

ORIGINAL RESEARCH—OTOLOGY

Improvements to staged canal wall up tympanoplasty for middle ear cholesteatoma

Yasuyuki Hinohira, MD, PhD, Naoaki Yanagihara, MD, PhD, and Kiyofumi Gyo, MD, PhD, Ehime, Japan

OBJECTIVE: To describe our improvements to staged canal wall up tympanoplasty with mastoidectomy (SCUT) for middle ear cholesteatoma, and to show more successful outcomes of the surgery compared with our data previously reported.

STUDY DESIGN: Retrospective study in a tertiary referral hospital.

SETTING: 78 ears of 76 patients with extensive cholesteatoma were operated on using the improved SCUT between July 1998 and December 2006. Improved SCUT included new techniques such as scutum plasty and mastoid cortex plasty performed in a staged manner.

RESULTS: Only 2 ears showed retraction pocket formation (7.7%) without recurrence in 26 ears followed for more than 5 years. In 48 followed for more than 3 years, frequency of postoperative retraction pocket formation (5/48; 10.4%) was significantly lower compared to our previous results (41/134; 30.6%, $P < 0.01$).

CONCLUSION: Our improvements to SCUT contributed to the decreasing of frequency of postoperative retraction pocket that may lead to cholesteatoma recurrence, although a longer follow-up study is required.

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In the surgical treatment for middle ear cholesteatoma, staged canal wall up tympanoplasty with mastoidectomy (SCUT) to eradicate the disease was proposed in the 1960s.^{1,2} We have consistently applied the SCUT for extensive cholesteatoma cases since 1975, although controversy remains regarding surgical reintervention.³ In our experiences, SCUT is valuable in residual recurrence, but the surgery still has a number of recurrence cases caused by postoperative retraction pocket. To reduce the frequency of postoperative retraction pocket, we have been devising and improving SCUT for the past 30 years.^{4–7} The improvements to SCUT we performed include new techniques such as scutum plasty and mastoid cortex plasty performed in a staged manner, and also include use of endoscopy and mastoid cavity obliteration.

In this study, we describe our improvements to SCUT and present surgical outcomes compared with our data⁵ previously reported.

PATIENTS

Between July 1998 and December 2006, 160 ears with attic cholesteatoma, which have no history of previous ear surgery, were operated on at Takanoko Hospital (Table 1). A SCUT was applied to 78 ears of 76 patients, consisting of 36 males and 40 females, age 5 to 74 years (average: 36.5). Seventeen pediatric cases (<15 years old) were included. Microscopic, oto-endoscopic, audiometric, and computed tomography (CT) scan examinations were performed pre-operatively in all patients.

Operative indications for the use of this procedure were determined as follows: 1) cholesteatoma involves both the ossicles and the mastoid cavity; 2) the extent of bone destruction of the posterior ear canal due to cholesteatoma invasion does not exceed approximately one half of the bony canal; 3) residual diseases are suspicious especially in the tympanic sinus, around the stapes, and/or in the epitympanum.

For 56 small attic cholesteatoma ears, a 1-stage canal wall up tympanoplasty or tympanomastoidectomy not requiring a second-look operation was applied. In 26 ears with more advanced cholesteatoma having extensive bone destruction of the posterior ear canal, a canal wall down tympanomastoidectomy was performed.

The study protocol was approved by the Ethical Committee of Takanoko Hospital, and informed consent was obtained from all subjects.

SURGICAL METHODS

The operation was usually performed under local anesthesia except in pediatric cases.

First-stage operation

The bony external ear canal and the mastoid cortex bone are exposed by retroauricular incision. Removal of the cholesteatoma matrix is performed using a combination of techniques

Received June 21, 2007; revised August 16, 2007; accepted September 12, 2007.

Table 1
Cholesteatoma surgeries at Takanoko Hospital
(7/1998-12/2006)

1-stage canal wall up tympanoplasty	56 (35.0%)
Staged canal wall up tympanoplasty	78 (48.8%)
Canal wall down tympanoplasty	26 (16.2%)
Total	160 (100%)

such as transcanal and transmastoid approaches. The head of the malleus and the incus are usually removed due to involvement of cholesteatoma following posterior hypotympanotomy. A 30° or 70° angled endoscope is used to ensure removal of cholesteatoma matrix. A piece of silastic sheet, 0.5 mm thick, is placed to prevent adhesion of the repaired tympanic membrane (Fig 1A). This sheet is glued to the bone bridge posteriorly with bone pate (Fig 1B) collected during mastoidectomy using a pate collector by Sheehy, and is left in place until the second-stage operation. Double drain tubes support the silastic sheet and are always inserted for 7 to 10 days (Fig 1B). This is performed for temporary fixation of the silastic sheet and for tympanic cavity drainage of blood or secretions that are present after the procedure. Following silastic sheet placement, the scutum defect due to cholesteatoma invasion is repaired using bone pate.⁷ Bone pate is spread on the sheet a little at a time until completion (Fig 1C). The attic bony wall is smoothed out as much as possible to facilitate epithelial migration from the eardrum to the external ear canal. Myringoplasty is performed

using a piece of temporal fascia. The mastoid cortex bone is reconstructed⁶ using bone pate (Fig 1D).

Second-stage operation

At 1 year after the first-stage operation, a second-stage operation is performed. Endoscope-assisted exploration of the residual cholesteatoma matrix is performed using combined techniques as in the first-stage operation (Fig 2A and B). Scar tissue and pathological mucosa in the mastoid cavity are removed, if any. Tympanic cavity mucosa is preserved as much as possible, even if diseased. The scutum reconstructed in the first-stage operation is examined (Fig 2C). Reformation of the scutum is performed if necessary, using bone pate or a burr. Ossicular reconstruction is performed using hydroxyapatite prosthesis. A piece of thinly sliced auricular cartilage is placed on top of the prosthesis to prevent extrusion (Fig 2D). The edge of the cartilage piece is connected to the scutum to obtain a smoother wall. In cases with an aerated mastoid cavity, mastoid cortex plasty is performed again. If the mastoid cavity is not aerated, mastoid obliteration is performed with bone pate and hydroxyapatite granules.

RESULTS

Neither intraoperative complications nor postoperative troubles, such as eardrum perforations, infections, or extrusion of prosthesis were noted in any patients for the follow-up period.

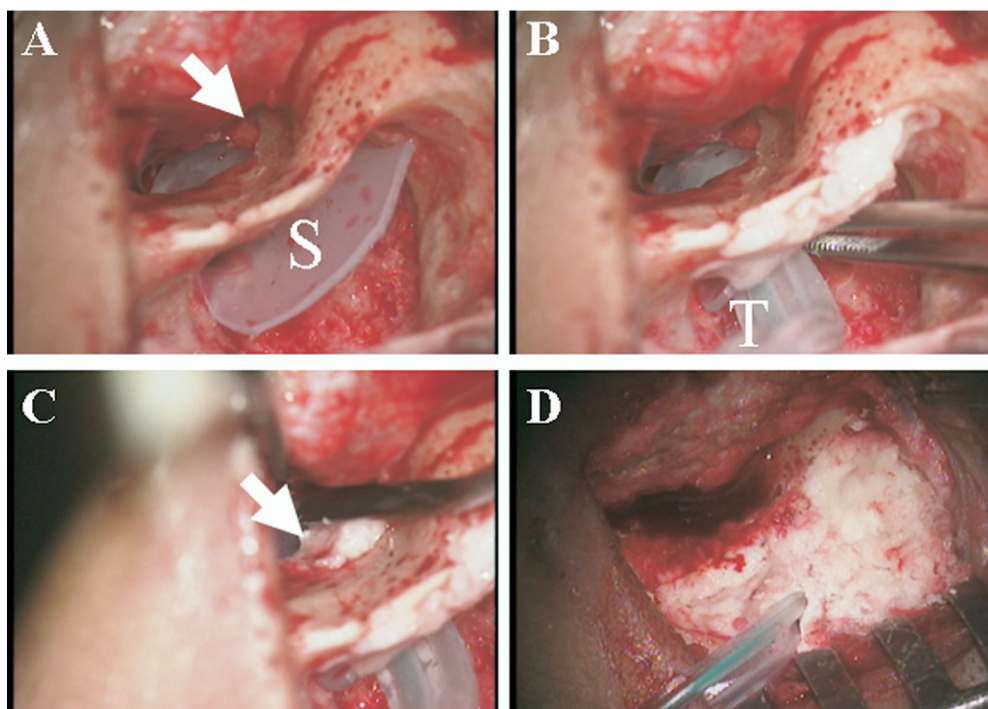


Figure 1 Surgical procedures at the first-stage operation (left ear). (A) A piece of silastic sheet is inserted. White arrow indicates the scutum defect. (B) Temporary drainage tubes are inserted. The silastic sheet is glued with bone pate onto the ear canal posteriorly. (C) Bone pate is used to smoothly repair the scutum bony defect. Bone pate (white arrow) is spread on the silastic sheet and is then glued. (D) Bone pate is also used to smoothly repair mastoid cortex defect. S, silastic sheet; T, double drain tubes.

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