

## Evaluation of Giddiness with MRI

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| Received: 24.12.2018 | Accepted: 05.01.2019 | Published: 26.01.2019

DOI: 10.36347/sjams.2019.v07i01.022

### Abstract

### Original Research Article

Giddiness is a non-specific symptom or feeling that includes sensations such as faintness, light headedness, vertigo and imbalance. The purpose of the study was to evaluate the role of magnetic resonance imaging (MRI) in diagnosing the cause of giddiness in symptomatic patients. A prospective cohort study was conducted in 106 patients who presented with giddiness. MRI scans of these patients were analysed, and we concluded that MRI can successfully demonstrate the significant findings which cause giddiness.

**Keywords:** Brain, Giddiness, Magnetic Resonance Imaging.

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## INTRODUCTION

Giddiness is scientifically termed as "dizziness" which means impairment in spatial perception and stability as defined in Dorland's Medical Dictionary. Giddiness is reported in about 20–30% of the population at some point in the year 2009[1]. Multiple parts of the body are required for maintaining balance including the inner ear, eyes, muscles, skeleton and the nervous system, so any disorder or disease in these systems can manifest as what is commonly referred to as giddiness[2]. Common physiological causes of giddiness include inadequate blood supply to the brain due to a sudden fall in blood pressure or arterial blockage, loss or distortion of vision or visual cues, disorders of the inner ear, distortion of brain/nervous function by medications such as anticonvulsants and sedatives [2]. Differential diagnoses of many conditions are associated with giddiness. The most common causes are as follows: 40% peripheral vestibular dysfunction, 10% central nervous system lesion, 15% psychiatric disorder, 25% presyncope/dysequilibrium, and 10% nonspecific giddiness [3]. Conditions that often present as giddiness or have giddiness as a symptom include: benign paroxysmal positional vertigo, Meniere's disease, vestibular neuronitis, labyrinthitis, otitis media, brain tumor, acoustic neuroma, chronic motion sickness, Ramsay Hunt syndrome, migraine, multiple sclerosis, pregnancy, low blood pressure (hypotension), low blood oxygen content (hypoxemia), myocardial infarction, iron deficiency (anemia), low blood sugar

(hypoglycemia), hormonal changes (e.g., thyroid disease, menstruation, pregnancy), panic disorder, hyperventilation, anxiety, depression, age-diminished visual, balance and perception of spatial orientation abilities[1-3]. Giddiness is a common presenting symptom in medicine and otorhinolaryngology outpatient departments. Most patients with giddiness often have difficulty describing their symptoms, therefore determining the cause can be challenging. An evidence-based approach using knowledge of key history, physical examination and radiologic findings for the causes of giddiness can help establish a diagnosis and consider appropriate treatments in most cases. When the symptom is refractory to medications, patients are invariably referred for magnetic resonance imaging studies (MRI) of Brain. Magnetic resonance imaging (MRI) has been shown to have potential to diagnose or to rule out conditions that present as giddiness. MRI has superior resolution to other cross-sectional imaging techniques like computed tomography for visualization of posterior fossa of brain where most central nervous system disease that causes giddiness is present. The aims of this study were to record the findings in patients who underwent MRI brain for giddiness as the presenting symptom and to analyze the sensitivity and specificity of MRI in diagnosing the cause of giddiness.

### Aim & objectives of the study

The objective of the study was to evaluate the role of magnetic resonance imaging in diagnosing the cause of giddiness in symptomatic patients.

## MATERIALS AND METHODS

The study was conducted in 106 patients who presented with complaint of giddiness (dizziness, vertigo, light headedness, imbalance) and referred for MRI to the Department of Radio Diagnosis. Majority of the referred cases were those who complaint of giddiness with neurologic signs and symptoms, risk factors for cerebrovascular disease, or progressive unilateral hearing loss.

### Inclusion Criteria

- Patients with complaint of giddiness.
- Patients willing to undergo this study.

### Exclusion Criteria

- Patients not willing to undergo this study
- Pregnancy
- Claustrophobic patients

Clinical assessment was done including detailed history, physical examination and laboratory investigations for the causes of giddiness.

Subsequent MRI was done. For contrast enhancement, imaging was performed following intravenous injection of 0.1 mmol/kg of gadolinium.

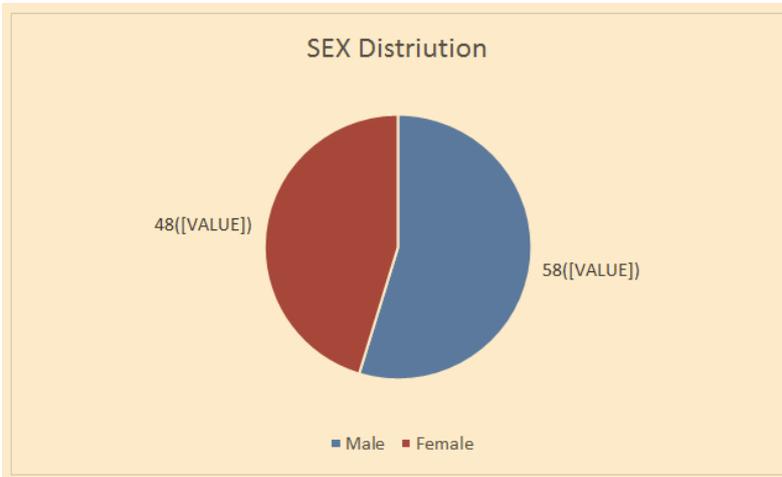
## RESULTS AND OBSERVATIONS

**Table-1: Age distribution of the patients**

Age in years	Number	%
0-20	6	5.66%
21-40	34	32.08%
41-60	35	33.02%
61-80	28	26.42%
81-100	3	2.83%
Mean +/- SD	49.2 +/-	18.6

In the study group, majority of the cases i.e., 33 % belong to the age group 41-60 years, 32 % belong to the age group 21- 40 years, 5.6 % belong to the age group 0-20, 2.8 % belong to the age group 81-100 years.

Among the total cases, 58 (45%) were males and 48(55%) were females out of which significant MRI findings were found in 50 males and 38 females.



**Chart-1: SEX distribution of the patients**

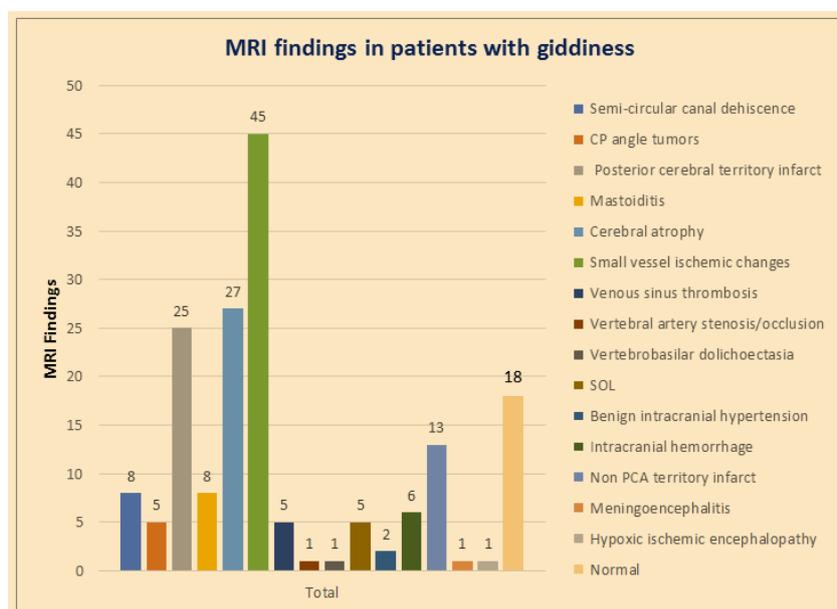
**Table-2: Distribution of MRI findings in patients complaining of giddiness**

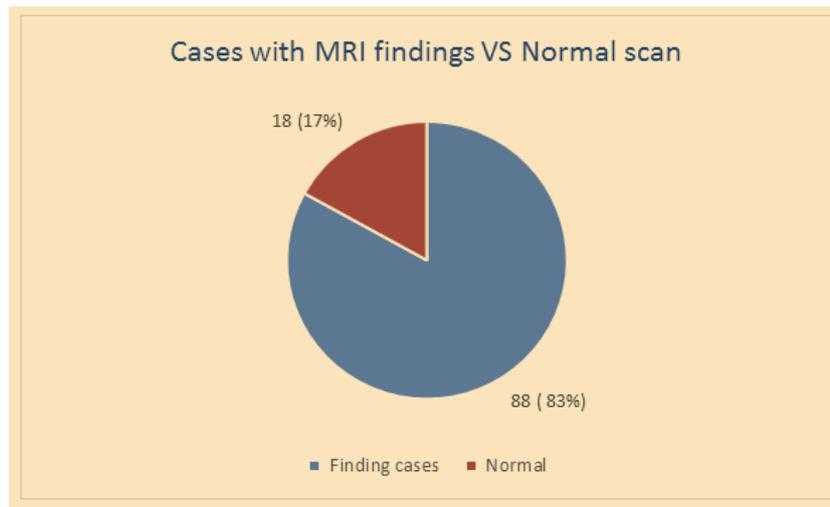
S. No.	MRI Findings	No. of Cases	Percentage
1.	Semi-circular canal dehiscence	8	4.68%
2.	CP angle tumors	5	2.92%
3.	Mastoiditis	8	4.68%
4.	Posterior cerebral territory infarct	25	14.62%
5.	Cerebral atrophy	27	15.79%
6.	Small vessel ischemic changes	45	26.32%
7.	Venous sinus thrombosis	5	2.92%
8.	Vertebral artery stenosis/occlusion	1	0.58%
9.	Vertebrobasilar dolichoectasia	1	0.58%
10.	Benign intracranial hypertension	2	1.17%
11.	SOL (Space occupying lesion)	5	2.92%
12.	Intracranial hemorrhage	6	3.51%
13.	Non PCA territory infarct	13	7.60%
14.	Meningoencephalitis	1	0.58%
15.	Hypoxic ischemic encephalopathy	1	0.58%
16.	Normal	18	10.53%
	Total	106	100

MRI scans of 106 patients were analyzed and total 171 findings were seen that are known to cause giddiness. Out of 106 cases the most common finding on MRI was cerebral small vessel ischemic changes found in 45(26.3%) scans. 27(15.7%) scans had cerebral atrophy, 25(14.6%) patients had PCA territory infarct, 8(4.6%) scans had semicircular canal

dehiscence, 8(4.6%) patients had mastoiditis and 5(2.9%) scans had CP angle tumors.

Other findings that were found include intracranial hemorrhage found in 6(3.5%) scans, SOL found in 5(2.9%) scans, venous sinus thrombosis in 5(2.9%) scans and benign intracranial hypertension in 2(1.1%) scans. Overlap of findings in same scan was noted in many cases.

**Chart-2: Distribution of MRI findings in patients complaining of giddiness**



**Chart-3: Number of patients with significant MRI findings VS Normal scan**

Among the study group, 83 % (88) of the cases had significant MRI findings that are known to cause giddiness and 17 % (18) of the cases had normal MRI scan.

Out of 18 normal scans, 11 patients were clinically diagnosed as BPPV, cause of giddiness in 3 patients was psychological, 2 patients had orthostatic hypotension and after taking detailed history 2 patients were diagnosed with drug induced vertigo.

## DISCUSSION

Giddiness is a common symptom which affects about 30% of people over the age of 65.4 Benign paroxysmal positional vertigo, acute vestibular neuronitis, and Meniere's disease cause most cases of giddiness; however, physicians must consider other causes including cerebrovascular disease, semicircular canal dehiscence, migraine, psychological disease, perilymphatic fistulas, multiple sclerosis, and intracranial neoplasms. In these patients MRI scan is done to look for the cerebrum, cerebellum as well as for cerebello-pontine angle lesions and the internal auditory meatus.

A descriptive cohort study was conducted on patients who present with complaint of giddiness (vertigo, light headedness, presyncope, and disequilibrium). In the present study 106 patients who presented with giddiness underwent MRI brain. MRI showed high sensitivity to visualize findings that were clinically significant and consistent with giddiness. We found that approximately 83% of scans had positive findings and 17% scans were normal. Kalsotra *et al.* studied the findings on magnetic resonance imaging in patients with giddiness by evaluating MRI scans of 62 patients and reported 54.84% MRI scans as normal[5].

In the present study, most common finding was small vessel ischemic changes in 26.3% of the scans. In 2010 Papanikolaou *et al.* studied findings on

MRI scans of patients presenting with audiovestibular symptoms. Subcortical white matter hyperintensive foci have been reported in 44% cases by Papanikolaou *et al.* [6].

In present study the second most common finding was cerebral atrophy in 15.7%. Papanikolaou *et al.* reported atrophy in 5.5% cases[6] while Kalsotra *et al.* reported it in 3.22%[5].

Another significant and prevalent finding was posterior cerebral territory infarct in 14.6% scans and non-posterior cerebral territory infarct in 7.6% scans. Zoya Irfan Khan *et al.* conducted retrospective study and analyzed MRI brain scans of 500 patients who presented with giddiness and reported acute infarcts in 8.4% cases [7].

In the present study semicircular dehiscence was seen in 8 (4.6%) scans which significantly attributes to giddiness. P. Browaeys *et al.* found that MR imaging has a sensitivity of 100% to depict semicircular canal dehiscence (SCD). Mastoiditis was seen in 4.6% scans compared to 3% cases reported by Papanikolaou *et al.* in his study.

In the present study CP angle tumors were visualized on MRI in 5(2.9%) scans. Other findings include intracranial hemorrhage in 6(3.5%) scans, SOL in 5(2.9%) scans, venous sinus thrombosis in 5(2.9%) scans, benign intracranial hypertension in 2(1.1%) scans, meningoencephalitis in 1 scan (0.58%), hypoxic ischemic encephalopathy in 1 scan (0.58%), vertebral artery stenosis/occlusion in 1 scan (0.58%), vertebral artery stenosis/occlusion in 1 scan (0.58%) and vertebrobasilar dolichoectasia compressing over the midbrain in 1 scan (0.58%).

In the present study 45% were males and 55% were females out of which significant MRI findings were found in 50 males and 38 females. Study conducted by Zoya Irfan Khan *et al.* included 57.6%

females and 42.4% males with age ranging between 36 to 74 years were found[7]. Current study comprised of patients between 6-94 years of age with mean age of 49.2 years. Majority of the cases i.e. 65% were in the age group of 21-60 years.

White matter hyperintensities and its progression, present in the MRIs of older people have been associated with hypertension and evidence suggests that WMHs occur because of arteriosclerosis within the wall of the arteriole [8-11]. Large arterial and small vessel disease of the cerebral circulation share risk factors, (e.g., hypertension, diabetes) and may coexist in individuals. People with uncontrolled and untreated hypertension had significantly greater white matter lesion progression than people with uncontrolled but treated hypertension.

In the present study 40 (37.7%) patients were known hypertensive. Out of 45 scans with small vessel ischemic changes (white matter hyperintensities) on MRI, 27 patients were hypertensive i.e. 60% of the cases with WMH were hypertensive. Out of 25 scans with PCA territory infarct on MRI, 15 patients were hypertensive i.e. 60% of the cases with PCA territory infarct were hypertensive. Out of 13 scans with non-PCA territory infarct on MRI, 10 patients were hypertensive i.e. ~ 77 % of the non-PCA territory infarct cases were hypertensive.

## CONCLUSION

MRI has high sensitivity and can successfully demonstrate the significant findings which cause giddiness. Out of 106 cases, 83 % (88) of the cases had significant MRI findings that are known to cause giddiness and 17 % (18) of the cases had normal MRI scan.

Most common finding was small vessel ischemic changes and cerebral atrophy in these patients. PCA and non-PCA territory infarcts were among the other predominant findings.

Spectrum of other findings included semicircular canal dehiscence, mastoiditis, CP angle tumors, intracranial hemorrhage, SOL, venous sinus thrombosis, benign intracranial hypertension, meningoencephalitis, hypoxic ischemic encephalopathy vertebral artery stenosis/occlusion, vertebral artery stenosis/occlusion and vertebrobasilar dolichoectasia compressing over the midbrain.

Male predominance was noted in the study group. Majority of the cases ie, 33 % belong to the age group 41-60 years, 32 % belong to the age group 21- 40 years with the mean age of 49.2 years.

MRI is a costly investigation, so it should be used judiciously in such patients after obtaining detailed

history and physical examination who do not respond to routine medications.

## Summary

Giddiness is a common presenting complaint of patients. MRI scan of these patients is done to look for possible treatable definitive cause.

Out of 106 MRI scans, 83 % of the cases had significant MRI findings that are known to cause giddiness and 17 % of the cases had normal MRI scan.

Most common finding was small vessel ischemic changes in 26.3% of the scans. Spectrum of other findings included cerebral atrophy, PCA & non-PCA territory infarcts.

MRI is a highly sensitive investigation to find out the cause of giddiness. Its benefit weighs more than its cost. So the patients with persistent giddiness must undergo MRI brain to find the cause and for further appropriate management.

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