It was noted that our unique large-sized silicone sheet placed covering the whole middle ear had better effects on recovery of mastoid aeration after surgery than several previous reports regarding the recovery of mastoid aeration with the CT after CWU procedure with or without a silicone sheet [6,8,9].

Although there are several reports regarding the regeneration of the mucosa of the tympanic cavity after surgery in cases that involved staged tympanoplasty with CWU procedure, in which placement of a silicone sheet were performed in the first-stage operation, whereby generally good regeneration of mucosa of the tympanic cavity has been observed [3,4,10], in our present observation with cytokeratin staining, the regeneration of the mucosa was observed frequently, but it was partial in most cases, and regeneration extending from the epitympanum to the mastoid cavity was in only 1 case. Therefore, it is presumed that, when mastoidectomy is performed to remove almost all mastoid air cells and mucosa, it may be difficult or take a considerably long time for such complete regeneration of mucosa in the excavated mastoid as reported by Gamolleti, et al [4,11,12]. Moreover, because no positive correlation was observed between the regeneration of mucosa and the recovery of aeration, it is interesting to assume that the recovery of mastoid aeration due to use of a large-sized silicone sheet is not necessarily caused by good or poor regeneration of mucosa. Although it may be a matter of the silicone sheet preventing healing with adhesion as mentioned above, another important factor for the recovery of aeration may be shrinkage of the exudate and clots retaining within the mastoid due to organization after surgery. This volume decrease due to organization is presumed to passively create an air space around the silicone sheet even without mucosal regeneration on its surface, thus aeration recovers and expands.

REFERENCES