Utility of Non-EPI DWI MRI in the Management of Pediatric Cholesteatoma

Sreenivasa Murthy T.M.¹  Anjali Nagadi²  Sneha Krishna Mohan³

¹Department of ENT, Columbia Asia Referral Hospital, Yeshwanthpur, Karnataka, India
²Department of Radiology, Columbia Asia Referral Hospital, Yeshwanthpur, Karnataka, India
³Department of Otorhinolaryngology, Columbia Asia Referral Hospital, Yeshwanthpur, Karnataka, India

Address for correspondence: Sreenivasa Murthy TM, MBBS, PG Diploma, DNB, Department of ENT, Columbia Asia Referral Hospital, Yeshwanthpur 560055, Karnataka, India (e-mail: tmsreemurthy@gmail.com).

Abstract

Introduction  Cholesteatoma in children can be acquired or congenital and is generally extensive. The most commonly used technique for the removal of cholesteatoma is intact canal wall mastoidectomy. This invariably leads to second-look surgery to assess for recurrence or residual cholesteatoma. Magnetic resonance imaging (MRI) with non–echo-planar imaging (non-EPI) diffusion-weighted imaging (DWI) is an accurate noninvasive imaging option that can be used in diagnosing primary cholesteatoma. This can also be used to diagnose residual or recurrent cholesteatoma in patients who have undergone intact canal wall mastoidectomy.

Case Report  A 7-year-old male patient presented with a 1-week history of foul-smelling discharge from the right ear. On examination, a polypoidal mass with keratinized debris was seen. A diagnosis of cholesteatoma of right ear was made. Imaging with high-resolution computed tomography (HRCT) of the temporal bone and non-EPI DWI MRI confirmed the same. The child underwent an intact canal wall mastoidectomy and was followed up at 2 years with non-EPI DWI MRI to monitor any residual or recurrent cholesteatoma.

Conclusion  Non-EPI DWI MRI provides a convenient, accurate, and noninvasive method of evaluating and monitoring for residual or recurrent cholesteatoma and thus helps avoid unnecessary second-look surgery.

Keywords

- non-EPI DWI MRI
- high-resolution computed tomography
- relook surgery

Introduction

Cholesteatoma in children can be congenital or acquired.¹ It is generally extensive because of the anatomy of mastoid that is usually diploic or cellular.²⁻³ The traditional treatment of cholesteatoma is a canal wall down (CWD) mastoidectomy that results in a large cavity with its associated problems. To circumvent the problems of cavity, an alternative option is intact canal wall (ICW) mastoidectomy. The disadvantage of ICW technique is the possibility of recurrence or residual cholesteatoma that further requires a relook surgery at regular intervals.⁴⁻⁵ Imaging with high-resolution computed tomography (HRCT) as a noninvasive modality offers limited information about specificity regarding cholesteatoma in the postoperative setting.⁶ Magnetic resonance imaging (MRI) with non–echo-planar imaging (non-EPI) diffusion-weighted imaging (DWI) is a noninvasive option for diagnosing and predicting the extent of cholesteatoma as well as monitoring postoperative residual or recurrent cholesteatoma.⁷

We present a case of a 7-year-old child with extensive cholesteatoma managed with ICW technique and monitored using this non-EPI DWI MRI.

Case Report

A 7-year-old male patient presented with history of foul-smelling discharge from the right ear. On examination under microscope, he was found to have a polypoidal mass in...
the right external auditory canal, which after excision showed
a retraction pocket in the attic area with keratinizing debris.
The left ear was normal. A diagnosis of right ear chronic
suppurative otitis media with suspicion of cholesteatoma
was made. HRCT of the temporal bone revealed opacifica-
tion of the right middle ear cavity, predominantly in the
epitympanum, contiguously extending through aditus ad
antrum into the mastoid with complete opacification of
mastoïd air cells. There was truncation of the scutum and
widening of Prussak’s space. Erosion of the body, short and
long process of the incus with mild truncation of the head
of the malleus was seen. The stapes was normal (►Fig. 1).
A non-EPI DWI MRI revealed a 5 × 6 × 7 mm (AP × T × CC) focus
of diffusion restriction in the middle ear and another contig-
uous 9 × 6 × 10 mm (AP × T × CC) focus of diffusion restric-
tion in the mastoid (►Fig. 2). Appearances were consistent
with a large cholesteatoma with ossicular chain erosion. Pure
tone audiometry (PTA) showed minimal conductive hearing
loss in the right ear (mean PTA: -23.30 dBHL). The patient
was offered the options of CWD mastoidectomy or ICW
mastoidectomy and tympanoplasty, followed by frequent
follow-up visits and MRI screening for residual or recurrent
cholesteatoma. The parents opted for an ICW mastoidecto-
my, and the patient underwent the procedure. Intraoperative
findings showed cholesteatoma in the attic that was found
filling the posterior two-thirds of mesotympanum and facial
recess with no extension into the anterior epitympanum. The
incus was absent, malleus was partially eroded, and stapes
was found intact. Intraoperative findings correlated with
the non-EPI DWI MRI findings. The immediate postopera-
tive period was uneventful. Postoperatively, the patient
was followed up clinically after 1 month. Examination under
the microscope showed an intact neotympanum and no evidence
of cholesteatoma, and postoperative audiogram showed
mean AC threshold at 36.60 dBHL in the right ear. The patient
was followed up at 2 years with HRCT and non-EPI DWI MRI
for any evidence of residual or recurrent cholesteatoma. The
studies demonstrated the right canal wall up mastoidectomy
cavity with no evidence of restricted diffusion to suggest
residual or recurrent cholesteatoma (►Figs. 3, 4). The patient
is asymptomatic and continues on clinical follow-up.

Discussion and Conclusion

Cholesteatoma in the pediatric population is aggressive
and requires early management to avoid complications.
Diagnosis was based on clinical examination and HRCT of the
temporal bones to determine extent of the cholesteatoma.
Once diagnosed, cholesteatoma removal was done by
either the more conventional CWD procedure or the more
recent ICW mastoidectomy. Because the conventional CWD
mastoidectomy involved extensive dissection and postopera-
tive cavity issues, there is a paradigm shift toward preserving
the posterior canal wall and offering ICW mastoidectomy for
patients with cholesteatoma. Literature review demonstrates
a very high rate of recurrence or recidivism. The incidence of recurrence and residual cholesteatoma was comparatively higher among patients who underwent ICW mastoidectomy compared with those who underwent CWD mastoidectomy. ICW mastoidectomy requires regular follow-ups and screening for such a recurrence. Traditionally, second-look revision surgery was the most common technique for assessment of recurrence. This meant a mandatory second surgery, and often it was found that the revision surgery was unnecessary as no disease was found. Non-EPI DWI MRI provided a very convenient, less invasive, and an accurate method to evaluate such a recurrence, thereby circumventing the need for invasive methods.

Conflict of Interest
None declared.

References

Fig. 3 Follow-up HRCT at 2 years demonstrating a right intact canal wall mastoidectomy with minor right middle ear linear opacities but no mastoid cavity opacification. HRCT, high-resolution computed tomography.

Fig. 4 Axial and coronal non-EPI DWI (T2 HASTE) at the 2-year follow-up demonstrating no foci of restricted diffusion in the right middle ear and mastoid. EPI DWI, echo-planar imaging diffusion-weighted imaging.