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ORIGINAL RESEARCH

Assessment of causes of Trigeminal neuralgia using MRI

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ABSTRACT
Background: Trigeminal neuralgia typically manifests as muscle twitching or severe hemifacial discomfort. Despite not being a life-threatening illness, the morbidity can be quite crippling and interfere with daily activities, including job. The present study was conducted to assess causes of Trigeminal neuralgia using MRI. **Materials & Methods:** 74 patients presenting with clinical symptoms of unilateral trigeminal neuralgia of both genders underwent MRI using a 1.5 Tesla, Philips multiva system. A high resolution 3D T2 DRIVE or 3D bFFE cranial nerve sequences were performed in addition to the routine Magnetic Resonance (MR) sequences. MR severity grading of neurovascular compression of the trigeminal nerve was as Grade 0- A vascular loop is seen in the prepontine cistern, but not abutting the nerve, Grade 1- Vascular loop abutting the nerve (root entry zone or the cisternal segment) without nerve displacement or atrophy, Grade 2- Vascular loop causing mild indentation of the nerve, Grade 3- Vascular loop significantly displacing the nerve, without nerve atrophy, Grade 4- Vascular loop significantly displacing/distorting the nerve with signs of nerve atrophy. **Results:** Out of 74 patients, 44 were males and 30 were females.MRI findings showed neurovascular compression in 54, benign intracranial hypertension in 7, trigeminal pontine sign in 4, no specific findings in 9 patients. The difference was significant (P< 0.05). Neurovascular compression grade 1 was seen in 23, grade 2 in 17, grade 3 in 10 and grade 4 in 4 patients. The difference was significant (P< 0.05). **Conclusion:** The clinician can completely relieve the patient's symptoms by determining reversible aetiologies, such as benign intracranial hypertension. A customized MRI can show both typical and uncommon causes of trigeminal neuralgia in the majority of instances, which helps the clinician treat the patient appropriately.
Keywords: Benign intracranial hypertension, Trigeminal neuralgia, MRI

INTRODUCTION

Trigeminal neuralgia typically manifests as muscle twitching or severe hemifacial discomfort. Despite not being a life-threatening illness, the morbidity can be quite crippling and interfere with daily activities, including job.[1] Most of the time, trigeminal neuralgia causes can be more precisely determined because to advancements in MR techniques and resolutions. For persistent, unilateral trigeminal neuralgia, neurovascular compression continues to be the most common cause. There was uncertainty regarding which instances needed a surgical microvascular decompression because the clinical importance of the neurovascular compression was not clearly defined in earlier research.[2]

One of the most common causes of trigeminal neuralgia is the compression of the trigeminal nerve by a nearby blood vessel (usually an artery or vein). MRI, especially when enhanced with high-resolution imaging techniques (like 3D imaging or T2-weighted sequences), can help visualize this compression.[3]MRI is useful in detecting any lesions, tumors, or other structural anomalies (such as a multiple sclerosis plaque) that could be compressing or affecting the trigeminal nerve.In some cases, TN can be linked to multiple sclerosis, which may cause demyelination of the trigeminal nerve. MRI scans with gadolinium contrast can identify these areas of demyelination.[4]

T2-weighted images are effective for highlighting areas of nerve compression, particularly from blood vessels.Contrast-enhanced imaging(like gadolinium) is used, it helps identify lesions, tumors, or areas of demyelination associated with multiple sclerosis.[5]3D Magnetic Resonance Neurography (MRN)provides high-resolution imaging of nerves, potentially allowing for the visualization of the trigeminal nerve and any associated structural changes that might be contributing to TN.[6]The present study was conducted to assess causes of Trigeminal neuralgia using MRI.

MATERIALS & METHODS

The study was carried out on 74 patients presenting with clinical symptoms of unilateral trigeminal neuralgia of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. The MRI was done using a 1.5 Tesla, Philips multiva system. A high resolution 3D T2 DRIVE or 3D bFFE cranial nerve sequences were performed in addition to the routine Magnetic Resonance (MR) sequences.MR severity grading of neurovascular compression of the trigeminal nerve was as Grade 0- A vascular loop is seen in the prepontine cistern, but not abutting the nerve, Grade 1- Vascular loop abutting the nerve (root entry zone or the cisternal segment) without nerve displacement or atrophy, Grade 2- Vascular loop causing mild indentation of the nerve, Grade 3- Vascular loop significantly displacing the nerve, without nerve atrophy, Grade 4- Vascular loop significantly displacing/distorting the nerve with signs of nerve atrophy. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of cases

Total- 74		
Gender	**Male**	**Female**
Number	44	30

Table I shows that out of 74 patients, 44 were males and 30 were females.

Table II MRI findings of TN

MRI findings	Number	P value
Neurovascular compression	54	0.01
Benign intracranial hypertension	7	
Trigeminal pontine sign	4	
No specific findings	9	

Table II, graph I shows that MRI findings showed neurovascular compression in 54, benign intracranial hypertension in 7, trigeminal pontine sign in 4, no specific findings in 9 patients. The difference was significant (P< 0.05).

Graph I MRI findings of TN

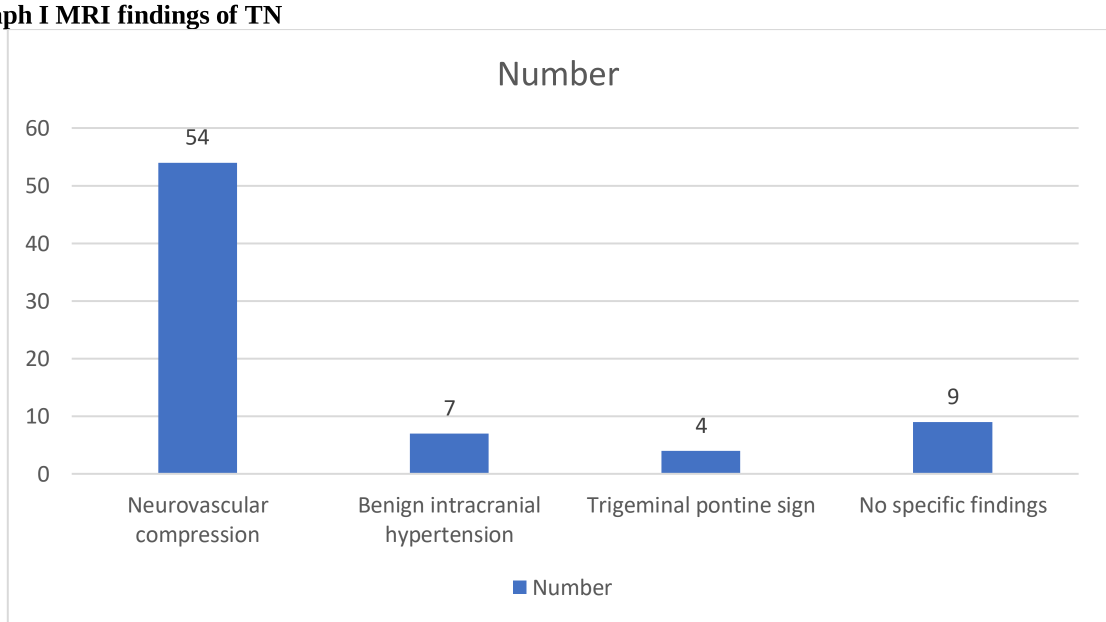

Table III Neurovascular compression grading

Grading	Number	P value
Grade 1	23	0.04
Grade 2	17	
Grade 3	10	
Grade 4	4	

Table III shows that neurovascular compression grade 1 was seen in 23, grade 2 in 17, grade 3 in 10 and grade 4 in 4 patients. The difference was significant (P< 0.05).

DISCUSSION

In cases of classical trigeminal neuralgia, where there's no underlying structural cause, the MRI may appear normal.[7,8]If there's nerve compression (e.g., from a vascular anomaly), the MRI will show the blood vessel pressing on the trigeminal nerve root at the brainstem. In cases where multiple sclerosis is involved, MRI may reveal plaques along the nerve or in the brainstem.[9,10]Not all cases of TN have visible structural abnormalities on MRI, especially in classical TN where the cause is often vascular compression, which may not always be clearly visible.MRI can be a more expensive and time-consuming process.[11,12]The present study was conducted to assess causes of Trigeminal neuralgia using MRI.

We found that out of 74 patients, 44 were males and 30 were females. A study by Soundarapandian et al[13]aimed in showing that all trigeminal neuralgias are not secondary to neurovascular compression and other unusual causes needs to be looked for and assessed during an MRI examination. Out of the 70 patients, we found that the majority (53) had a neurovascular compression, which ranged from a simple indentation by a tortuous Superior Cerebellar Artery (SCA) to full blown vertebrobasilar dolichoectasia. Out of the remaining cases, six were found to be secondary to benign intracranial hypertension with prominent Meckel's caves. There were two cases who had an unusual finding of "Trigeminal pontine sign", which were post infective (postherpetic being the most probable cause).

We found that MRI findings showed neurovascular compression in 54, benign intracranial hypertension in 7, trigeminal pontine sign in 4, no specific findings in 9 patients. Lorenzoni et al[14]described the anatomical characteristics and patterns of neurovascular compression in patients suffering classic trigeminal neuralgia (CTN), using high-resolution magnetic resonance imaging (MRI).MRI studies (T1, T1 enhanced and T2-SPIR) with axial, coronal and sagital simultaneous visualization were dynamically assessed using the software GammaPlan™. Three-dimensional reconstructions were also developed in some representative cases.In 93 patients (93%), there were one or several vascular structures in contact, either, with the trigeminal nerve, or close to its origin in the pons. The superior cerebellar artery was involved in 71 cases (76%). Other vessels identified were the antero-inferior cerebellar artery, the basilar artery, the vertebral artery, and some venous structures. Vascular compression was found anywhere along the trigeminal nerve. The mean distance between the nerve compression and the origin of the nerve in the brainstem was 3.76±2.9mm (range 0-9.8mm). In 39 patients (42%), the vascular compression was located proximally and in 42 (45%) the compression was located distally. Nerve dislocation or distortion by the vessel was observed in 30 cases (32%).

We found that neurovascular compression grade 1 was seen in 23, grade 2 in 17, grade 3 in 10 and grade 4 in 4 patients. Hughes MA et al[15] suggested that imaging combined with clinical information is critical to correctly identify patients who are candidates for microvascular decompression. The purpose of this article is to review trigeminal nerve anatomy and to provide strategies for radiologists to recognize important MRI findings in patients with trigeminal neuralgia.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that the clinician can completely relieve the patient's symptoms by determining reversible aetiologies, such as benign intracranial hypertension. A customized MRI can show both typical and uncommon causes of trigeminal neuralgia in the majority of instances, which helps the clinician treat the patient appropriately.

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