

Differentiation between cholesteatoma and inflammatory process of the middle ear, based on contrast-enhanced computed tomography imaging *J Laryngol Otol* 2007; 121:444–8

Dear Sirs,

We have read with interest the paper ‘Differentiation between cholesteatoma and inflammatory process of the middle ear, based on contrast-enhanced computed tomography imaging’ by A Trojanowska *et al.*¹ Numerous articles have demonstrated the strength of magnetic resonance imaging (MRI) – including delayed post-gadolinium T1-weighted images² and/or echo-planar diffusion-weighted images in demonstrating middle-ear cholesteatoma.³ In an era of increasing interest in reducing patient irradiation, it is puzzling to see that the 17 selected patients had three consecutive computed tomography (CT) scans for the demonstration of a residual or recurrent cholesteatoma, without approval by an ethical committee. Recently, the strength of echo-planar diffusion-weighted images in the diagnosis of acquired middle-ear cholesteatoma has been described.³ However, the value of echo-planar diffusion-weighted images remains limited in the diagnosis of pre-second-look residual cholesteatoma, due to the often very small size of these residual cholesteatomas.³ The size limit for detection of middle-ear cholesteatoma in this paper has been set on 5 mm. Moreover, recent reports have highlighted the additional value of non-echo-planar diffusion-weighted sequences in the demonstration of middle-ear cholesteatoma.^{4,5} Non-echo-planar diffusion-weighted images sequences are able to demonstrate cholesteatoma with a size limit of 5 mm.⁴ We reported our preliminary findings on a new non-echo-planar diffusion-weighted images sequence with a higher resolution and a complete lack of artifacts, which look very promising for demonstration of middle-ear cholesteatoma.⁵ The most challenging task for radiologists still remains the differentiation of a completely opacified mastoidectomy cavity. We would like to illustrate the strength of this new non-echo-planar diffusion-weighted images sequence and its value compared to CT in two cases (three ears).

Case one: A 56-year-old male with prior surgery for cholesteatoma on the left side presented for pre-second-look evaluation. On axial high resolution CT, it is virtually impossible to differentiate the entirely opacified middle ear (Figure 1) and mastoidectomy cavity (Figure 2). On late post-gadolinium enhanced T1-weighted image a hypointense non enhancing tissue in the middle ear was laterally delineated by the enhancing tympanic membrane (Figure 3). A clear hyperintense aspect of the middle ear was seen on T2-weighted images. On the axial late post-gadolinium enhanced T1-weighted image a completely enhancing mastoidectomy cavity was seen (Figure 4). The coronal non-echo-planar diffusion-weighted images revealed a complete lack of hyperintensity, excluding the presence of a cholesteatoma (Figure 5). At surgery, glue was found in the middle ear and scar and granulation tissue was found in the mastoidectomy cavity. The presence of glue explains the non-enhancement of the material in the

middle ear. On standard MRI sequences as well as on CT – even enhanced – this lesion can easily be misdiagnosed as a cholesteatoma due to the lack of enhancement. In this case,

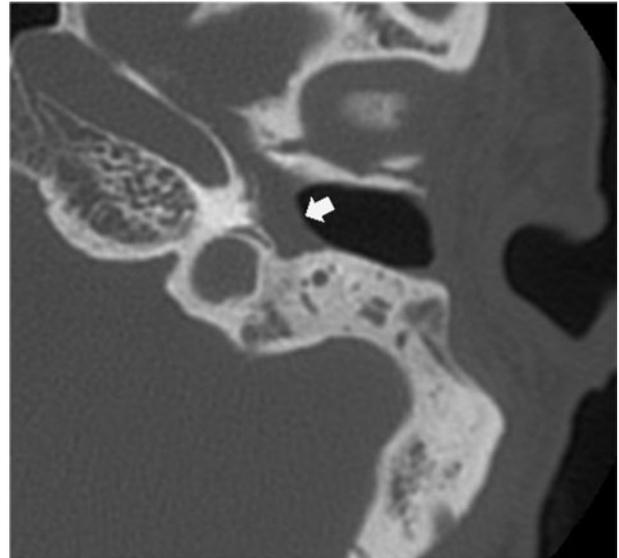


FIG. 1

Case one: axial high resolution CT: it is virtually impossible to differentiate the entirely opacified middle ear (arrow).

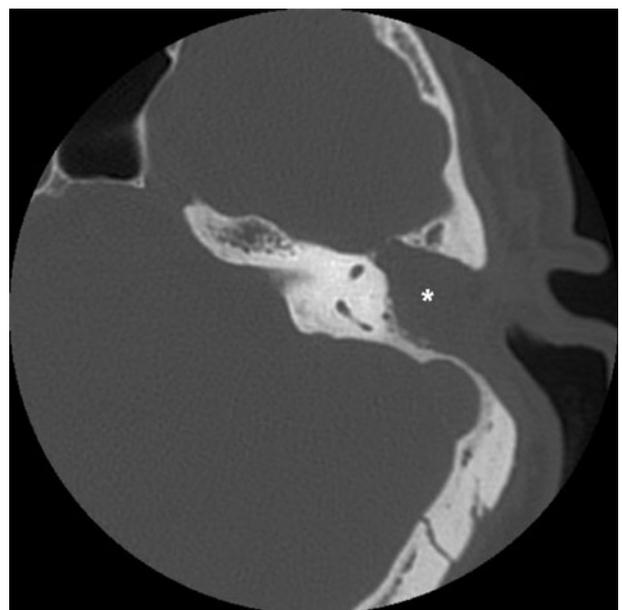


FIG. 2

Case one: axial high resolution CT: it is virtually impossible to differentiate the mastoidectomy cavity (asterisk).

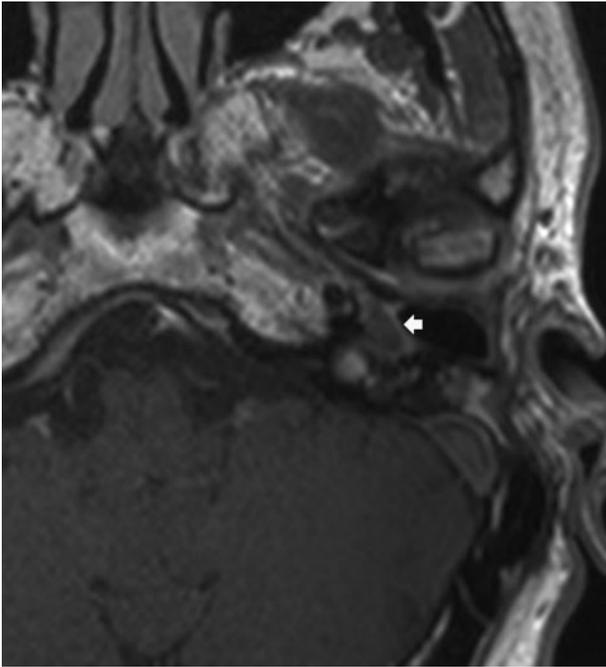


FIG. 3

Case one: late post gadolinium enhanced T1-weighted image showing hypointense non-enhancing tissue in the middle ear, laterally delineated by the enhancing tympanic membrane (arrow).

only the non-echo-planar diffusion-weighted images gave the solution, excluding the presence of cholesteatoma.

Case two: A 40-year-old female with prior surgery for cholesteatoma on the right side four years ago and on the left side one years ago. Axial CT shows a modified radical mastoidectomy on the right side with irregular peripheral soft tissue density, anterior to the sigmoid plate

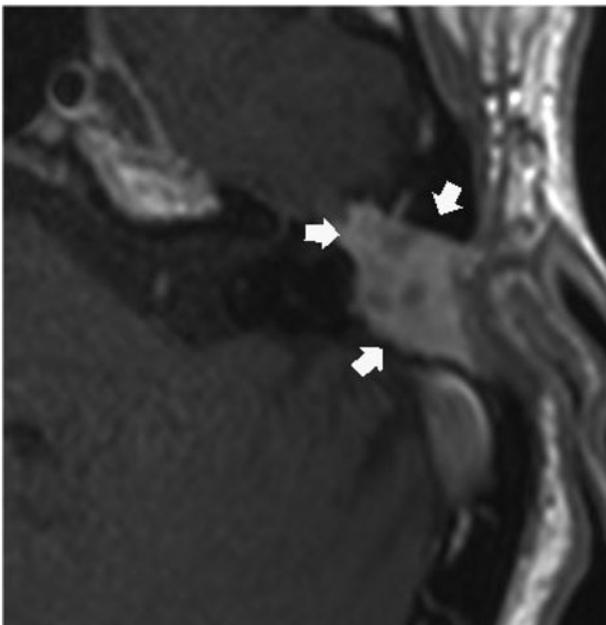


FIG. 4

Case one: axial late post-gadolinium enhanced T1-weighted image showing a completely enhancing mastoidectomy cavity (arrows).

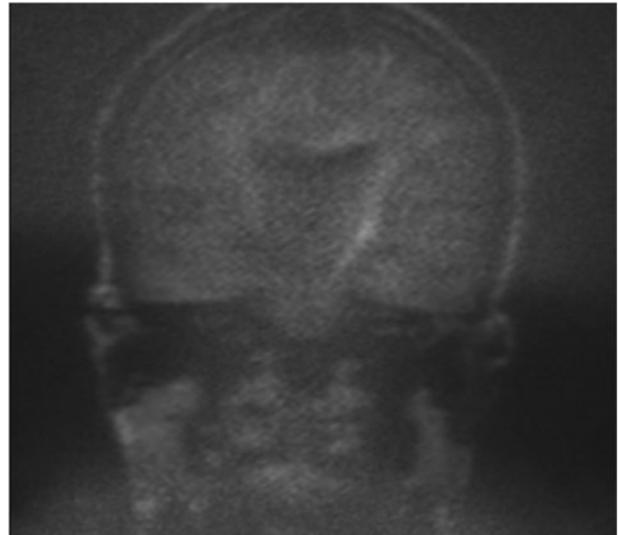


FIG. 5

Case one: The coronal non-echo-planar diffusion-weighted images revealing a complete lack of hyperintensity, excluding the presence of a cholesteatoma.

(Figure 6). The coronal non-echo-planar diffusion-weighted images sequence clearly shows an oval 0.9 cm large hyperintensity in the flow void region of the right temporal bone (Figure 7). It corresponds to a non-enhancing recurrent cholesteatoma just anterior to the sigmoid sinus on the late post-gadolinium T1-weighted MR image (Figure 8). There was a lot of enhancing inflammatory tissue around the cholesteatoma. Surprisingly, a small nodular hyperintensity under the tegmen was found on the left side (Figure 7). On the late post-gadolinium T1-weighted coronal MR image a small nodular hypointensity was found (Figure 8), corresponding to a small nodular soft tissue density on CT, directly under the tegmen (Figure 9). MRI – both the non-echo-planar

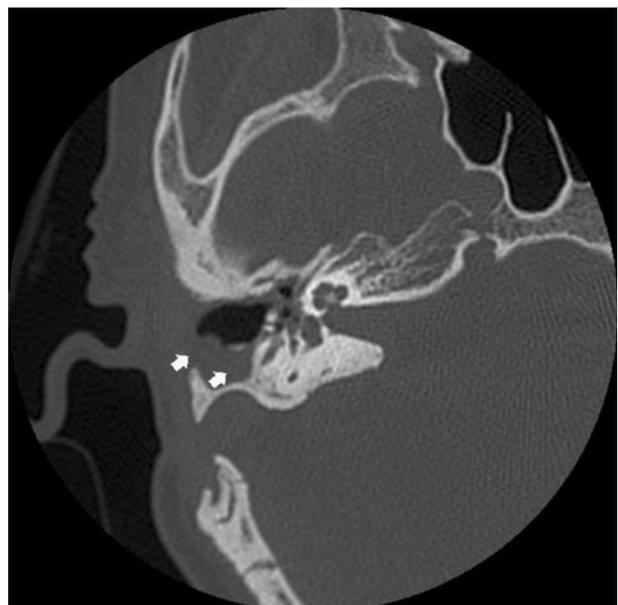


FIG. 6

Case two: axial CT showing a modified radical mastoidectomy on the right side with irregular peripheral soft tissue density (arrows), anterior to the sigmoid plate.

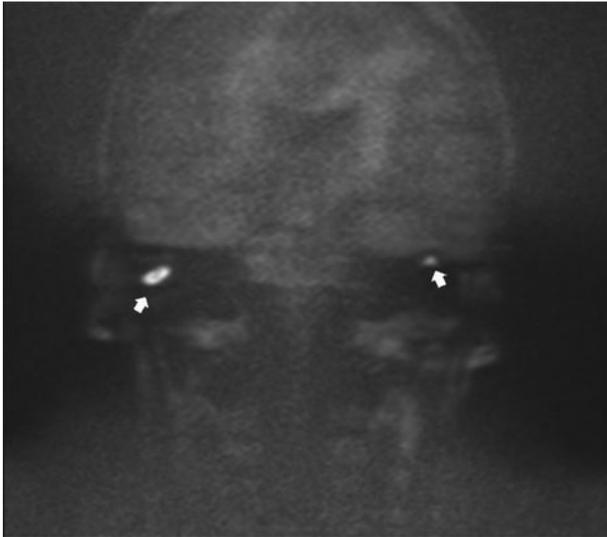


FIG. 7

Case two: the coronal non echo-planar diffusion-weighted images sequence clearly shows an oval 9 mm large hyperintensity (arrow) in the flow void region of the right temporal bone and a 3 mm small hyperintensity on the left side (arrow).

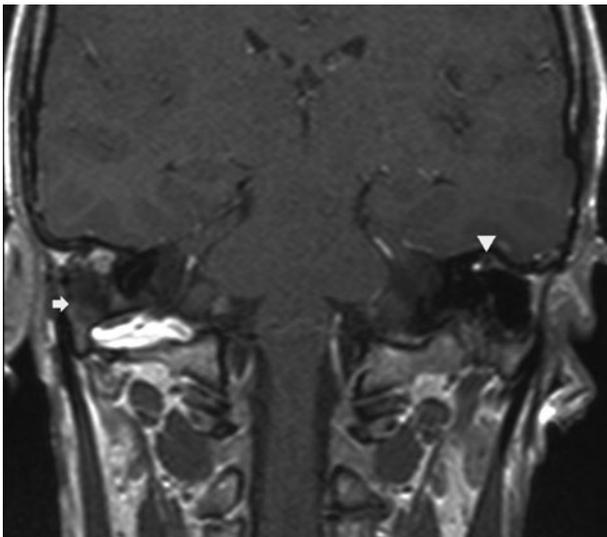


FIG. 8

Case two: late post-gadolinium T1-weighted MR image showing a non-enhancing recurrent cholesteatoma just anterior to the sigmoid sinus on the right side (arrow) and a small nodular hypointense residual cholesteatoma on the left side (arrow head) under the temporal lobe.

diffusion-weighted images and late post-gadolinium T1-weighted images – clearly demonstrated the 9 mm recurrent cholesteatoma on the right side and the 3 mm small residual cholesteatoma on the left side, whereas CT only clearly demonstrated the small residual cholesteatoma on the left side. In our current protocol we use a combination of a non-echo-planar diffusion-weighted images sequence and a late post-gadolinium T1-weighted sequence. We hope that this combination of sequences will be able to demonstrate small residual cholesteatomas pre-second-look as well as (larger) recurrent cholesteatomas in mastoidectomy cavities, avoiding the need for repetitive irradiating CT scans of the middle ear.

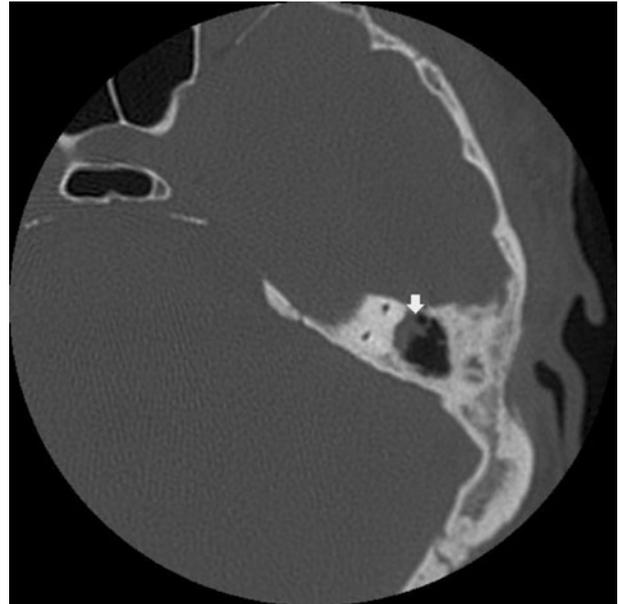


FIG. 9

Case two: CT scan showing small nodular soft tissue density directly under the tegmen (arrow).

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Authors' reply

The authors declined to make a response.