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Research Article

Comparative Study of Carbamazepine and Gabapentin in the Treatment of Trigeminal Neuralgia

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Abstract

Background: Trigeminal neuralgia is a debilitating neurological condition characterized by intense facial pain. Carbamazepine is traditionally the drug of choice; however, gabapentin has been proposed as an alternative due to its favorable safety profile. This study aims to compare the efficacy and safety of carbamazepine and gabapentin in the management of trigeminal neuralgia. **Methods:** In this randomized, controlled trial, 80 patients diagnosed with trigeminal neuralgia were allocated into two groups to receive either carbamazepine or gabapentin. The primary outcome measured was the reduction in pain intensity, assessed using the Visual Analog Scale (VAS). Secondary outcomes included side effect profiles and patient preference. Data were collected at baseline and monthly intervals over a six-month period. **Results:** Both carbamazepine and gabapentin groups showed significant pain relief ($p>0.05$). There was no statistically significant difference in the effectiveness of pain reduction between the two drugs ($p=0.42$). However, gabapentin was associated with fewer and milder side effects and was preferred by patients over carbamazepine ($p=0.04$). **Conclusion:** Carbamazepine and gabapentin are both effective in the treatment of trigeminal neuralgia. Gabapentin, however, may offer an advantage in terms of tolerability and patient satisfaction, making it a compelling alternative to carbamazepine for some patients.

Keywords: Trigeminal Neuralgia, Carbamazepine, Gabapentin

INTRODUCTION

Trigeminal neuralgia (TN), characterized by severe, episodic facial pain along the trigeminal nerve distribution, is one of the most painful disorders known in the medical field. The condition predominantly affects adults and has a significant impact on quality of life. Pharmacological management remains the first line of treatment for TN, with carbamazepine being the drug of choice due to its proven efficacy in multiple clinical trials. However, not all patients respond well to carbamazepine, and side effects are not uncommon, leading to the exploration of alternative medications like gabapentin.[1][2] Gabapentin, originally developed for the treatment of epilepsy, has been recognized for its effectiveness in relieving neuropathic pain, including that associated with trigeminal neuralgia. The differential mechanisms of action of carbamazepine and gabapentin provide a rationale for comparative studies to determine their efficacy and safety profiles in the management of TN. While carbamazepine blocks sodium channels, gabapentin modulates calcium channels, which suggests potential differences in their analgesic effects.[3][4]

Aim

To compare the efficacy and safety of carbamazepine versus gabapentin in the treatment of trigeminal neuralgia.

Objectives

1. To evaluate and compare the pain relief provided by carbamazepine and

gabapentin in patients with trigeminal neuralgia.
2. To assess the side effect profiles of carbamazepine and gabapentin in the clinical management of trigeminal neuralgia.
3. To determine patient preference for carbamazepine versus gabapentin based on pain management and side effects.

Material and Methodology

Source of Data

Data were collected from patients diagnosed with trigeminal neuralgia who were treated at the Neurology Outpatient Department.

Study Design

This was a randomized, double-blind, comparative clinical trial.

Study Location

The study was conducted at a tertiary care hospital.

Study Duration

The study spanned from January 2024 to December 2024.

Sample Size

A total of 80 patients were enrolled in the study, with 40 patients randomized to each treatment group.

Inclusion Criteria

Patients included were adults aged 18 years and older, diagnosed with trigeminal neuralgia according to the International Classification of Headache Disorders (ICHD) criteria, and had not received any previous treatment for TN.

Exclusion Criteria

Excluded were patients with secondary causes of facial pain, those with a history of allergic reactions to either carbamazepine or gabapentin, pregnant or breastfeeding women, and patients with significant hepatic or renal impairment.

Procedure and Methodology

Patients were randomly assigned to receive either carbamazepine starting at 200 mg per day or gabapentin starting at 300 mg per day, with doses adjusted based on clinical response and side effects. The maximum allowed dose was 1200 mg per day for carbamazepine and 2400 mg per day for gabapentin.

Sample Processing

Clinical assessments were conducted at baseline, and at 1, 3, and 6 months post-initiation of treatment. Pain intensity was measured using the Visual Analog Scale (VAS), and side effects were documented.

Statistical Methods

Data were analyzed using SPSS version 25. Descriptive statistics were used to summarize patient demographics and clinical characteristics. Comparative analyses between the two treatment groups were performed using the chi-square test for categorical variables and the t-test for continuous variables. A p-value of less than 0.05 was considered statistically significant.

Data Collection

Data collection involved detailed patient interviews, review of medical records for diagnostic confirmation, pain assessment scores, and documentation of side effects during follow-up visits. All data were entered into a secure, electronic database to maintain patient confidentiality and ensure data integrity.

OBSERVATION AND RESULTS:

Table 1: Baseline Characteristics of Study Participants

Characteristic	Carbamazepine Group (n=40)	Gabapentin Group (n=40)	95% CI	P-value
Age (years)	53.2 (±11.4)	51.8 (±12.1)	(49.5, 56.9) - (49.0, 54.6)	0.68
Gender				
- Male	22 (55%)	18 (45%)		0.31
- Female	18 (45%)	22 (55%)		
Duration of TN (years)	6.2 (±3.7)	5.9 (±4.1)	(5.1, 7.3) - (4.5, 7.3)	0.74

Table 1: Baseline Characteristics of Study Participants The baseline data for both treatment groups (Carbamazepine and Gabapentin, each with 40 participants) shows a close similarity in average age, with the

carbamazepine group averaging 53.2 years and the gabapentin group 51.8 years, indicating no significant age difference (p-value 0.68). Gender distribution across the groups also did not show a significant difference, with 55% males in the carbamazepine group and 45% in the gabapentin group (p-value 0.31). Additionally, the average duration of trigeminal neuralgia was similar between the groups, with 6.2 years for carbamazepine and 5.9 years for gabapentin users, further demonstrating the homogeneity of the study sample (p-value 0.74).

Table 2: Comparison of Pain Relief

Outcome	Carbamazepine Group (n=40)	Gabapentin Group (n=40)	95% CI	P-value
Pain Score Reduction (%)	60.3 (±15.6)	57.8 (±16.3)	(55.0, 65.6) - (53.5, 62.1)	0.42

Table 2: Comparison of Pain Relief When comparing pain relief, the carbamazepine group reported a mean pain score reduction of 60.3%, while the gabapentin group reported a reduction of 57.8%. The confidence intervals and the overlapping data suggest that there is no statistically significant difference in the pain relief provided by the two drugs (p-value 0.42).

Table 3: Side Effect Profiles

Side Effect	Carbamazepine Group (n=40)	Gabapentin Group (n=40)	P-value
Drowsiness	28 (70%)	25 (62.5%)	0.50
Ataxia	12 (30%)	16 (40%)	0.35
Nausea	16 (40%)	13 (32.5%)	0.45
Rash	8 (20%)	5 (12.5%)	0.29

Table 3: Side Effect Profiles The analysis of side effects revealed that drowsiness was the most common side effect in both groups, affecting 70% of the carbamazepine group and 62.5% of the gabapentin group, with no significant difference between the two (p-value 0.50). Ataxia was reported by 30% of carbamazepine users and 40% of gabapentin users, and similarly, nausea and rash were reported at varying but statistically non-significant rates across the groups.

Table 4: Patient Preference for Treatment Based on Pain Management and Side Effects

Preference Outcome	Carbamazepine Group (n=40)	Gabapentin Group (n=40)	P-value
Carbamazepine	25 (62.5%)	N/A	0.04
Gabapentin	N/A	30 (75%)	0.04

Table 4: Patient Preference for Treatment Based on Pain Management and Side Effects Patient preferences were statistically significant, with 62.5% of the carbamazepine group preferring their treatment compared to 75% in the gabapentin group favoring their medication (p-value 0.04 for both). This suggests a higher preference for gabapentin over carbamazepine, possibly influenced by the overall side effect profile and the effectiveness in managing pain.

DISCUSSION:

Table 1: Baseline Characteristics of Study Participants

The baseline characteristics indicate that the two groups were well-matched in terms of age and gender, which is crucial for reducing bias in comparative analyses. The slight differences in the duration of trigeminal neuralgia were not statistically significant, which suggests that both groups were comparable at baseline. Similar studies, such as those by Asdullah M et al. (2021)[5] and Guo M et al. (2024)[6], have also emphasized the importance of well-matched control groups in studying trigeminal neuralgia treatments, supporting the validity of these findings.

Table 2: Comparison of Pain Relief

The pain relief observed in both treatment groups was substantial, but not significantly different, suggesting that both carbamazepine and gabapentin are effective for this

indication. This finding is consistent with Rana MH et al. (2023)[7], who found no significant difference in pain control between these drugs in a similar setting. However, the range of pain reduction (confidence interval) overlaps significantly, indicating that individual patient response can vary, which underscores the need for personalized treatment approaches in clinical practice.

Table 3: Side Effect Profiles

The side effect profiles revealed a slightly higher, but not statistically significant, incidence of side effects in the carbamazepine group compared to the gabapentin group. This aligns with the findings of Pergolizzi Jr JV et al. (2022)[8], who reported that gabapentin generally has a milder side effect profile compared to carbamazepine. This aspect of treatment is crucial as it affects patient adherence and quality of life.

Table 4: Patient Preference for Treatment Based on Pain Management and Side Effects

Interestingly, despite the similarity in efficacy and mild differences in side effects, patient preference was significantly higher for gabapentin. This could be influenced by the side effect profile or other unmeasured factors such as the ease of use or patient perceptions. The significant preference for gabapentin noted here supports the findings by Ta PC et al. (2019)[9], who suggested that patient-centered factors often dictate treatment success and preference beyond clinical efficacy alone.

CONCLUSION:

The comparative study provides valuable insights into the efficacy and patient preferences associated with two commonly used medications for this debilitating condition. Both carbamazepine and gabapentin demonstrated significant effectiveness in reducing the pain associated with trigeminal neuralgia, with no statistically significant difference in their pain-relieving capabilities. This equivalence in efficacy suggests that both medications can be considered viable first-line treatment options for trigeminal neuralgia.

However, the study also highlighted differences in the side effect profiles and patient preferences between the two drugs. Gabapentin was favored over carbamazepine in terms of patient preference, which was statistically significant. This preference may be attributed to the milder side effect profile observed in the gabapentin group, suggesting that patients may perceive gabapentin as a more tolerable option. The choice between carbamazepine and gabapentin should therefore consider individual patient responses, potential side effects, and personal preferences.

In conclusion, while both carbamazepine and gabapentin are effective for managing trigeminal neuralgia, gabapentin might offer an advantage in terms of tolerability and patient satisfaction. Future research should continue to explore these differences to further refine treatment strategies, ensuring that clinical decisions are tailored to maximize both efficacy and patient quality of life.

Limitations of Study:

1. **Sample Size**: While the study included 80 participants, which provides adequate power to detect differences between treatments, a larger sample size could enhance the ability to identify more subtle differences and provide more robust statistical power, particularly in subgroup analyses.
2. **Short Duration**: The study's duration may not have been sufficient to fully assess the long-term efficacy and safety of the treatments. Trigeminal neuralgia is a chronic condition, and longer-term studies are needed to evaluate sustained efficacy, long-term side effects, and patient compliance over time.
3. **Single-Center Design**: Conducted at a single tertiary care center, the findings may not be universally applicable to other settings due to variations in patient demographics, physician prescribing habits, and other regional healthcare factors.
4. **Blinding and Placebo Control**: The study was not placebo-controlled and relied on active comparison, which is a robust design but does not account for placebo effects that are particularly significant in pain management studies.
5. **Subjective Outcome Measures**: The primary outcome measure, pain relief, was assessed using patient-reported scales, which are inherently subjective and can be influenced by various factors, including patient expectations and mood disorders.
6. **Side Effect Reporting**: The reporting of side effects was based on patient self-reporting, which can lead to underreporting or bias. Objective

measures or more structured methods for capturing side effects could provide more reliable data.

7. **Variability in Dosing**: Although the dosing for both medications was adjusted based on clinical response and side effects, this variability might introduce a confounding factor, as individual differences in metabolism and drug handling could influence both efficacy and side effect profiles.
8. **Lack of Assessment of Functional Impact**: The study did not measure the impact of pain relief on functional and psychological outcomes, which are crucial for understanding the broader implications of treatment in chronic pain conditions like trigeminal neuralgia.

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