



Original Research Article

Comparative Analysis to Evaluate the Effectiveness of Platelet-Rich Plasma (PRP) Versus Conventional Medications in Treating Trigeminal Neuralgia Thereby Determining Superior Therapeutic Approach: An Original Research Study

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Name of Author:

Dr. Bogi Prashanthi¹, Dr. Sai Krishna Priya B², Dr. Aishwarya Sonti³, Dr. Manikanta Koyi⁴, Dr. Bhavani Meesala⁵, Dr. Asha Supriya Satti⁶

Affiliation: ¹MDS, Reader, Department of Oral Medicine and Radiology, Nimra Institute of Dental Sciences, Ibrahimpatnam, NTR District, Andhra Pradesh, India (Corresponding Author)

²MDS, Department of Oral Medicine and Radiology

³MDS, Senior Lecturer, Department of Oral Medicine and Radiology, Sibar Institute of Dental Sciences, Takkellapadu, Guntur, Andhra Pradesh, India

⁴BDS, Masters of Science in Health Informatics, Westfield, Indiana, USA

⁵MDS, Senior Lecturer, Department of Oral Pathology, Sibar Institute of Dental Sciences, Takkellapadu, Guntur, Andhra Pradesh, India

⁶MDS, Senior Lecturer, Department of Pediatric and Preventive Dentistry, Sibar Institute of Dental Sciences, Takkellapadu, Guntur, Andhra Pradesh, India

Corresponding Author:

Dr. Bogi Prashanthi

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Abstract: **Aim:** This study aims to analyze the effectiveness of platelet-rich plasma (PRP) versus conventional medications in treating trigeminal neuralgia, thereby determining a superior therapeutic approach. **Materials and Methods:** This study investigates 40 patients suffering from severe unilateral facial pain, specifically focusing on those with trigeminal neuralgia. Of these, 30 patients reported intense, brief episodes of pain, often described as electric shocks or stabbing sensations in areas like the cheek, jaw, teeth, or around the eye. Common triggers included light touches, chewing, talking, and brushing teeth, severely impacting daily life and functionality. The study aimed to evaluate treatment options for these patients, with strict inclusion criteria for individuals aged 18 to 42 who experienced severe facial pain on one side. Exclusion criteria ruled out those with metastatic conditions, systemic diseases, pregnant or lactating women, and others with specific symptoms, ensuring ethical standards were maintained through informed consent. Patients were divided into three treatment groups: Group 1 received conventional medical treatments involving anticonvulsants; Group 2 underwent platelet-rich plasma (PRP) therapy, using a two-step centrifugation process to prepare PRP for injection; and Group 3 received a combination of both treatments. The study's primary goal was to analyze the effectiveness of PRP therapy alongside traditional medications, aiming to enhance treatment strategies for trigeminal neuralgia and improve patient quality of life. **Statistical Analysis and Results:** This study analyzed 30 patients diagnosed with trigeminal neuralgia, characterized by severe unilateral facial pain. The cohort consisted of 17 males and 13 females, aged 18 to 42 years, all seeking effective treatment for their debilitating symptoms. Participants were divided into three treatment groups of 10: Group 1 received conventional medications (anticonvulsants and analgesics), Group 2 underwent platelet-rich plasma (PRP) therapy, and Group 3 was treated with a combination of both methods. Results indicated that in Group 1, 1 patient (10%) reported diminished effectiveness of conventional treatment. In Group 2, 2 patients (20%) experienced less effectiveness with PRP therapy. However, Group 3 showcased promising results, with no patients reporting reduced effectiveness from the combined treatment, suggesting potential synergistic benefits. Overall treatment outcomes were assessed using one-way ANOVA, highlighting significant differences in treatment efficacy across the groups. These findings could enhance clinical practices and improve patient quality of life in managing trigeminal neuralgia. **Conclusion:** This study found that PRP is a highly effective treatment, especially when combined with traditional therapies. It offers better pain relief, longer-lasting effects, and fewer side effects.

Patients using PRP with carbamazepine experience greater pain reduction, reduced reliance on painkillers, and improved sleep, with minimal relapse. PRP addresses the root causes of trigeminal neuralgia, providing a more sustainable long-term solution.

Keywords: Trigeminal Neuralgia, Platelet-Rich Plasma (PRP), Trigeminal Nerve, Tic Douloureux

INTRODUCTION

Trigeminal neuralgia is a severe and debilitating neurological disorder characterised by sudden and excruciating episodes of facial pain, predominantly affecting one side of the face. Individuals suffering from this condition often describe the pain as sharp and piercing, reminiscent of electric shocks coursing through their facial nerves. These agonising attacks can strike abruptly, lingering for a brief few seconds or extending into several torturous minutes, leaving patients in a state of heightened sensitivity.^{1,2} Even minor stimuli can trigger these intense pain episodes: an innocuous light touch on the cheek, the simple act of chewing a meal, or just a gentle breeze brushing against the mucosa, can unleash a wave of discomfort that is both unpredictable and overwhelming. This relentless cycle of pain significantly impacts not only the physical well-being of patients but also their emotional state, often leading to heightened anxiety and avoidance behaviours. As a result, many find their daily routines profoundly disrupted, as the looming threat of another attack diminishes their overall quality of life, casting a shadow over previously enjoyed activities and interactions.^{3,4} The underlying mechanism of trigeminal neuralgia typically involves the compression of the trigeminal nerve, which is responsible for sensory perception in the facial region, by nearby blood vessels. This compression results in nerve irritation and dysfunction, creating a pathological state that manifests as the striking pain associated with the disorder. In some cases, trigeminal neuralgia may develop secondary to other neurological conditions, such as multiple sclerosis or the presence of tumours in the cranial area, further complicating its management and impact on the individual's well-being.^{5,6} Diagnosis of trigeminal neuralgia is primarily contingent upon a comprehensive clinical history and neurological examination, which focuses on the presentation and nature of the pain. Clinicians assess the specific triggers and qualities of the pain experienced by the patient. Advanced imaging techniques, such as magnetic resonance imaging (MRI), may be utilised to exclude secondary causes, ensuring the diagnosis is as accurate as possible.⁷ Initial treatment for trigeminal neuralgia usually involves pharmacological intervention, with anti-seizure medications like carbamazepine and oxcarbazepine being standard first-line therapies. These medications

have demonstrated efficacy in reducing both the frequency and intensity of pain episodes. However, in situations where patients experience inadequate pain relief, intolerable side effects, or a lack of response to these medications, alternative pharmacological options, including baclofen or certain antidepressants, may be considered, alongside potential surgical interventions.^{8,9} In recent years, Platelet-Rich Plasma (PRP) therapy has gained attention as a potentially effective adjunctive treatment for trigeminal neuralgia. This innovative approach involves drawing a small volume of the patient's blood, processing it to concentrate the platelets, which are rich in growth factors, and then injecting the PRP near the affected trigeminal nerve. The intention is to stimulate the body's natural healing processes, promoting nerve regeneration and potentially leading to long-term pain relief.^{10,11} For patients who do not derive adequate relief from medical management, surgical options are available, and these vary considerably based on individual patient characteristics and preferences. Surgical techniques may include nerve-damaging procedures such as radiofrequency ablation, which focuses on disrupting the pain pathways, or more invasive procedures like Microvascular Decompression. The latter involves relocating the offending blood vessel to relieve pressure on the trigeminal nerve, thereby alleviating pain.^{12,13} This study aims to meticulously compare the effectiveness and outcomes of PRP therapy with conventional medication regimens in individuals suffering from trigeminal neuralgia. The goal is to provide clearer guidance on optimal treatment strategies that may not only enhance pain management but also significantly improve the quality of life for those affected by this complex and challenging condition. By understanding the comparative benefits and risks associated with these treatment modalities, the study hopes to contribute valuable insights to the field of pain management and neurology.

Materials and Methods

This study delves deeply into a group of 40 patients with severe unilateral facial pain, with a particular focus on those diagnosed with trigeminal neuralgia. Within this cohort, 30 individuals were clinically confirmed to experience intense, ephemeral episodes of excruciating pain. These patients vividly described their pain as abrupt in onset and overwhelmingly severe, often likening it to electric shocks or stabbing

sensations that pierced through their facial regions. The debilitating discomfort typically localized in specific areas such as the cheek, jaw, teeth, or around the eye, severely diminishing their quality of life and daily functionality. The study identified common triggers for these agonizing episodes—such as seemingly benign actions that many take for granted, such as a light touch to the face, chewing food, conversing, or even the mundane act of brushing their teeth. The repercussions of trigeminal neuralgia on these patients' daily routines were profound, resulting in substantial disruptions and significant challenges in managing even the most routine tasks. A thorough analysis established that these 30 patients were diagnosed with trigeminal neuralgia an ailment notorious for its debilitating nature and the complexities inherent in its management. The central aim of the study was to explore and evaluate an array of effective treatment options tailored specifically for these patients. To achieve this, inclusion criteria were strictly defined, requiring participants to be between the ages of 18 and 42 years. This age range ensured a diverse demographic comprised of both male and female subjects, all enduring severe, localized facial pain predominantly on one side. To uphold the integrity of the study, rigorous exclusion criteria were implemented. Individuals afflicted with metastatic conditions, systemic diseases, pregnant or lactating women, or those presenting symptoms such as fever, excessive alcohol consumption, or bleeding disorders were deemed ineligible for participation. Furthermore, informed consent was diligently obtained from all participants prior to the commencement of the research, upholding the highest ethical standards throughout the study. The research design strategically categorized the patients into three distinct treatment groups, each receiving different therapeutic interventions. Group 1 consisted of 10 patients diagnosed with trigeminal neuralgia who were undergoing conventional medical treatments, typically involving the administration of anticonvulsant medications or analgesics aimed at alleviating their distressing symptoms. Group 2 featured another cohort of 10 patients who underwent platelet-rich plasma (PRP) therapy. The PRP preparation involved drawing 10 ml of the patient's blood, which was subsequently processed using centrifugation at a speed of 3500 rpm for

duration of 10 minutes. Following this initial spin, the upper layers containing the buffy coat and plasma were subjected to a second centrifugation at 4000 rpm for 7 minutes, yielding approximately 2 to 3 ml of concentrated PRP. For PRP administration, patients were carefully positioned in a supine manner, with a supportive pillow placed beneath their heads to ensure comfort. The procedure adhered to stringent aseptic techniques to minimize infection risks. Utilizing a 26 G, 1-inch hypodermic needle, 0.5 to 1 ml of PRP was injected delicately 0.5 to 1 cm beneath the skin at carefully designated trigger points, optimized at a precise 30-degree angle to the skin surface. Post-injection management included applying gentle pressure to the injection site with a dry gauze pad for 2 minutes to control any immediate bleeding and enhance patient comfort during the recovery process. Group 3 comprised the remaining 10 patients who received a combined treatment approach, integrating conventional medical therapy with PRP treatment to explore the potential synergistic effects of both modalities. The primary objective of this study is to meticulously analyze the effectiveness of platelet-rich plasma therapy when juxtaposed with traditional medications in treating trigeminal neuralgia. Through this investigation, the study ultimately seeks to uncover a more effective therapeutic strategy to manage this challenging and often debilitating condition, aiming to provide insights that could significantly enhance patient outcomes and markedly improve their overall quality of life.

Statistical Analysis and Results

In this study, we conducted all statistical analyses using SPSS software version 29.0, renowned for its robustness and widespread application in the social sciences for statistical computing and data analysis. To evaluate the significance of our findings, we applied the chi-square test, which is an effective method for investigating differences in proportions across various groups. This approach allowed us to perform a comprehensive comparison of categorical data, ensuring that our results accurately reflected the underlying trends and relationships within the dataset.

This study involved a comprehensive analysis of 30 patients who presented with severe, sudden, unilateral episodic pain, ultimately leading to a confirmed diagnosis of trigeminal neuralgia, a condition characterized by excruciating facial pain. All participants reported an urgent need for effective treatment to manage their debilitating symptoms. The demographic profile of these individuals included both male and female patients, with ages ranging from 18 to 42 years. As indicated in Table 1, a detailed statistical breakdown of the age and gender distribution shows that out of the total 30 patients, 17 were male and 13 were female, highlighting a slightly higher representation of males in this cohort. The research was methodically designed into three distinct treatment groups, each comprising 10 patients with confirmed trigeminal neuralgia. Group 1 underwent conventional medical treatments, which included a combination of anticonvulsants and analgesics standard approaches in the management of this particular type of

neuropathic pain. Group 2 received treatment solely with platelet-rich plasma (PRP) therapy, an innovative method that has gained attention for its potential regenerative properties and ability to promote healing. Group 3 was treated using a combination of both conventional medications and PRP therapy, allowing for an exploration of any possible synergistic effects that may arise from employing both treatment modalities concurrently. Table 2 presents the findings for Group 1 (n=10), where patients adhered to the regimen of conventional medications. A thorough statistical analysis was conducted using the Pearson Chi-Square test, a robust method for examining the relationships between categorical variables. The analysis indicated that 1 patient (10% of the group) reported a diminished effectiveness of the conventional medication, suggesting the need for further investigation into alternative treatment options. In Table 3, the outcomes for Group 2 (n=10) are showcased, with patients having received PRP therapy exclusively. Consistent with the approach taken in Group 1, a rigorous statistical evaluation using the Pearson Chi-Square test was performed. The results revealed that 2 patients (20% of the group) experienced less effectiveness with the PRP treatment, raising questions about the consistency of this therapy's efficacy across different individuals. Table 4 outlines the findings for Group 3 (n=10), wherein patients received a dual treatment strategy that integrated both platelet-rich plasma and conventional medications. The analysis, conducted with the Pearson Chi-Square test, yielded particularly promising results; this combined treatment approach was notably more effective, with none of the patients reporting any diminished effectiveness. This outcome suggests that the synergistic effects of combining the two treatment modalities may significantly enhance patient responses. Lastly, Table 5 offers a comprehensive estimation of treatment outcomes across all groups, utilizing one-way ANOVA to assess the overall effectiveness of each treatment strategy in managing trigeminal neuralgia. This analysis aims to identify significant differences in treatment efficacy among the various approaches investigated in the study, thereby contributing valuable insights into optimizing therapeutic strategies for this challenging condition. Such findings could have important implications for clinical practice and patient quality of life in the management of trigeminal neuralgia.

Table 1: Age & gender based statistical description of contributing patients

Age Group Y)	Male	Female	Total	P value
18-22	5	3	8	0.06
23-27	2	2	4	0.03*
28-32	3	3	6	0.01*
33-37	4	4	8	0.60
38-42	3	1	4	0.40
Total	17	13	30	*Sig
*p<0.05 significant				

Graph 1: Patients demographic distribution and associated details

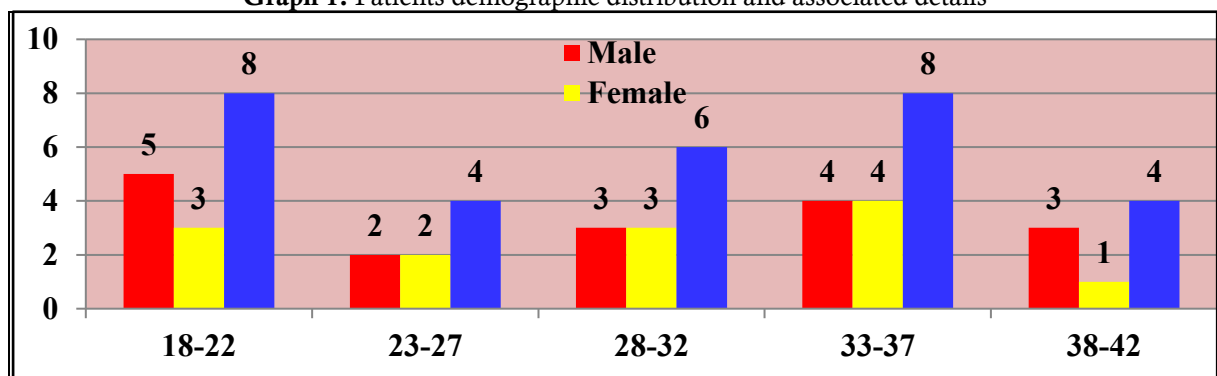


Table 2: Group 1(n=10) patients with trigeminal neuralgia received conventional medication as part of their treatment regimen. To assess the significance of the findings observed during the study, a rigorous statistical analysis was performed using the Pearson Chi-Square test, which is a reliable method for evaluating the relationship between categorical variables

Evaluation	N	Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	df	p value
Treatment approach	2	1.12	1.09	1.07	1.05	1.09	1.10	0.06
Efficacy	2	1.12	1.09	1.07	1.05	1.09	1.10	0.06
Safety and side effects	2	1.12	1.09	1.07	1.05	1.09	1.10	0.06
Invasiveness	1	1.06	1.04	1.03	1.01	1.03	1.06	0.02*
Status	1	1.06	1.04	1.03	1.01	1.03	1.06	0.02*
Recovery	1	1.06	1.04	1.03	1.01	1.03	1.06	0.02*
Less effective	1	1.06	1.04	1.03	1.01	1.03	1.06	0.02*

*p<0.05 significant

Table 3: Group 2 (n=10) patients with trigeminal neuralgia received platelet-rich plasma as part of their treatment regimen. To assess the significance of the findings observed during the study, a rigorous statistical analysis was performed using the Pearson chi-square test, a reliable method for evaluating the relationship between categorical variables

Evaluation	N	Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	df	p value
Treatment approach	1	1.06	1.04	1.03	1.01	1.03	1.06	0.02*
Efficacy	2	1.12	1.09	1.07	1.05	1.09	1.10	0.06
Safety and side effects	1	1.06	1.04	1.03	1.01	1.03	1.06	0.02*
Invasiveness	2	1.12	1.09	1.07	1.05	1.09	1.10	0.06
Status	1	1.06	1.04	1.03	1.01	1.03	1.06	0.02*
Recovery	1	1.06	1.04	1.03	1.01	1.03	1.06	0.02*
Less effective	2	1.12	1.09	1.07	1.05	1.09	1.10	0.06

*p<0.05 significant

Table 4: Group 3 (n = 10) patients with trigeminal neuralgia received combined treatment, including platelet-rich plasma and conventional medications,as part of their treatment regimen. To assess the significance of the findings observed during the study, a rigorous statistical analysis was performed using the Pearson Chi-Square test, which is a reliable method for evaluating the relationship between categorical variables

Evaluation	N	Mean	Std. Dev.	Std. Error	95% CI	Pearson Chi-Square Value	df	p value
Treatment approach	2	1.12	1.09	1.07	1.05	1.09	1.10	0.06
Efficacy	2	1.12	1.09	1.07	1.05	1.09	1.10	0.06
Safety and side effects	3	1.14	1.10	1.08	1.07	1.08	1.11	0.07
Invasiveness	1	1.06	1.04	1.03	1.01	1.03	1.06	0.02*
Status	1	1.06	1.04	1.03	1.01	1.03	1.06	0.02*
Recovery	1	1.06	1.04	1.03	1.01	1.03	1.06	0.02*
Less effective	0	-	-	-	-	-	-	-

*p<0.05 significant

Table 5: Estimation amongst all studied groups using one-way ANOVA

Variables	Degree of Freedom	Sum of Squares Σ	Mean Sum of Squares $m\Sigma$	F	Level of Sig. (p)
Between Groups	5	2.235	2.237	1.2	0.02*
Within Groups	17	2.246	2.413	–	
Cumulative	125.09	5.98	*p<0.05 significant		

DISCUSSION

Snel BJ et al reviewed in their study that trigeminal neuralgia, historically known as tic douloureux, is a complex and debilitating chronic pain condition that is characterised by sudden, severe episodes of intense pain that can feel like electric shocks. These distressing episodes primarily affect the areas innervated by the trigeminal nerve, the fifth cranial nerve (CN V). This nerve is crucial for facial sensation, transmitting sensory information from the forehead, cheeks, and lower jaw to the brain, as well as facilitating essential motor functions involved in chewing. Pain typically presents unilaterally, impacting one side of the face, and individual experiences may vary significantly in the specific branches of the trigeminal nerve that are involved.^{14,15} Martinelli R et al included in their study that the trigeminal nerve is the largest among the cranial nerves, making it instrumental in facial sensations and chewing mechanics. The most prevalent cause of trigeminal neuralgia is neurovascular compression, where a blood vessel exerts pressure on the trigeminal nerve, leading to demyelination. This condition, while not life-threatening, can severely hinder a person's quality of life, resulting in chronic pain, emotional distress, and disabilities that interfere with daily activities and social interactions.¹⁶ Gambeta E et al showed in their study that the clinical course of trigeminal neuralgia is highly variable. Some individuals may experience discrete episodes of excruciating pain that are separated by periods of relief, while others may endure continuous, fluctuating discomfort. Even routine activities such as eating, speaking, smiling, or light touch can trigger these painful attacks, complicating the diagnostic process, which is primarily based on clinical evaluation. However, advanced imaging techniques, particularly high-resolution magnetic resonance imaging (MRI), play a vital role in ruling out secondary causes of facial pain, such as tumours, multiple sclerosis, or other demyelinating diseases. MRI can also be instrumental in visualising neurovascular compression, which often plays a critical role in the

pathophysiology of the disorder.^{17,18} Villegas Díaz D et al reviewed in their study that upon diagnosis, it becomes crucial to implement effective treatment strategies to manage symptoms. First-line pharmacological treatment typically involves carbamazepine, an anticonvulsant that has shown significant efficacy in alleviating neuralgic pain. Other anticonvulsants, such as oxcarbazepine, lamotrigine, phenytoin, pregabalin, and gabapentin, can also be beneficial in managing symptoms. Additionally, muscle relaxants, such as baclofen, may provide complementary benefits by reducing nerve and muscle tension, further alleviating discomfort.^{19,20} Egierska D et al showed in their study that for patients who do not find sufficient relief from their pain through medication or who suffer from unbearable side effects, exploring surgical options may become necessary. One prevalent procedure among these is microvascular decompression. This intricate surgical technique focuses on alleviating the pressure on nerves by skilfully repositioning or, if needed, removing the blood vessels that are pressing against the trigeminal nerve. By addressing this nerve compression, microvascular decompression can lead to significant pain relief for many individuals, thereby enhancing their overall quality of life and restoring a sense of normalcy to daily activities.^{21,22} Carlson NE et al showed in their study that emerging therapies, particularly platelet-rich plasma (PRP) therapy, are currently under investigation for their intriguing potential to promote nerve regeneration and mitigate inflammation in individuals suffering from trigeminal neuralgia. Preliminary studies have shown encouraging results, indicating that PRP may provide relief for some patients; however, further in-depth research is essential to thoroughly ascertain both its efficacy and safety within this particular clinical context.^{23,24} Allam AK et al reviewed in their study that trigeminal neuralgia is a complex and often debilitating condition characterised by intense facial pain, and its manifestations can vary significantly from one individual to another. Given this multifaceted nature, a comprehensive,

multidisciplinary approach is frequently necessary. This entails collaborating with neurologists, pain specialists, physical therapists, and other healthcare professionals to devise a treatment plan that is finely tuned to the unique needs and circumstances of each patient. By adopting such a personalised strategy, healthcare providers can aim to optimise therapeutic outcomes, enhance the effectiveness of treatments, and ultimately improve the overall quality of life for those grappling with this challenging condition.²⁵

Conclusion

This study delves into the comparative effectiveness of platelet-rich plasma (PRP) against conventional medications for the treatment of trigeminal neuralgia, a condition characterised by intense facial pain. The findings indicate that PRP emerges as a more effective therapeutic option, particularly when integrated with traditional treatments. It not only delivers superior pain relief but also extends the duration of its effects while minimising the likelihood of adverse side effects. Conventional medications, such as carbamazepine and oxcarbazepine, are typically the first-line approach for immediate pain management. However, the addition of PRP injections enhances treatment outcomes significantly. Research highlights that patients who receive PRP alongside carbamazepine experience markedly greater reductions in pain intensity, reduced reliance on analgesics, and noteworthy improvements in sleep quality. Furthermore, follow-up assessments conducted over several months reveal a remarkable absence of symptom relapse in these patients. In essence, while conventional pharmaceuticals primarily help manage the immediate symptoms, PRP injections target the underlying causes of trigeminal neuralgia, such as inflammation and nerve damage. This dual approach not only alleviates pain but potentially offers a more sustainable solution for long-term recovery, suggesting that PRP could play a critical role in the evolving landscape of trigeminal neuralgia therapy.

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