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Research Paper

The Role of Gamma Knife Radiosurgery in Conferring the Inflammatory Hypothesis of Trigenminal Neuralgia

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ABSTRACT:

BACKGROUND:

Gamma knife radiosurgery, a bloodless surgery used to treat a variety of intracranial pathologies and is regarded as the first line for treating trigeminal neuralgia, since it has the property of minimal invasiveness and risk.

OBJECTIVE:

In this report, we estimate the effect of gamma knife radiosurgery on certain inflammatory markers in patients with TN.

PATIENTS AND METHODS:

29 patients underwent gamma knife radiosurgery for TN between September 2018 and March 2019. Two readings of inflammatory biomarkers were recorded, the first one just prior to GNRS while the second within one month after it.

Statistical Analysis: Statistical analysis was performed using the Microsoft Excel Statistical Package

RESULTS:

The measured data for each gender is considered separately since TN is more common among women than men. Significant changes were observed regarding PDW and Lymphocytes level post radiosurgery in female group (n=19) but not in male

CONCLUSION:

The significant decrement in PDW and lymphocyte cell percentage post radiosurgery supports the inflammatory hypothesis in trigeminal neuralgia

KEYWORDS: Trigeminal neuralgia, gamma knife, PDW

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Iraqi Postgraduate Medical Journal, 2024; Vol. 23(3): 292-295
DOI: 10.52573/ipmj.2024.137826 *Received: February 26, 2023,* *Accepted: March 12, 2023*

INTRODUCTION:

Gamma Knife radiosurgery is a well identified management that's elected principally for the treatment of tumors, vascular abnormalities and functional brain illnesses[(1)]. It offers to the patients a harmless as well as confident substitute to conventional neurosurgery. Gamma Knife radiosurgery provides emission beams precisely to the target while sparing the adjacent healthy brain tissue [(2)]. Gamma Knife radiosurgery is an optional treatment for trigeminal neuralgia once pharmacological treatments such as antiepileptic or antidepressant medications are definitely no longer effective. Trigeminal neuralgia (TN) is one of the functional brain illnesses characterized by a distinctive pain syndrome known as tic douloureux, classically affects the trigeminal or 5th cranial nerve, one of the most broadly disseminated nerves in the head [(3)]. Actually the pathogenesis of TN is still vague, widely argued and complex. However inflammation and its consequences including demyelination, compression and traumatic cause may contribute in such a way or another [(4)].

This work designed to estimate the potential influence of Gamma knife radiosurgery (GNRS) on certain hematological inflammatory markers in TN and subsequently may possibly put an emphasis on the inflammatory hypothesis.

PATIENTS AND METHOD:

This study was conducted at Neurosciences hospital in Baghdad, from September 2018 to March 2019. It involves 29 patients (10 male with

mean age 48.6±13.62 and 19 female with mean age 50.3±14.65) who established as a case of TN and candidate for GNRS. All cases were under observation of a consultant neurosurgeon. Different inflammatory biomarker were assessed as a part of complete blood count test including red blood cell distribution width(RDW), Lymphocyte cell percent ,Platelets count (PL), mean platelet volume (MPV) ,Platelets distribution width and platelet/lymphocyte ratio (P/L) using a hematology analyzer machine (Swelab Alfa Standard/Boyle, serial number: 25664/Sweden/2014). Two readings were recorded, the first one just prior to GNRS while the second within one month after it. All patients underwent stereotactic radiosurgery with Leksell Gamma Knife Unit model perfexion—Co60 source (A.B. Elekta, Stockholm, Sweden, 2014).

Statistical Analysis

All statistical tests were achieved by using Microsoft Excel statistical package. Data were expressed as mean + standard deviation. Differences between the mean values were analyzed using two tail paired t-test. A P value <0.05 was considered as statistically significant.

RESULTS:

Since, it is well documented that TN is more common among women than men with a female-to-male ratio of 3:2 we assess the measured data for each gender separately.

Table 1 shows the main measured hematological parameters for the recruited patients before and after Gamma Knife radiosurgery (GKRS) for patients with trigeminal neuralgia. No significant changes were observed in these parameters.

Table 1: Comparisons of the measured hematological parameters of patients with trigeminal neuralgia before and after GKRS treatment.

Hematological parameter	Male(10)		P value	Female (19)		P value
	PREGKRS	**POSTGKRS**		**PREGKRS**	**POSTGkRS**	
Platelets count/µL	191.3±38.9	194.1±27.3	NS	206±63.9	205.6±72.4	NS
Mean platelet volume (fL)	9.3±0.68	9.3±0.55	NS	9.5±0.68	9.3±0.67	Ns
RDW (%)	**12.4±0.68**	**13.2±1.47**	**NS**	**12.8±1.24**	**12.7±0.97**	Ns
Platelets/lymphocytes Ratio	7.0±2.13	7.7±2.72	NS	7.3±3.51	8.2±3.83	NS

In contrast, interesting significant changes were observed regarding PDW and Lymphocytes level post radiosurgery in female group (n=19) but not in male (n=10) (figure 1 and 2 respectively).

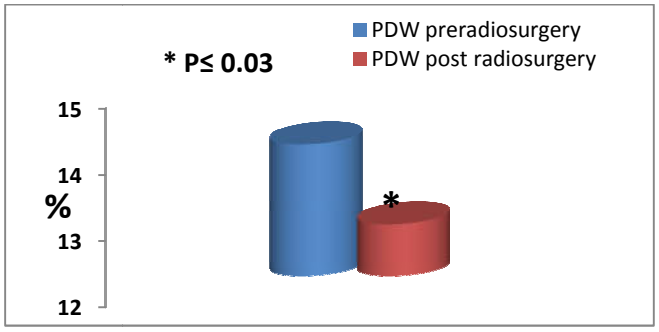

Figure 1: PDW percent pre and post radiosurgery.

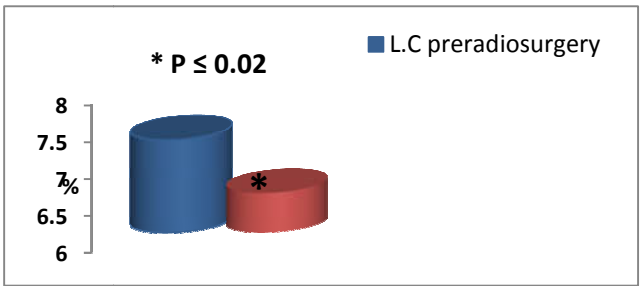

Figure 2: Lymphocyte count percent pre and post radiosurgery.

DISCUSSION:

Trigeminal neuralgia (TN) is a devastating disorder designated as upsetting, uncontrollable hurts. Unfortunately its prevalence increasing and continue to challenge health experts [5].

It is approximately twofold as common in females and the frequency increases with age. The current study showed that 65.5% of recruited patient are females which is in agreement with Loh et al. findings [6]. Moreover different former studies have stated that the age of onset is trapped between the fifth and seventh decades of life [7,8,9] such inclination was in harmony with our observation. What's more, platelets play a vital role in inflammatory process in addition to their well-known impact in hemostasis [10]. As well as, during inflammation platelets experience a succession of variations reflected by changes in platelets indices including PDW [11]. In the current study an interesting significant decrement in PDW post radiosurgery was observed in female patients, which may augment the inflammatory hypothesis in trigeminal neuralgia. Likewise substantial drop in lymphocyte cell percentage post radiosurgery regarding female patients enhances this theory. Since this observation was not true for male patients it may possibly indicate that the pathophysiology of TN is uneven in both gender. However small sample size of male group may contribute to such findings. Unfortunately according to our knowledge there were no previous similar study designs to compare with.

CONCLUSION:

The significant decrement in PDW and lymphocyte cell percentage post radiosurgery supports the inflammatory hypothesis in trigeminal neuralgia.

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