Journal of Surgical Radiology

Site: https://journalsurgrad.com/

ISSN Print 2156-213X| ISSN Online: 2156-4566 Volume: 05 Issue: 03 Open Access

Research Article

Diagnostic Yield of Magnetic Resonance Imaging in Patients with Vertigo at a Tertiary Care Centre

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Article History
Received: 25.03.2026
Revised: 28.03.2026
Accepted: 03.04.2026
Published: 10.04.2026

Citations:
Siddi, S. V., Lakshmeesha, M. T., Suresh, P., Raghav, K. B. S., Shetty, V. V., & Naik, S. M. (n.d.). Diagnostic yield of magnetic resonance imaging in patients with vertigo at a tertiary care centre. J Surg Radiol, V(I) 77-81

Abstract: ***Introduction:*** Vertigo is a common clinical symptom arising from disorders of the peripheral or central vestibular system. Differentiating between these causes is essential due to their varied clinical implications. Magnetic Resonance Imaging (MRI) plays a crucial role in identifying central causes of vertigo, particularly ischemic, demyelinating, inflammatory, and neoplastic conditions. **Aim:** To evaluate the diagnostic yield of Magnetic Resonance Imaging in patients presenting with vertigo at a tertiary care centre. **Materials and Methods:** This prospective cross-sectional study was conducted in the Department of Radiodiagnosis at a tertiary care centre and included 100 patients presenting with vertigo. All patients underwent MRI of the brain and inner ear using standard sequences including T1, T2, FLAIR, diffusion-weighted imaging, and post-contrast imaging where indicated. MRI findings were categorized into normal and abnormal, and further classified into etiological groups. Clinical features were correlated with imaging findings. Statistical analysis was performed using appropriate tests, and a p-value <0.05 was considered significant. **Results:** Out of 100 patients, MRI findings were abnormal in 70% of cases and normal in 30%. Central causes accounted for 54% of cases, while peripheral causes were seen in 16%. Among abnormal findings, ischemic lesions were the most common (26%), followed by inflammatory (16%), demyelinating (12%), neoplastic (10%), and degenerative causes (6%). Significant associations were observed between central causes and symptoms such as ataxia and nausea/vomiting, while hearing loss and tinnitus were significantly associated with peripheral causes. **Conclusion:** MRI is a highly effective diagnostic modality in patients presenting with vertigo, particularly in identifying central causes that may require urgent management. It provides detailed evaluation of posterior fossa and inner ear structures and plays a key role in differentiating central and peripheral vertigo. MRI should be considered an essential investigation in the diagnostic approach to vertigo in tertiary care settings.

Keywords: Vertigo. Magnetic Resonance Imaging. Central Vertigo.

INTRODUCTION

Vertigo is a common clinical symptom characterized by a false sensation of movement, most often described as spinning of self or surroundings. It arises due to dysfunction of the vestibular system, which comprises the peripheral apparatus of the inner ear, vestibular nerve, brainstem nuclei, cerebellum, and higher cortical centers responsible for spatial orientation. Vertigo accounts for nearly 2-3% of emergency department visits and is a frequent cause of neurological and otological consultations, with increasing prevalence in the elderly population.[1]

Clinically, vertigo is broadly classified into peripheral and central types based on the anatomical origin of pathology. Peripheral vertigo is caused by disorders of the inner ear or vestibular nerve, with common etiologies including benign paroxysmal positional vertigo (BPPV), vestibular neuritis, and Meniere's disease. In contrast, central vertigo results from lesions involving the brainstem, cerebellum, or central vestibular pathways and may be due to ischemic stroke, demyelinating disorders, neoplasms, infections, or degenerative diseases.[2] Differentiating between these two categories is crucial because central causes are potentially life-threatening and require urgent intervention. [3]

Clinical evaluation of vertigo relies on history and bedside examination; however, overlapping symptoms and subtle neurological findings often make accurate diagnosis challenging. Posterior circulation strokes, in particular, may present with isolated vertigo without

focal neurological deficits, leading to misdiagnosis or delay in treatment. [4] This diagnostic dilemma underscores the importance of neuroimaging in patients presenting with vertigo, especially when central pathology is suspected.

Magnetic Resonance Imaging (MRI) has emerged as the imaging modality of choice in the evaluation of vertigo due to its superior soft tissue contrast and multiplanar imaging capability. MRI provides excellent visualization of posterior fossa structures, including the brainstem and cerebellum, which are often inadequately assessed by computed tomography due to bone-related artifacts. [5] MRI also allows detailed assessment of the internal auditory canal, cerebellopontine angle, and inner ear structures, aiding in the diagnosis of vestibular schwannomas, inflammatory conditions, and congenital anomalies.

AIM

To evaluate the diagnostic yield of Magnetic Resonance Imaging in patients presenting with vertigo at a tertiary care centre.

OBJECTIVES

1. To assess MRI findings in patients presenting with vertigo.
2. To determine the etiological spectrum of vertigo based on MRI.
3. To differentiate central and peripheral causes of vertigo using MRI.

MATERIALS AND METHODS

Source of Data

The data were obtained from patients presenting with complaints of vertigo in the Department of Radiodiagnosis of a tertiary care hospital. Clinical details were collected from patient records and referrals.

Study Design

This was a prospective observational cross-sectional study.

Study Location

The study was conducted in the Department of Radiodiagnosis at a tertiary care teaching hospital.

Study Duration

The study was carried out over a period of 18 months.

Sample Size

A total of 100 patients presenting with vertigo were included in the study.

Inclusion Criteria

- Patients presenting with clinical symptoms of vertigo
- Patients referred for MRI brain/inner ear evaluation
- Patients of all age groups and both genders
- Patients who provided informed consent

Exclusion Criteria

- Patients with contraindications to MRI (e.g., pacemakers, metallic implants)
- Patients unwilling to participate
- Patients with incomplete clinical data
- Claustrophobic patients unable to undergo MRI

Procedure and Methodology

All patients presenting with vertigo underwent detailed clinical evaluation including history and neurological examination. MRI was performed using a standard protocol. Imaging sequences included T1-weighted, T2-weighted, FLAIR, diffusion-weighted imaging (DWI), apparent diffusion coefficient (ADC), GRE/SWI, and post-contrast sequences where indicated.

Special attention was given to posterior fossa structures, internal auditory canals, cerebellopontine angle regions, and labyrinthine structures. MRI findings were categorized into normal and abnormal groups. Abnormal findings were further classified into ischemic, inflammatory, demyelinating, neoplastic, and degenerative causes. Correlation between clinical features and MRI findings was performed.

Sample Processing

MRI images were acquired and processed using standard imaging software. Images were interpreted by experienced radiologists. Relevant findings were documented and categorized systematically.

Statistical Methods

Data were analyzed using appropriate statistical software. Descriptive statistics such as mean, standard deviation, frequency, and percentages were used. Categorical variables were analyzed using Chi-square test. A p-value <0.05 was considered statistically significant.

Data Collection

Data were collected using a structured proforma including demographic details, clinical presentation, associated symptoms, and MRI findings. All data were entered into a master chart and analyzed accordingly.

RESULTS

Table 1. Diagnostic yield of Magnetic Resonance Imaging in patients presenting with vertigo (N = 100)

MRI Diagnostic Yield	n (%)	95% CI	Test of significance	p value
Abnormal MRI	70 (70.0)	61.0-79.0	Z = 4.00	<0.001

Normal MRI	30 (30.0)	21.0-39.0		
Total	100 (100.0)			

In the present study, MRI demonstrated a high diagnostic yield, with abnormal findings detected in 70 out of 100 patients (70.0%), while 30 patients (30.0%) had normal MRI results. The 95% confidence interval for abnormal MRI findings ranged from 61.0% to 79.0%, indicating a reliable estimate of diagnostic yield in the study population. Statistical analysis using the Z test showed a highly significant result ($Z = 4.00$, $p < 0.001$), confirming that MRI significantly contributed to the detection of underlying pathology in patients presenting with vertigo.

Table 2. MRI findings in patients presenting with vertigo (N = 100)

MRI Finding	n (%)	95% CI	Test of significance	p value
Central cause	54 (54.0)	44.2-63.8	$\chi^2 = 22.16$	<0.001
Peripheral cause	16 (16.0)	8.8-23.2		
Normal MRI	30 (30.0)	21.0-39.0		
Total	100 (100.0)			

The distribution of MRI findings revealed that central causes were the most common, observed in 54 patients (54.0%), followed by normal MRI in 30 patients (30.0%) and peripheral causes in 16 patients (16.0%). The 95% confidence interval for central causes ranged from 44.2% to 63.8%. The difference in distribution among the categories was statistically highly significant ($\chi^2 = 22.16$, $p < 0.001$), indicating that central etiologies constituted a predominant proportion of vertigo cases in the study population.

Table 3. Etiological spectrum of vertigo based on MRI findings (N = 100)

Etiology based on MRI	n (%)	95% CI	Test of significance	p value
Normal MRI	30 (30.0)	21.0-39.0	$\chi^2 = 26.72$	<0.001
Ischemic	26 (26.0)	17.4-34.6		
Inflammatory	16 (16.0)	8.8-23.2		
Demyelinating	12 (12.0)	5.6-18.4		
Neoplastic	10 (10.0)	4.1-15.9		
Degenerative	6 (6.0)	1.3-10.7		
Total	100 (100.0)			

The etiological distribution based on MRI findings showed that 30% of patients had normal MRI, while 70% had identifiable pathological causes. Among the abnormal findings, ischemic lesions were the most common (26.0%), followed by inflammatory (16.0%), demyelinating (12.0%), neoplastic (10.0%), and degenerative causes (6.0%). The 95% confidence intervals for these categories indicate variability but consistent representation of ischemic causes as the leading pathology. The overall distribution was statistically highly significant ($\chi^2 = 26.72$, $p < 0.001$), suggesting that MRI effectively delineates the spectrum of underlying etiologies.

Table 4. Differentiation of central and peripheral causes of vertigo using MRI with associated symptoms (MRI-positive cases, n = 70)

Associated symptom	Central (n = 54) n (%)	Peripheral (n = 16) n (%)	Odds Ratio (95% CI)	Test of significance	p value
Nausea/Vomiting	44 (81.5)	8 (50.0)	4.40 (1.33-14.56)	$\chi^2 = 6.40$	0.011
Ataxia	42 (77.8)	4 (25.0)	10.50 (2.86-38.56)	$\chi^2 = 15.26$	<0.001
Hearing loss	2 (3.7)	12 (75.0)	0.01 (0.002-0.078)	$\chi^2 = 39.21$	<0.001
Tinnitus	2 (3.7)	12 (75.0)	0.01 (0.002-0.078)	$\chi^2 = 39.21$	<0.001
Diplopia	10 (18.5)	1 (6.3)	3.41 (0.40-28.90)	$\chi^2 = 1.40$	0.236
Headache	8 (14.8)	1 (6.3)	2.61 (0.30-22.60)	$\chi^2 = 0.81$	0.369

Among MRI-positive cases (n = 70), significant differences were observed in the distribution of associated symptoms between central and peripheral causes. Nausea and vomiting were more frequent in central causes (81.5%) compared to peripheral causes (50.0%), with a statistically significant association (OR = 4.40, $p = 0.011$). Ataxia showed a very strong association with central vertigo (77.8% vs 25.0%), with high statistical significance (OR = 10.50, $p < 0.001$), indicating its importance as a clinical marker of central pathology. In contrast, hearing loss and tinnitus were predominantly associated with peripheral causes (75.0% each), and this association was highly significant ($p < 0.001$), suggesting their strong diagnostic value in identifying peripheral vertigo. Diplopia and headache were more common in central causes; however, these associations were not statistically significant ($p > 0.05$).

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DISCUSSION

In the present study, MRI demonstrated a diagnostic yield of 70.0%, with abnormal findings detected in the majority of patients presenting with vertigo (Table 1). This high yield is consistent with the findings of Jeong et al. (2025)[1], who reported that neuroimaging identified clinically significant abnormalities in approximately 60-75% of patients with suspected central vertigo. Similarly, Shah et al. (2023)[2] demonstrated that MRI has superior sensitivity compared to CT in detecting posterior circulation strokes, thereby increasing the overall diagnostic yield in vertigo patients. Buyurgan et al. (2023)[3] also emphasized that MRI significantly improves diagnostic accuracy, particularly in cases of acute vestibular syndrome, where clinical misdiagnosis is common. These findings support the present study, highlighting MRI as a highly valuable diagnostic modality. However, a proportion of patients (30.0%) had normal MRI findings, which is comparable to Happonen et al. (2024)[4], who reported normal imaging in 25-40% of cases, particularly in peripheral vertigo.

With respect to MRI findings (Table 2), the present study showed that central causes (54.0%) predominated over peripheral causes (16.0%), with statistical significance ($p < 0.001$). This observation is in agreement with Malak et al. (2021)[5], who reported that central etiologies account for a substantial proportion of vertigo cases in tertiary care settings, especially among patients with vascular risk factors. Shareef et al. (2025)[6] also observed that central causes, particularly ischemic lesions, were more frequently detected on MRI compared to peripheral causes in hospitalized patients. Conversely, some studies such as Idil et al. (2020)[7] reported a higher prevalence of peripheral vertigo in general outpatient populations, suggesting that the predominance of central causes in the present study may be attributed to referral bias in a tertiary care centre.

Regarding the etiological spectrum (Table 3), ischemic lesions were the most common abnormal finding (26.0%), followed by inflammatory (16.0%), demyelinating (12.0%), neoplastic (10.0%), and degenerative causes (6.0%). These findings are consistent with Hasan et al. (2021)[8], who reported that posterior circulation ischemia is a leading cause of central vertigo and is frequently detected on MRI using diffusion-weighted imaging. Similarly, Shareef et al. (2025)[6] found ischemic stroke to be the most common etiology among central causes of vertigo. The proportion of inflammatory and demyelinating lesions in the present study is also comparable to Happonen et al. (2024)[4], who documented a similar distribution of MRI findings in vertigo patients. The presence of neoplastic lesions such as vestibular schwannoma further supports previous reports by Ashiq et al. (2024)[9], emphasizing MRI's role in detecting cerebellopontine angle tumors.

In Table 4, differentiation between central and peripheral causes based on associated symptoms showed that ataxia (77.8%) and nausea/vomiting (81.5%) were significantly associated with central causes, while hearing loss (75.0%) and tinnitus (75.0%) were significantly associated with peripheral causes ($p < 0.001$). These findings are in strong agreement with Buyurgan et al. (2023)[3], who highlighted that gait ataxia is a key clinical indicator of central vertigo, particularly stroke. Malak et al. (2021)[5] also reported that central vertigo is more commonly associated with neurological deficits such as ataxia and diplopia. On the other hand, Adams et al. (2022)[10] demonstrated that auditory symptoms like hearing loss and tinnitus are hallmark features of peripheral vestibular disorders such as Meniere's disease and labyrinthitis. The lack of statistical significance for diplopia and headache in the present study may be due to their lower prevalence, although similar observations were noted by Jeong et al. (2025)[1], who reported that these symptoms are less sensitive indicators of central pathology.

CONCLUSION

The present study highlights the significant diagnostic utility of Magnetic Resonance Imaging (MRI) in the evaluation of patients presenting with vertigo at a tertiary care centre. MRI demonstrated a high diagnostic yield of 70%, indicating that it is an effective modality for identifying underlying causes of vertigo, particularly central pathologies. A substantial proportion of patients were found to have abnormal MRI findings, emphasizing the importance of neuroimaging in cases where clinical evaluation alone may be insufficient.

Central causes of vertigo were more prevalent than peripheral causes in this study, with ischemic lesions emerging as the most common etiology. This underscores the critical role of MRI, especially diffusion-weighted imaging, in the early detection of posterior circulation strokes, which may otherwise be missed on clinical examination. In addition, MRI proved valuable in identifying inflammatory, demyelinating, neoplastic, and degenerative conditions, thereby providing a comprehensive evaluation of vertigo etiologies.

The study also demonstrated that certain clinical features, such as ataxia and nausea/vomiting, were significantly associated with central causes, while

auditory symptoms like hearing loss and tinnitus were more commonly seen in peripheral causes. This reinforces the importance of correlating clinical findings with imaging results to improve diagnostic accuracy.

Despite a proportion of patients having normal MRI findings, the role of MRI in excluding serious central causes and guiding appropriate management remains indispensable. Overall, MRI serves as a crucial diagnostic tool in differentiating central from peripheral vertigo, aiding in timely intervention and improving patient outcomes. Therefore, MRI should be considered an essential component in the diagnostic workup of patients presenting with vertigo, particularly in tertiary care settings.

LIMITATIONS OF THE STUDY

1. The study was conducted at a single tertiary care centre, limiting generalizability of results.
2. The sample size of 100, although adequate, may not represent the broader population.
3. Being a cross-sectional study, causal relationships could not be established.
4. Selection bias may be present as more severe or referred cases were included.
5. Patients with contraindications to MRI were excluded, which may affect applicability.
6. Clinical follow-up was not done to correlate long-term outcomes with MRI findings.
7. Some peripheral causes of vertigo may not be detected on MRI, leading to normal imaging results.
8. Interobserver variability in MRI interpretation was not assessed.

REFERENCES

1. Jeong Y, Cho SJ, Lim H, Lee DH, Jeong SY, Baik SH, Sunwoo L, Bae YJ, Choi BS, Kim JH. Diagnostic yield of MRI in adult patients with dizziness or vertigo at the emergency department: a systematic review and meta-analysis. European Radiology. 2025 Aug 15:1-3.
2. Shah VP, Oliveira J. e Silva L, Farah W, Seisa M, Kara Balla A, Christensen A, Farah M, Hasan B, Bellolio F, Murad MH. Diagnostic accuracy of neuroimaging in emergency department patients with acute vertigo or dizziness: a systematic review and meta-analysis for the guidelines for reasonable and appropriate care in the emergency department. Academic Emergency Medicine. 2023 May;30(5):517-30.
3. Buyurgan CS, Eray O, Yigit O, Yaprak N, Unal A, Senol U. Diagnostic Contribution of Magnetic Resonance Imaging and Computerized Tomography in Patients with Unidentified Vertigo and Normal Neurologic Examination in Emergency Medicine. Nigerian journal of clinical practice. 2023 Jun 1;26(6):694-700.
4. Happonen T, Nyman M, Ylikotila P, Mattila K, Hirvonen J. Imaging outcomes of emergency MR imaging in dizziness and vertigo: a retrospective cohort study. American Journal of Neuroradiology. 2024 Jun 1;45(6):819-25.
5. Malak W, Hagiwara M, Nguyen V. Neuroimaging of dizziness and vertigo. Otolaryngologic Clinics of North America. 2021 Oct 1;54(5):893-911.
6. Shareef F, Tu L, Neupane A, Siddique Z, Joshi R, Melnick E, Wira C, Mahajan A. Diagnostic yield of an abbreviated MRI protocol in the evaluation of dizziness in the emergency department, a single institutional experience. Emergency radiology. 2025 Aug;32(4):559-68.
7. Idil H, Yenice GO, Kilic TY, Eyler Y, Atilla OD. The incidence of central neurological disorders among patients with isolated dizziness and the diagnostic yield of neuroimaging studies. The Neurologist. 2020 Jul 1;25(4):85-8.
8. Hasan TS. Evaluation of Patients with Vertigo by Cranial Magnetic Resonance Imaging (MRI). Diyala Journal of Medicine. 2021 Oct 23;21(1):1-2.
9. Ashiq IN, Khan S, Yousaf A. Comparative diagnostic accuracy of computed tomography scan versus magnetic resonance imaging in the emergency department for the evaluation of dizziness: a systematic review. Indian Journal of Radiology and Imaging. 2024 Jul;34(03):488-95.
10. Adams ME, Karaca-Mandic P, Marmor S. Use of neuroimaging for patients with dizziness who present to outpatient clinics vs emergency departments in the US. JAMA Otolaryngology-Head & Neck Surgery. 2022 May;148(5):465-73.