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Hypoperfusion During Migraine and its Effect on the Retina

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Abstract
Background: One of the most prevalent chronic, complex neurovascular illnesses, migraine, is primarily defined by recurring bouts of incapacitating headaches with aura appearances in up to one-third of patients. Nearly 15% of people get migraines, making it the third most common sickness in the world. **Objective**: This paper aims to study hypoperfusion during migraines and its Effect on the Retina. **Patients and methods**: This paper was contributed to study and assess hypoperfusion during migraine and its effect on the retina. This study was designed methodology into two groups. Which first group presented patients have migraine with 50 patients, while the second group have 50 patients who were treated of migraine. This paper designed collected data using the SPS program. This study was progressed for all patients of data for ages in between patients and controls into study between 24th 2021 to 17th 2022 in the different hospitals in Iraq. **Discussion**: Our study aims to determine the thickness of the RNFL and its relationship to the migraine clinical features. This paper was examined all data related to hypoperfusion during migraine and its effect on the retina, where it has found that almost patients with 40 to 50 years struggle of a strong migraine due to hypoperfusion.
Additionally, the MIGSEV scale patient evaluation revealed that RNFL attenuation in the right superior quadrant corresponded with increased nausea and worse tolerance. To the symptoms side, this paper noticed constipation and stiff neck on the patients where the first symptom got 17 while the second was 16. **Conclusion**: The key finding of our research was that, in contrast to healthy controls, migraine patients had considerably thinner RNFLs, but that the migraine symptoms, such as aura, had no significant effect on RNFL thickness.

Keywords: RNFL thickness; migraine; symptoms; Chronic; Episodic

Introduction

One of the most prevalent chronic, complex neurovascular illnesses, migraine, is primarily defined by recurring bouts of incapacitating headaches with aura appearances in up to one-third of patients [1]. Nearly 15% of people get migraines, making it the third most common sickness in the world. [2]
According to the neurovascular hypothesis, frequent migraine attacks caused by thickening the retinal nerve fiber sections (RNFL) cause hypoperfusion of the brain as well as eye frameworks, especially the retina, which can cause axonal injury and even permanent massive damage to the eye. [3]
The pathophysiology of migraine has also been linked to neuroinflammation, oxidative stress, hypercoagulability, and altered endothelial functioning in the past. The sensitization to the trigeminal vascular

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system (TGVS), which includes the ocular structures and intra- and extracranial meningeal blood vessels, may also have an impact on vascular tone and pain signal transmission. [4,5]

OCT modifications can identify retrograde trans-synaptic degeneration of neurons (RTSD) of retinal ganglion cells (RGCs), which is a valuable indicator of the degenerative process that occurs in a variety of neurological illnesses, including migraine [6,7].

One of the most trustworthy techniques for assessing morphological modifications to the retinal or optic nerve structure has existed since OCT, or optical coherence tomography was first used in clinical practice. OCT changes can reveal retrograde motion trans-synaptic neuronal degeneration (RTSD) of retinal ganglion cells (RGCs), providing information that is useful for assessing the neurodegenerative process linked to a variety of neurological diseases, including multiple sclerosis, Alzheimer's disease, Parkinson's disease, and various types of headaches, including migraine. OCT aids in the diagnosis and treatment of neuro-ophthalmological illnesses by offering knowledge regarding axonal and neuronal loss in the retina, as well as information about the visual afferent pathways and the brain's nervous system. [8]

An individual evaluation of the retinal layers is provided using spectral domain optical coherence tomography (SD-OCT). Time-domain OCT (TD-OCT), which was the prior technique, has been replaced by SD-OCT. The peripapillary retinal nerve fiber layer (RNFL), macular ganglion cell layer, macular volume, and the optic nerve may all be determined with SD-OCT. The SD-OCT offers a fresh viewpoint on the pathophysiological process behind neuro-ophthalmological diseases, such as migraine, by assessing the irreversible loss of neurons in vivo. [9,10]

According to Kwon et al., patients with neurodegenerative disorders had significantly less peripapillary RNFL thickness. The measurement of the macula's volume or macula thickness on OCT may also be used to estimate neuronal loss. Perimetry, a visual field diagnostic assessment that can identify malfunction in central and peripheral vision that may be brought on by a variety of medical problems, including ocular or neurological diseases, relates to OCT. [11]

OCT is easier to use, more accurate, and extremely sensitive when compared to perimetry while monitoring patients to monitor disease development. Interferometry is used in optical coherence tomography to analyse reflectance data and calculate RNFL thickness. The average thickness of the center region, which has a diameter of 1000 m, is known as the macular thickness. [12]

The number of years since the condition first manifested, the MIDAS (Migraine Disability Assessment Score) score, the involvement of various retinal quadrants, or the advent of chronic migraines were all found to be related to changes in RNFL thickness in migraine sufferers. This study evaluated oxidative stress parameters, peripapillary RNFL thickness, and macula thickness in migraine patients without aura who were not taking preventative medication. It also examined the link between oxidative stress and OCT findings [13,14]. This paper aims to study hypoperfusion during migraines and its Effect on the Retina.

Patients and methods

This paper was contributed to study and assess hypoperfusion during migraine and its effect on the retina. This study was designed methodology into two groups. Which first group presented patients have migraine with 50 patients, while the second group have 50 patients who were treated of migraine. This paper designed collected data using the SPS program. This study was progressed for all patients of data for ages in between patients and controls into study between 24th 2021 to 17th 2022 in the different hospitals in Iraq.

To follow that, this study was focused on statistics data of age in comparison between Migraine patients, and controls were into basics ages and sexes for both males and females, which can be noticed in **Table 1** and **Table 2**.

Besides that, this paper had examined into the type of migraines in correlation with age, chronic, and episodic that it existed crosstabulation between age and type of migraines for patients, and all these details can be shown in **Table 3**.

This paper also has selected the response to abortive treatment of patients where with three parameters which are poor, moderate, and high, which can information find in **Figure 1**. This study as well as interested about patients who take abortive treatments, which are Paracetamol, NSAIDS, and Triptans, all of these outcomes in **Figure 2**.

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This paper focused also on the type of migraines of patients in correlation with an aura which correlated with two types which, are Chronic and Episodic, where it can be clarify in **Table 4**. Moreover, this study has studied symptoms of migraine patients, where these points can be shown in **Table 5**.
This data was extended to study causes of migraine aura patients which are difficulty speaking, vision loss, Visual phenomena, such as seeing various shapes, bright spots, or flashes of light, and Weakness or numbness of the face, where these results can be shown in **Table 6.**
Furthermore, this study was also progressed to evaluate signs of risk factors of migraine aura where represents with these items which include Chronic headache that worsens after coughing, Headache after a head injury, new headache, and Sudden, severe headache and all these outcomes can be presented in **Table 7**.
This study was examined the MIGSEV scale of migraine aura with pointed with Disability, Intensity, and Nausea, where these points can be seen in **Table 8**.

Results

Table 1: Statistics data of age in comparison between Migraine patients and controls.

Statistics

		Age-patients	Age-control
N	Valid	50	50
	Missing	0	0
Mean		39.2200	38.6600
Std. Error of Mean		1.58650	1.30356
Median		35.0000	37.0000
Mode		25.00	34.00[a]
Std. Deviation		11.21822	9.21757
Variance		125.849	84.964
Skewness		.097	.540
Std. Error of Skewness		.337	.337
Range		30.00	30.00
Minimum		25.00	25.00
Maximum		55.00	55.00
Sum		1961.00	1933.00

Table 2: Statistics data of age in comparison between Migraine patients (a) and controls (b).

(a)

Patients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	16	32.0	32.0	32.0
	Male	34	68.0	68.0	100.0

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	Total	50	100.0	100.0	

(b)

Controls

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	11	22.0	22.0	22.0
	male	1	2.0	2.0	24.0
	Male	38	76.0	76.0	100.0
	Total	50	100.0	100.0	

Table 3: Type of migraines in correlation with age.

Type of migraine * Patients Crosstabulation

Count

		Type of migraine												Total
		25.00	27.00	28.00	33.00	34.00	35.00	41.00	44.00	47.00	50.00	51.00	55.00	
Type of migraine	Chronic	5	4	0	2	5	0	2	3	0	0	4	7	32
	Episodic	4	0	2	0	0	4	0	0	4	3	0	1	18
Total		9	4	2	2	5	4	2	3	4	3	4	8	50

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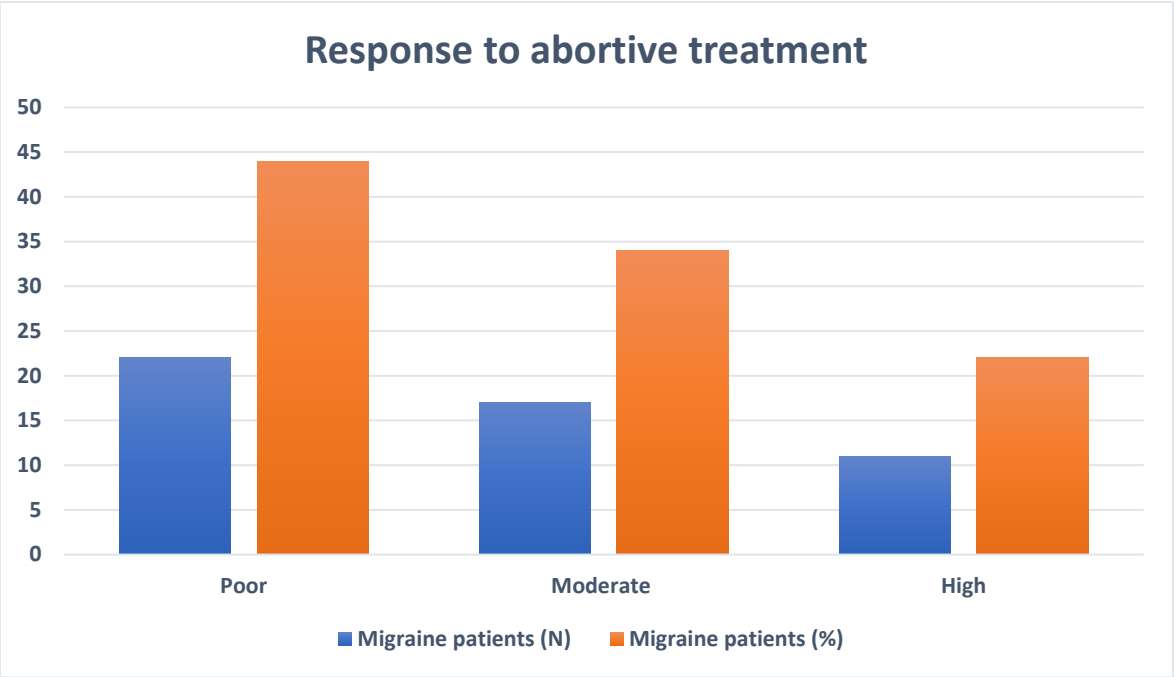

Figure 1: Response to abortive treatment of patients.

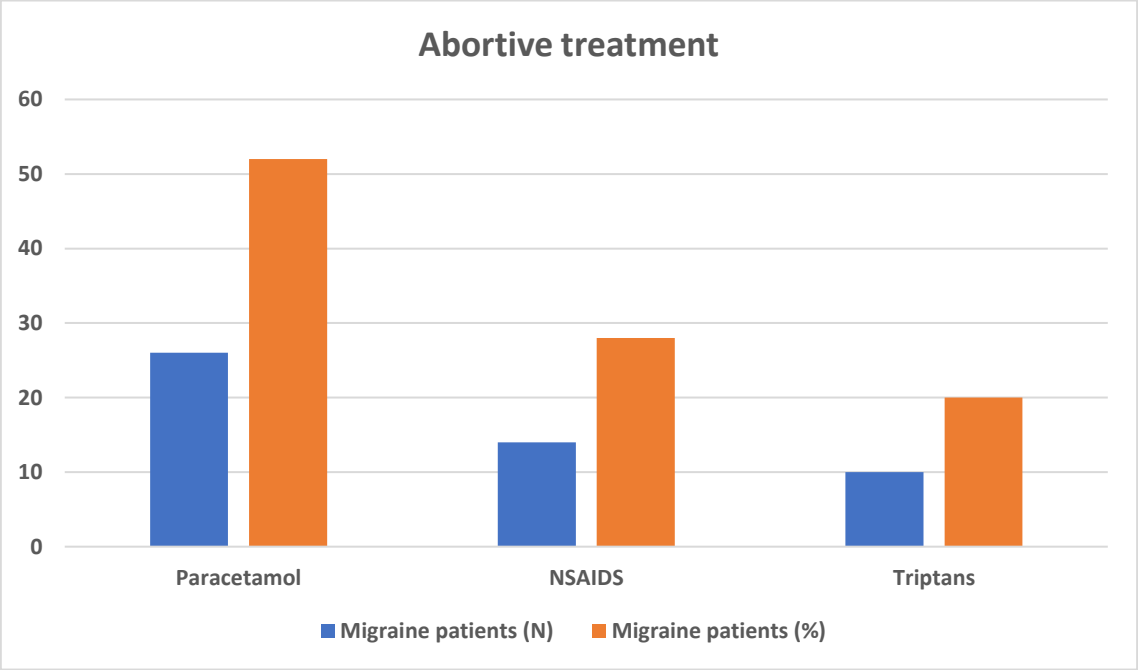

Figure 2: Distribution of patients who are taking abortive treatment.

Table 4: Type of migraines of patients in correlation with aura.

Aura * Type of migraines Crosstabulation

Count

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		Aura of patients		
		Absent	Present	Total
Type of migraines	Chronic	25	7	32
	Episodic	0	18	18
Total		25	25	50

Table 5: Symptoms of migraines patients.

Symptoms

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	constipation	17	34.0	34.0	34.0
	frequent urination	7	14.0	14.0	48.0
	Mood changes from depression to euphoria	10	20.0	20.0	68.0
	stiff neck	16	32.0	32.0	100.0
	Total	50	100.0	100.0	

Table 6: Causes of migraine aura patients.

Migraine aura

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	difficulty speaking	10	20.0	20.0	20.0
	vision loss	9	18.0	18.0	38.0
	Visual phenomena, such as seeing various shapes, bright spots, or flashes of light	15	30.0	30.0	68.0
	Weakness or numbness of the face	16	32.0	32.0	100.0
	Total	50	100.0	100.0	

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Table 7: signs of risk factors of migraine aura.

Signs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Chronic headache that worsens after coughing	4	8.0	8.0	8.0
	Headache after a head injury	16	32.0	32.0	40.0
	New headache	16	32.0	32.0	72.0
	Sudden, severe headache	14	28.0	28.0	100.0
	Total	50	100.0	100.0	

Table 8: MIGSEV scale of migraine aura.

MIGSEV scale

Count

		2.33	2.44	2.60	Total
VAR00013	Disability	0	7	0	7
	Intensity	0	0	21	21
	Nausea	0	12	0	12
	Tolerable	10	0	0	10
Total		10	19	21	50

Table 9: Assessment of retinal nerve fiber layer thickness through compare patients with and without aura.

Items	**Patients with aura**	**Patients without aura**	**P-value**
Superior retina			
Right	134	130.22	0.366
Left	121.4	119.8	0.622
Inferior retina			
Right	137.6	133.65	0.735

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Left	127.7	125.3	0.644
Nasal retina			
Right	71.6	75.12	0.245
Left	77.5	37.66	0.364
Temporal retina			
Right	73.2	77.4	0.778
Left	66.3	64.35	0.366

Discussion

Our study aims to determine the thickness of the RNFL and its relationship to the migraine clinical features. When compared to a healthy control group, migraine sufferers showed a statistically significant reduction in RNFL thickness in all bilateral quadrants. These results were in line with many earlier studies. [15]

This paper was examined all data related to hypoperfusion during migraine and its effect on the retina, where it has found that almost patients with 40 to 50 years struggle of a strong migraine due to hypoperfusion. Our results showed that constipation (17) 34% and stiff neck (16) 32% got high cases of patients.

Our study noticed that patients above 40 years struggle of Severe headaches, which patients below 30 years have normal headaches as well.

As almost of males had migraine more that females for both groups. In the study we described, there was no distinction in RNFL thickness between migraine patients with and without aura in any of the retinal quadrants. Simsek et al. [16]. also observed no distinction among the two groups of migraine patients. We discovered that severe headaches were linked with RNFL thinning at the left inferior and nasal retina region. Additionally, the MIGSEV scale patient evaluation revealed that RNFL attenuation in the right superior quadrant corresponded with increased nausea and worse tolerance. [17]

Our study showed in the assessment of response to abortive treatment of patients, was found the percentage of the poor level was highest in compare with moderate and excellent as well. As this study has distinguished to distribute of patients who are taking abortive treatment where got Paracetamol was highest with (26) cases, NSAIDS (14), and Triptans (10) cases. [18]

Moreover, this paper was progressed to conduct the examination in between types of migraines of patients in correlation with aura, which are Chronic and Episodic was found that Chronic was the most affecting on patients in comparison with Episodic. To the symptoms side, this paper noticed that constipation and stiff neck on the patients where the first symptom got 17 while the second was 16. [19,20]

Conclusion

The key finding of our research was that, in contrast to healthy controls, migraine patients had considerably thinner RNFLs, but that the migraine symptoms, such as aura, had no significant effect on RNFL thickness. Furthermore, this paper assessed of retinal nerve fiber layer thickness through compare patients with and without aura. Which outcomes found Superior retina and Inferior retina had affected on the right and left of fiber layer thickness, where found Patients with aura had a disadvantage impact on both the right and left in comparison with Patients without aura.

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