Section: Radiology

Original Research Article

COMPARISION OF MRI IMAGING VS CT IMAGING IN CHOLESTEATOMA AND ITS CORRELATION WITH HISTOPATHOLOGICAL FINDINGS

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Abstract

Background: sac of keratin collection lined by squamous epithelium that enlarges progressively is called as cholesteatoma. Ectopic keratinized epithelial tissues that are growing inside the middle ear cavity result in bone erosion. This can result in destruction of ossicles. There are few more conditions associated with ossicles and bone erosion. As the cholesteatoma is associated with life threatening complications such as labyrinthine fistulas with sensorineural hearing loss and vertigo, facial nerve canal erosion and facial paralysis, and rare intracranial complications, such as meningitis and abscess, Cholesteatoma has to be differentiated from other causes of bone erosion. MRI technique-DWI which is based on the brownian movement of particles within the particular voxel The cholesteatoma shows diffusion restriction due to its keratin content. Tiny lesions can be accurately diagnosed By using non echoplanar imaging, We want to compare the CT and MRI findings and their correlation with histopathology. **Materials and Methods:** Forty patients between 10-60 years of either sex with suspected cholesteatoma both new and postoperative cases were subjected to HRCT temporal bone and MRI in a 3 tesla MR unit (Siemens, SKYRA).

1.Patients in whom otoscopy positive middle ear focal lesion
2.Inconclusive HRCT temporal bone
3.Postoperative patients before second looking surgery. **Result:** Our study confirms MRI has high sensitivity and specificity in diagnosing cholesteatoma and is confirmed with postoperative histopathological reports. DW MRI has 100% sensitivity, 75 % specificity, 97.3% PPV and 100% NPV in detecting cholesteatoma. **Conclusion:** DWI can accurately detect primary cholesteatomas especially in absence of bony erosion in HRCT temporal bone. It can distinguish scar, granulation tissue, and inflammatory changes from cholesteatoma in patients with prior cholesteatoma resection and alleviate the need of second-look surgery in noncholesteatoma patients.

In postoperative cases MRI plays significant role in diagnosing cholesteatomas. DWI can replace the second look surgery, avoiding another surgical morbidity.

INTRODUCTION

A sac of keratin collection lined by squamous epithelium that enlarges progressively is called as cholesteatoma. MRI technique-DWI which is based on the brownian movement of particles within the particular voxel The cholesteatoma shows diffusion restriction due to its keratin content. By using non echoplanar imaging, tiny lesions can be accurately diagnosed.

MATERIALS AND METHODS

Forty patients between 10-60 years of either sex with suspected cholesteatoma both new and postoperative cases were subjected to HRCT temporal bone and MRI in a 3 tesla MR unit (Siemens, SKYRA). There are three groups of patients who are included in our study,

1. Patients in whom otoscopy positive middle ear focal lesion,
2. Inconclusive HRCT temporal bone

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3. Postoperative patients before second looking surgery

The Sequences used

TI & T2 AXIAL AND CORONAL, DWI AXIAL& CORONAL

RESULTS AND DISCUSSION

Patients in whom the otoscopy showing middle ear focal lesions and postoperative patients, patients with inconclusive HRCT are subjected to different MRI sequences such as DWI, HASTE axial images (b-values 0 and 1000 s/mm2). DW images and ADC maps were derived from the software. The results are compared with the postoperative pathological findings. The results were analysed using statistical package. The sensitivity, specificity, negative and positive predictive values are calculated using Wilson score.

HRCT is most useful to identify middle ear soft tissue and ossicular chain, scutum and tegmen tympani erosions and also to identify extent of disease. MRI is useful to confirm the cholesteatoma and also is valuable in facial nerve and semicircular canal involvement.

DWI has high sensitivity and specificity in the diagnosis of cholesteatoma.

In our study 40 patients were included. 28 cases are newly diagnosed cases in whom MRI detects 27 cholesteatoma cases which were confirmed post operatively. In one case it was found to be cholesterol granuloma which MRI detects accurately. 9 Out of 12 post operative cases are diagnosed as cholesteatoma accurately and confirmed by

Post-surgical HPE analysis. Three cases were diagnosed as granulation tissue. Two out of 3 granulation tissue are picked up in the MRI accurately and one lesion is misdiagnosed as cholesteatoma which shows diffusion restriction and low ADC values compared to other cholesteatomas. Most of cholesteatomas show ADC values higher than 0.55, however infected cholesteatoma can show low ADC value. Compared to cholesteatoma, the Granulation tissue shows significantly lower ADC values.

Postoperative Ear

Diffuse mucosal thickening of the middle ear with bony irregularities of the postoperative cases are difficult to evaluate with HRCT or MRI. CT can identify soft tissue mass but cannot differentiate between granulation tissue and cholesteatoma.

CT is not useful if there is no bone/ossicular erosion.

Cholesteatoma shows diffusion restriction with low ADC values whereas granulation tissue not shows diffusion restriction.

Second look surgery can be avoided if there is no cholesteatoma.

MRI with DWI accurately diagnose all the cases of cholesteatoma in postoperative cases and has high sensitivity and specificity. Smallest lesion detected in our study is 4 mm.

Results

Our study confirms MRI has high sensitivity and specificity in diagnosing cholesteatoma and is confirmed with postoperative histopathological reports. Smallest lesion detected in our study is 4 mm.

DW MRI has 100% sensitivity, 75 % specificity, 97.3% PPV and 100% NPV in detecting cholesteatoma.

Hence the MRI is more accurate than HRCT temporal bone in diagnosing cholesteatomas.

DWI can replace the second look surgery, avoiding another surgical morbidity.

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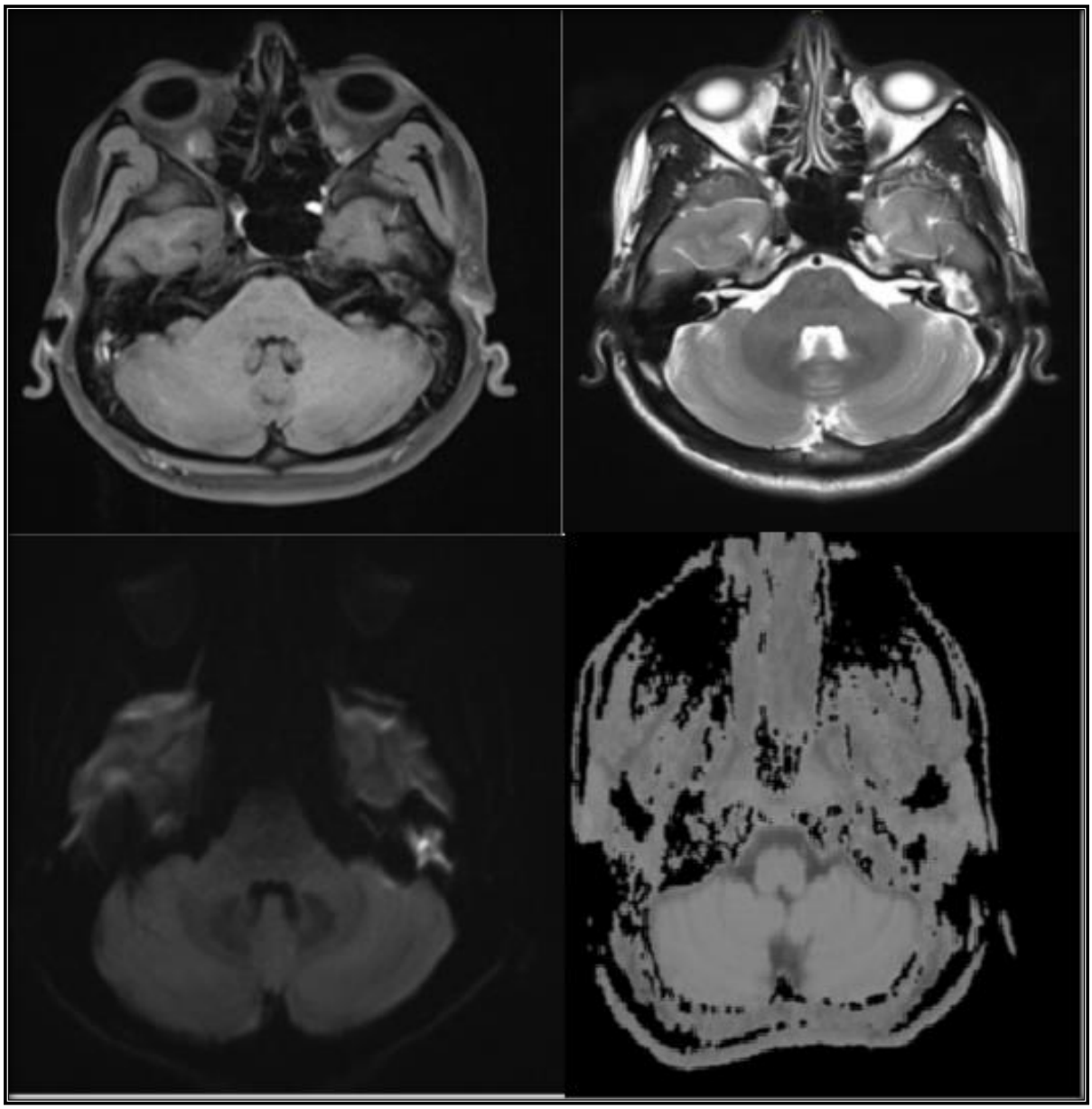

Lesion noted in the left middle ear has low signal on T1 images, high signal on T2 images and showing diffusion restriction with corresponding low ADC values - 0.59 x 10- 3 mm2/s and the provisional diagnosis of cholesteatoma was made. Patient was taken for surgery and removal of middle ear mass done and specimen sent for istopathological analysis. HPE

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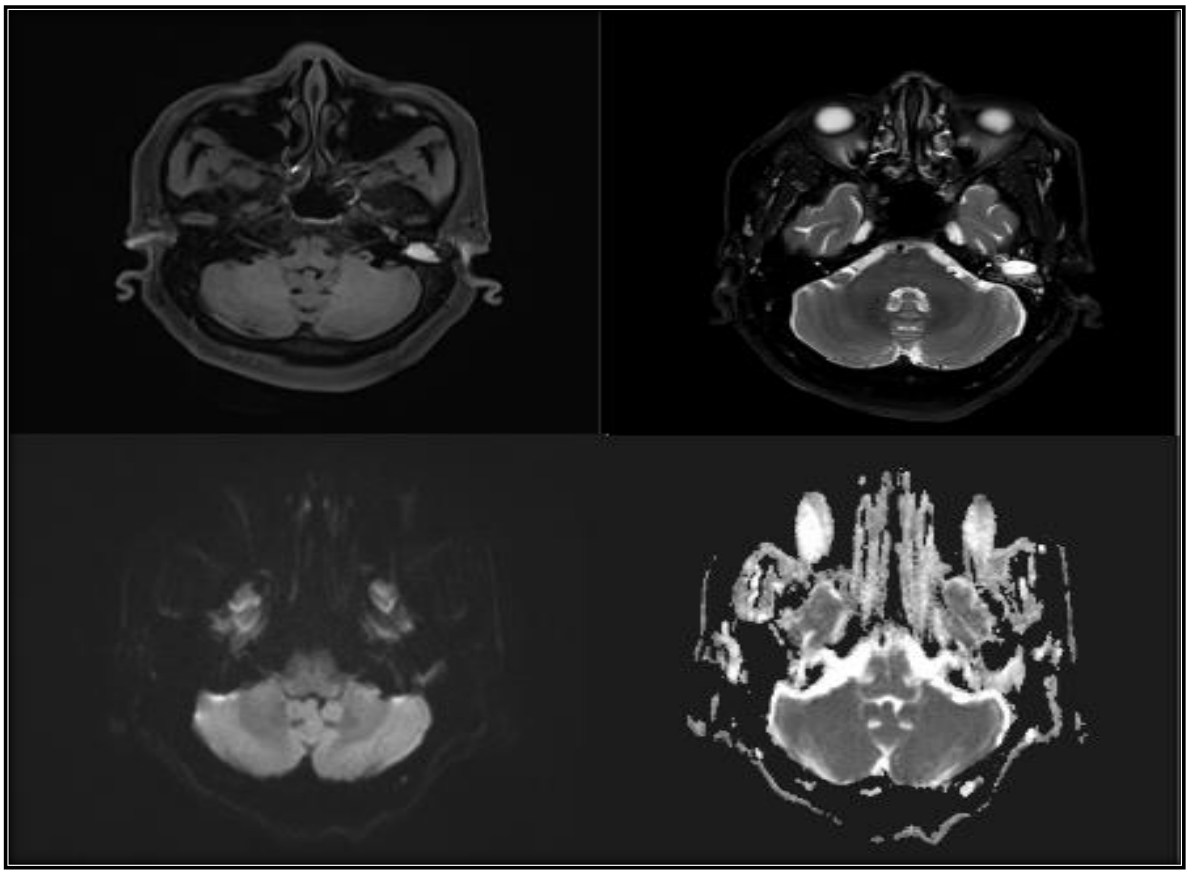
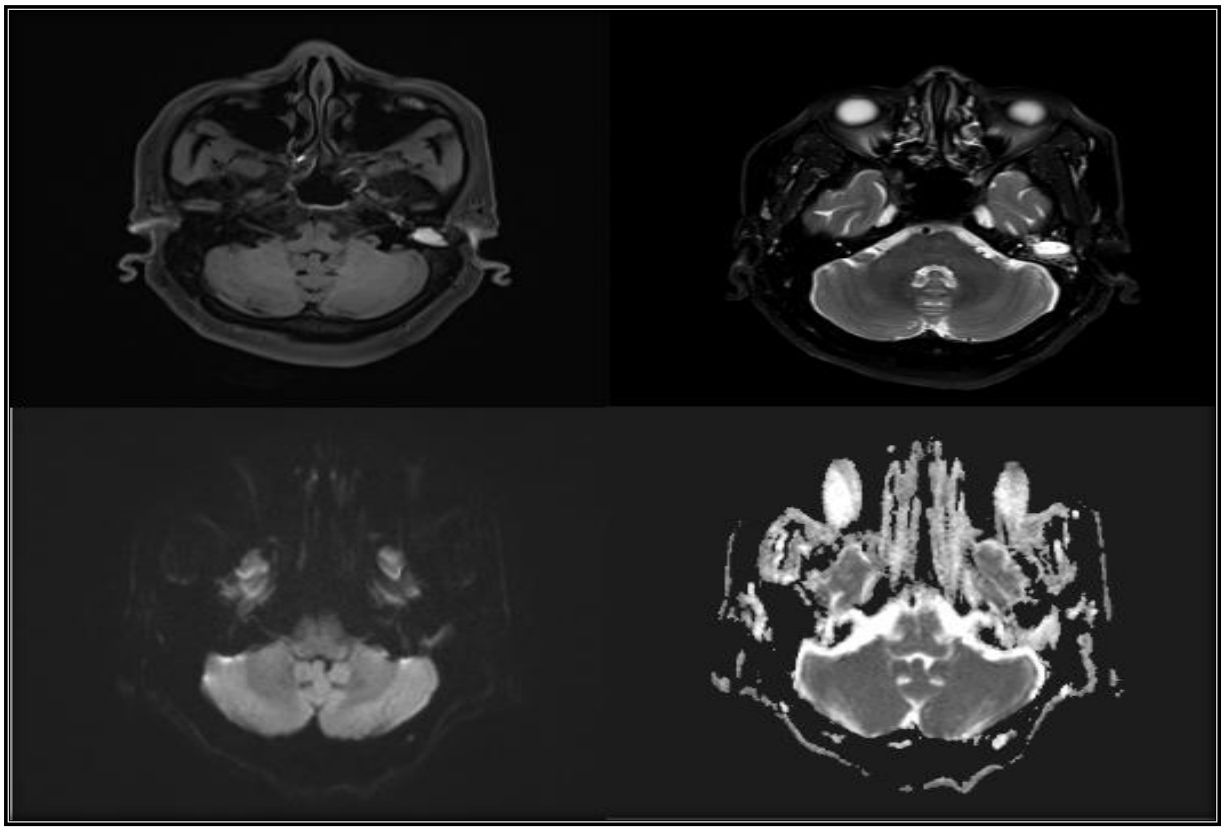


Lesion appears hyperintense both in T1 and T2 sequences and doesnot shows diffusion restriction with ADC value - 0.45x 10-3 mm2/s and diagnosis of granulation tissue was made which was subsequently confirmed by postoperative histopathological analysis.



Lesion appears hyperintense on T1, T2 and FLAIR sequences and hypointense in DWI and hyperintense in ADC sequences. ADC value is 1.9 x 10-3 mm2/s. Since no history of previous surgeries diagnosis of cholesterol granuloma made out. Postsurgical HPE analysis confirms the diagnosis.

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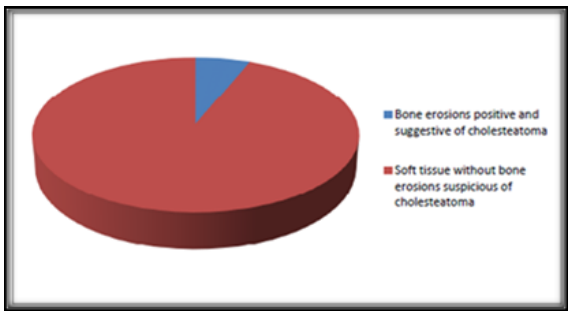
Report of HRCT scan of patients in the study

CT	N	Percentage
Bone erosions positive suggestive of cholesteatoma	29	72.5%
Bone erosions negative and suspicious of cholesteatoma	11	27.5%
Total	40	100%



Bar diagram shows Report of HRCT scan of patients in the study

Diagnostic evaluation of CT in pre and post operative cases with Histopathological report (HPE)

CT (Pre+post operative)	HPE Positive	HPE Negative	Total
CT with bone erosion	27	1	28
CT with out bone erosion	9	3	12
Total	36	4	40

Diagnostic evaluation of DWI with Histopathological report (HPE)

DWI	HPE Positive	HPE Negative	Total
Restricted	36	1	37
Not restricted	0	3	3
Total	36	4	40

DWI: Diffusion weighted image,

CONCLUSION

DWI can accurately detect primary cholesteatomas especially in absence of bony erosion in HRCT temporal bone. It can distinguish scar, granulation tissue, and inflammatory changes from cholesteatoma in patients with prior cholesteatoma resection and alleviate the need of second-look surgery in noncholesteatoma patients. DWI is superior to conventional T2 sequence in detecting the cholesteatomas. HRCT and MRI are complementary to each other in diagnosing cholesteatomas. In preoperative cases HRCT has high diagnostic accuracy and MRI is usually used to confirm the diagnosis whereas in postoperative cases HRCT is highly nonspecific and MRI plays significant role in diagnosing cholesteatomas. DWI can replace the second look surgery, avoiding another surgical morbidity.

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