Original Research Article

Role of magnetic resonance imaging in patients evaluated for transient ischemic attack

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Abstract

Introduction: For the evaluation of patients with TIA, According to the recent definition of transient ischemic attack (TIA) and the recommendations of the American Heart Association, magnetic resonance imaging (MRI) including diffusion-weighted imaging (DWI) is mandatory tool in evaluating patients with TIA.

Aim: This study aims to determine the prevalence of infarction identified in MRI of the patients who were initially evaluated with TIA . Analyzing the morphology, size pattern and distribution of infarcts and identifying the independent clinical predictors.

Methods: All TIA patients (with symptom duration of <24 h) who underwent DWI-MRI within 48 hours of symptoms with adequate clinical history were included in this retrospective observational study. The incidence of acute infarction and association with clinical predictors were studied.

Results: The evidence of acute infarction by DWI-MRI in TIA patients is detected in 27.9 % of patients. Acute single lacunar infarct distributed in MCA territory is the commonest finding in positive patients. Strongly associated clinical predictors are symptoms more than one hour and symptoms of both motor weakness and aphasia.

Conclusion: MRI is mandatory investigation in evaluation of TIA and strongly associated clinical predictors are duration of symptoms, motor weakness and aphasia.

Keywords: TIA, MRI, diffusion, lacunar infarct.

Introduction:

TIA was first clinically defined in 1964 as any transient neurological deficit lasting less than 24 hours due to focal cerebral or retinal ischemia (Marshall, 1964). Patients presents with varied symptoms like giddiness, headache, temporary loss of consciousness, temporary aphasia and weakness. This temporary event is generally an unstable condition and is associated with a higher risk of a stroke, especially in the early phase after TIA. It has been found that up to 20% of TIA patients suffer a stroke within 90 days after TIA (Hill et al., 2004; Kleindorfer et al., 2005). Therefore, TIA has been considered a major warning signal of stroke.

The development of brain imaging and its usage in daily diagnostic evaluation of patients has changed the view of TIAs. Particularly, the definition of TIA has shifted from a clinically time-based term to tissue-related one.

After MRI the diagnosis of patient may be shifted from TIA to acute ischemic stroke based on MRI findings. This study analyzed the findings in MRI of patients referred as TIA without considering the change of diagnosis after MRI evaluation.

Very few studies have analyzed the findings in MRI regarding the size and distribution of infarcts in patients referred as TIA. This study aims at analyzing the clinical presentation and MRI findings and co morbidities.

Aims and objective:

To assess the prevalence of positive MRI findings among the patients referred as TIA.

To analyze the findings in MRI with clinical data and other co-morbidities.

Materials and methods:

Retrospective observational study of MRI findings in Melmaruvathur Adhiparasakthi institute of medical science, Tamilnadu for the duration of eight months from January 2018 to august 2018 who were referred for TIA evaluation.

INCLUSION CRITERIA: Patients with all age group who underwent MRI scan with clinical findings of TIA and duration within one day.

EXCLUSION CRITERIA: Patients whose clinical data could not be obtained.

Clinical details evaluated are age, sex, personal history and associated co morbidities like diabetes mellitus, hypertension & atrial fibrillation.

Symptomatology particulars are duration of symptoms, presence or absence of giddiness, headache, weakness and slurring of speech. Giddiness may include temporary loss of consciousness.

MRI findings observed are lacunar or major infarcts, number of lacunar infarcts, chronicity of infarct – acute infarct, acute on chronic infarct, territory of infarct and presence or absence of hemorrhage.

Consent for MRI was taken in all patients and clinical and other data collection was based on their OP or admission card details. All images were taken in Siemens 1.5tesla MRI machine using T2WI, DWI, FLAIR protocols to detect ischemic areas & infarcts and T1WI & gradient echo images to detect hemorrhages.

Observations:

On analyzing the clinical background of 86 patients who were referred as TIA, commonest age group is more than 45 years and males are comparatively more than females. 31 Patients are known diabetic and 30 patients are known hypertensive. 3 out of 86 patients are known case of atrial fibrillation.

Table-1: Background details:

S.No	Characteristics		Frequency (n=86)	Percentage
1	Age	30-45	2	2.3
		45-60	47	54.7
		60-75	35	40.7
		>75	2	2.3
2	Sex	Males	50	58.1
		Females	36	41.9
3	Personal history	None	59	68.6
		Alcohol	9	10.5
		Smoking	15	17.4
		Both	3	3.5
4	Diabetes	Absent	55	64
		Present	31	36
5	Hypertension	Absent	56	65.1
		Present	30	34.9
6	Atrial fibrillation	Absent	83	96.5
		Present	3	3.5

Although smoking is a considered as a strong risk factor for TIA, in our study only 15 patients had symptoms of smoking and only 3 had both smoking and alcohol history.

Table-2: Symptomatology particulars:

On analyzing the symptomatology particulars majority of the patient had duration less than one hour and almost all had some symptoms related to giddiness. Headache present as one of the symptoms was seen in 21 out of 86 patients. Weakness was present in 18 out of 86 patients. Slurring of speech was present in 12 out of 86 patients.

S.No	Characteristics		Frequency	Percentage
1	Duration of symptoms	< 1 hr	80	93
		> 1 hr	6	7
2	Giddiness	Absent	0	0
		Present	86	100
3	Headache	Absent	65	75.6
		Present	21	24.4
4	Weakness	Absent	68	79.1
		Present	18	20.9
5	Slurring of speech	Absent	74	86
		Present	12	14

Table-3: Particulars related to MRI findings:

| S.No	Characteristics		Frequency	Percentage
1	Type	Acute	19	79.2
		Acute on chronic	5	20.8
2	Territory	MCA	17	70.8
		MCA + Posterior Circulation	1	4.2
		MCA +CER	1	4.2
		MCA+PONS	1	4.2
		PCA	1	4.2
		PONS	2	8.3
		POSTERIOR	1	4.2
3	Lacunar/major	Lacunar	23	95.8
		Major	1	4.2
4	Haemorrhage	Present	0	0
		Absent	86	100

In MRI, presence of infarct is considered as positive findings which are seen in 27.9 percentages of patients. Majority of them are lacunar infarcts which are less than 1.0cm in size. Major infarct was seen in 1 patient who was referred as TIA. Hemorrhage as finding was seen in none of the patients. Both acute and chronic lacunar infarcts were seen in 20.8 percentages of patients. Around 70 percentages of infarcts were seen in MCA territory. Commonest locations are corona radiata and deep grey matters. Very few infarcts were seen in posterior circulation and other territories.
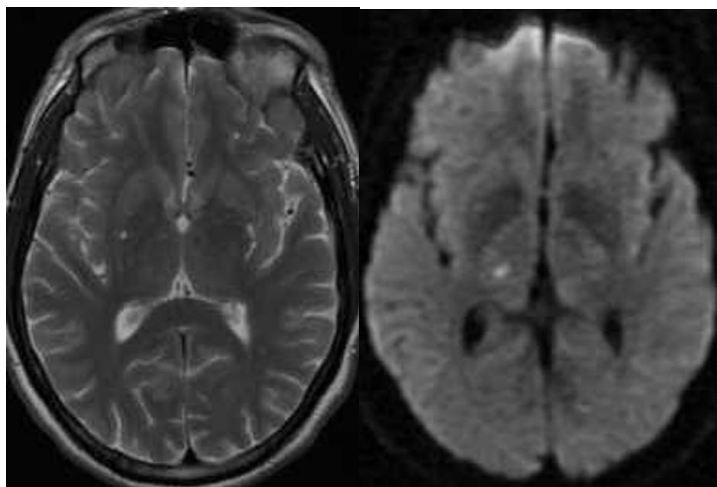
PICTURES: MRI T2 and DWI shows acute lacunar infarcts with diffusion restriction as bright hyperintense signals in right thalamus.
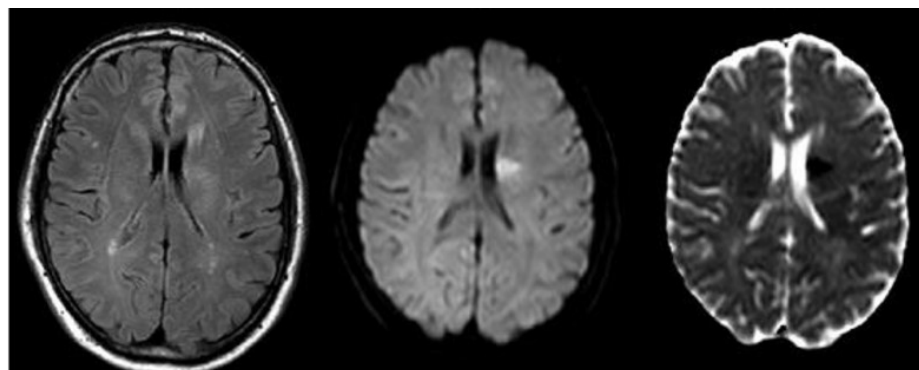
PICTURES: MRI FLAIR, DWI and ADC map show acute lacunar infarct in left corona radiata
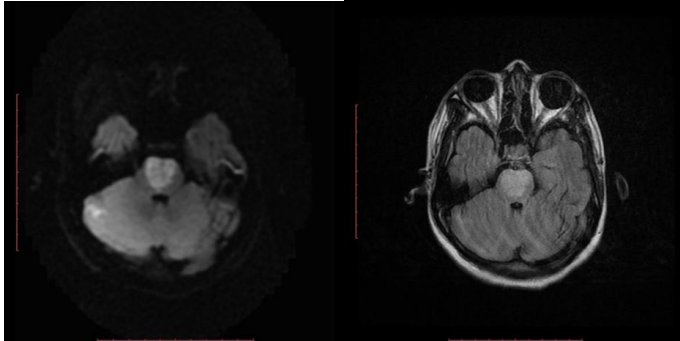
PICTURES: DWI & FLAIR images show acute infarcts in pons and right cerebellar hemisphere.

Association between MRI findings and the risk factors hypertension shows statistically significant correlation with positive results. Only 3 patients had history of atrial fibrillation who were referred as TIA and all had positive MRI findings.

Table-4: Association between risk factors and MRI findings:

S. No	Factor	N	MRI findings		Chi sq	P value
			Yes N(%)	No N(%)		
1	Age	30-45	0 (0)	2 (100)	1.6	0.651
		45-60	14 (29.8)	33 (70.2)		
		60-75	10 (28.6)	25 (71.40)		
		>75	0 (0)	2 (100)		
2	Sex	Males	12 (24)	38 (76)	0.9	0.341
		females	12 (33.3)	24 (66.7)		
3	Personal history	none	16 (27.1)	43 (72.9)	2.4	0.491
		alcohol	2 (22.2)	7 (77.8)		
		smoking	6 (40)	9 (60)		
		both	0 (0)	3 (100)		
4	Diabetes	Present	11 (35.5)	20 (64.5)	1.4	0.24
		Absent	13 (23.6)	42 (76.4)		
5	Hypertension	Present	14 (46.7)	16 (53.3)	8.05	0.005*
		Absent	10 (17.9)	46 (82.1)		
6	Atrial fibrillation	Present	3 (100)	0 (0)	8.03	0.005*
		Absent	24 (27.9)	62 (74.7)		

*statistically significant

Association between symptomatology and MRI findings - duration of symptoms more than one hour and presence of weakness and slurring of speech shows significant statistical correlation with MRI findings.

Table-5: Association between symptomatology and MRI findings:

S. No	Factor	N	MRI findings		Chi sq	P value
			Yes N(%)	No N(%)		
1	**Duration of symptoms**	<1hour	18 (22.5)	62 (77.5)	16.6	0.0001*
		>1hour	6 (100)	0 (0)		
2	**Headache**	Present	5 (23.8)	16 (76.2)	0.2	0.63
		Absent	19 (29.2)	46 (70.8)		
3	**Weakness**	Present	11 (64.7)	6 (35.3)	14.3	0.0001*
		Absent	13 (18.8)	58 (81.2)		
4	**Slurring of speech**	Present	9 (75)	3 (25)	15.4	0.0001*
		Absent	15 (20.3)	59 (79.70)		

*statistically significant

Discussion:

There is always concern raised about urgent expensive diagnostic evaluation in patients with clinical symptoms of TIA. This retrospective observational study aimed at analyzing the number of positive cases who were referred for TIA investigation and analyzing their clinical data, symptomatology and co morbidities hence there will be a chance of better scrutinizing of patients in emergency departments for immediate investigations.

 In this study it was also observed that patients with unclear symptoms like giddiness were evaluated as suspicious of TIA. Nearly 8 percentage of patients had positive MRI findings with symptoms of giddiness alone. Around 3 percentage of patients had positive MRI findings with symptoms of headache alone.

Patients presenting with giddiness or dizziness alone has the possibility of misdiagnosis without MRI evaluation.

Patients with symptoms of TIA more than one hour had 100% positive results. Patients with symptoms of both slurred speech and weakness had 71 percentage MRI positive results. Patients with slurred speech alone shows 9 % MRI positive results. Patients with symptoms of weakness alone showed 11 percentage positive results.

Diffusion weighted MRI is more reliable and rapid assessment tool to diagnose acute lacunar infarcts in patients presenting with clinical symptoms of TIA.

Conclusion:

Early investigation with MRI with diffusion weighted imaging plays a major role in all patients suspected for TIA which can provide tissue based diagnosis. Acute lacunar infarct in MCA territory distribution is the commonest MRI finding and strongly associated clinical predictors are history of hypertension, duration of symptoms, motor weakness and aphasia.

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