The Z-Meatoplasty for Modified Radical Mastoidectomy in Children

David E. Tunkel, MD

Objective: To determine the effectiveness of the Z-meatoplasty technique for enlargement of the external auditory meatus of children undergoing modified radical mastoidectomy.

Design: Case series.

Setting: Pediatric otolaryngology practice in an academic setting.

Patients: Consecutive sample of children (≤18 years old) who had undergone modified radical mastoidectomy performed by the author from 1995 to 2005.

Intervention: Z-meatoplasty technique used as part of modified radical mastoidectomy.

Main Outcome Measure: Development of postoperative stenosis of the external auditory meatus that required additional surgery.

Results: A total of 28 children and 29 ears were treated with modified radical mastoidectomy during the study period. The Z-meatoplasty was used in 24 ears, and 3 (12.5%) required revision meatoplasty for meatal stenosis. Twenty-one ears (87.5%) treated with Z-meatoplasty had excellent healing and cosmesis without stenosis, during a mean follow-up period of 40 months.

Conclusion: The Z-meatoplasty is an effective technique for use during modified radical mastoidectomy to treat children with cholesteatoma.


Modified radical mastoidectomy remains an effective procedure to remove or exteriorize cholesteatoma. Such “canal-wall down” procedures are usually used in patients who have extensive cholesteatoma or recurrence of cholesteatoma after intact canal-wall tympanomastoid surgery. Modified radical mastoidectomy is also used to treat ears with impending complications (lateral semicircular canal fistula or fallopian canal erosion) or anatomic issues that limit the intact canal-wall approach (eg, poor mastoid pneumatization, anteriorly placed lateral dural sinus, or low-lying middle fossa plate). Host factors, such as deafness in the contralateral ear, potential for poor postoperative follow-up, and ongoing eustachian tube dysfunction may favor the canal-wall down approach to treat cholesteatoma.

I have used the Z-meatoplasty to enlarge the external auditory meatus of children undergoing modified radical mastoidectomy. This procedure uses an incision that runs in 3 dimensions to reduce the potential for stenosis. Two skin flaps are transposed after removal of cartilage and soft tissue to reduce the raw surface area and amount of exposed cartilage.

The technique is described, my results reported, and the advantages of this procedure are discussed.

METHODS

Medical records of children (age, ≤18 years) who had undergone mastoidectomy performed by the author from 1995 to 2005 were reviewed. Patients who had modified radical mastoidectomy were identified. Demographic information including age at surgery, sex, side of surgery, and duration of follow-up was recorded. The method of meatoplasty was recorded (Z-meatoplasty or other). Indications for surgery, whether surgery was primary or revision, were also recorded.
Complications of Z-meatoplasty were analyzed, specifically the need for revision meatoplasty.

This study was reviewed by the institutional review board at Johns Hopkins University School of Medicine (Baltimore, Md) and was considered exempt under Department of Health and Human Services category 45CFR 46.404.

SURGICAL TECHNIQUE

The meatoplasty is performed after all mastoid dissection and tympanoplasty surgery has been completed. All procedures were performed through a postauricular incision. A skin incision is made along the posterior and inferior conchal borders, along the posterior ear canal meatus (Figure 1). A flap of conchal skin is lifted just above the perichondrial layer, based posterosuperiorly (Figure 2). The skin of the posterior cartilaginous ear canal is then dissected off underlying cartilage and soft tissue, and then this canal skin flap is released superiorly to create an inferiorly based flap of ear canal skin (Figure 3). The conchal cartilage is excised, and underlying soft tissue is either excised or incised to create a large meatus (Figure 4). The conchal skin flap is rotated medially and tacked with absorbable suture to the soft tissue on the deep surface of the pinna, and the flap of posterior canal skin is rotated almost 90° and sutured to the skin edge of the inferior conchal cut (Figure 5). The cavity is filled with antibiotic ointment through the meatus (Figure 6). A loose nonadherent packing can be used if hemostasis is required. The postauricular incision is then closed.

Oral antibiotics are administered for 5 to 7 days after surgery. If a meatal packing is placed, it is removed during the first postoperative week.

RESULTS

Twenty-eight children and 29 ears underwent modified radical mastoidectomy during the study period. Twenty patients were male, and 8 were female. Surgery was performed on 17 left ears and 12 right ears. The median age of the patients at surgery was 10 years (range, 2.5-16 years).

All modified radical mastoidectomy procedures were performed for cholesteatoma. Eight were primary procedures for cholesteatoma, with extensive disease or anatomic factors dictating the need for canal-wall down surgery. Twenty-one procedures were revision procedures (either second or third operations), and canal-wall down surgery was performed for recurrence or persistence of cholesteatoma. The mean length of follow-up was 40
months (range, 5-78 months), but 2 patients were lost to follow-up approximately 2 years after surgery.

Twenty-four (83%) of these 29 ears had Z-meatoplasty performed. Five ears had been previously treated with other methods of meatoplasty, all of which had left the conchal anatomy unsuitable for Z-meatoplasty. Three (12.5%) of the 24 ears that were treated with Z-meatoplasty required additional surgery to revise the meatus during the follow-up period. One of these ears had a postoperative perichondritis that resolved with local care and oral antibiotics, and 1 developed a keloid at the meatus. All 3 ears that required revision developed stenosis within 2 months of surgery. Aside from the 1 patient with postoperative infection and the other with hypertrophic scar formation, no other factors were identified to predict failure of the Z-meatoplasty technique.

The appearance of the meatus and pinna after Z-meatoplasty is shown in Figure 7. These ears are easy to examine and debride with the use of simple otologic tools and an operating microscope.

COMMENT

Successful control of cholesteatoma and chronic infection with open cavity mastoid procedures requires a well-ventilated, accessible mastoid cavity. Creation of a large meatus is a key component of such surgery. Meatoplasty requires removal of soft tissue and cartilage while avoiding raw tissue surfaces that may lead to granulation tissue and stenosis. Techniques of meatoplasty have included some combination of transposed skin flaps, removal of conchal cartilage, removal of cartilage from the tragus or the floor of the ear canal, and use of conchomastoid su-
tures or metatal packing to maintain a large metatal diam-
eter.3-6

The Z-meatoplasty has been described as a method to
enlarge the external auditory meatus by rotating 2 skin
flaps after removal of conchal cartilage and soft tissue.7
This technique reduces the amount of raw surface by pri-
mary closure of the rotated flaps. The need for packing
is reduced, and conchomastoid sutures are unnecessary
because the large meatus is tension-free. Murray et al8
describe the use of this technique in 32 patients, after ca-
nal-wall down mastoidectomy that was performed us-
ing an endaural incision. There was no stenosis seen in
this series, although 1 patient required revision of a hy-
pertrophic scar.

The success rate for meatoplasty of any method, spe-
cifically with regard to restenosis, is not well docu-
mented in the literature. The wide variety of techniques
described to enlarge the external auditory meatus sug-
gests that restenosis may be more common than the lit-
erature suggests. One series of patients who had under-
gone canal-wall down mastoidectomy in New Guinea,
where postoperative follow-up is minimal, reports a 12%
to 20% rate of revision meatoplasty.6 Aggressive postop-
erative treatment of granulation may reduce the rate of
stenosis after meatoplasty.

To my knowledge, the series reported herein is the first
series of children treated with Z-meatoplasty and the first
series that reports the use of Z-meatoplasty with the pos-
tauricular mastoid approach. The 88% success rate and
elegant cosmesis are comparable with or perhaps bet-
ter than other techniques of meatoplasty. This tech-
nique should be considered for use in children who re-
quire canal-wall down mastoid surgery to control
cholesteatoma.

Submitted for Publication: February 17, 2006; final re-
vision received March 29, 2006; accepted April 22, 2006.
Correspondence: David E. Tunkel, MD, Johns Hopkins
Outpatient Center, Room 6231, 601 N Caroline St, Balti-
more, MD 21287-0910 (dtunkel@jhmi.edu).

Author Contributions: Dr Tunkel had full access to all
the data in the study and takes responsibility for the in-
tegrity of the data and the accuracy of the data analysis.

Financial Disclosure: None reported.

Previous Presentation: This study was presented in part
at the annual meeting of the Society for Ear, Nose, Throat
Advances in Children; December 4, 2005; Baltimore.

1. Lambert PR, Dodson EE, Hashisaki G. Intact canal wall versus canal wall down
mastoidectomy. In: Lalwani AK, Grundfast KM, eds. Pediatric Otology and Neu-
2. Jackson CG, Glasscock ME, Nissen AJ, Schwaber MK, Bojrab DI. Open mastoid
procedures: contemporary indications and surgical technique. Laryngoscope. 1985;
95:1037-1043.
3. Fisch U. Tympanoplasty, Mastoidectomy, and Stapedectomy. New York, NY:
4. Suskind DL, Bigelow CD, Knox GW. Y modification of the Fisch meatoplasty. Oto-
5. Eisenman DJ, Parisier SC. Meatoplasty: the cartilage of the floor of the ear canal.
6. Raut VV, Rokta JA. The Toronto meatoplasty: enhancing one’s results in canal
108:1421-1422.
8. Murray DP, Jassar P, Lee MSW, Veitch DY. Z-meatoplasty technique in endaural