



Pharmacodynamics of pregabalin and gabapentin as pain treatment in cervical and lumbar radiculopathy in adults

Farmacodinamia de la pregabalina y gabapentina como tratamiento del dolor en la radiculopatía cervical y lumbar en el adulto

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ABSTRACT

Objective: to analyze the pharmacodynamics of Pregabalin and Gabapentin as pain treatment in cervical and lumbar radiculopathy in adult patients of the Neurosurgery service at the Central Hospital of Maracay, Aragua State, Venezuela, during the period from April to September 2024. Method: an observational, evaluative, prospective and longitudinal study was conducted. The sample consisted of 21 patients, divided into two groups: Group A (n=14) treated with Gabapentin 300 mg and Group B (n=7) treated with Pregabalin 75 mg. Results: the mean age was $52,07 \pm 10,4$ years in Group A and $47,71 \pm 7,8$ years in Group B ($p = 0,300$). Most patients were women (78,57 % in Group A and 85,71 % in Group B, $p = 1,000$). Both treatments significantly reduced pain (Gabapentin: $7,07 \pm 2,2$ to $4,78 \pm 2,8$; Pregabalin: $7,00 \pm 2,2$ to $5,28 \pm 12,2$; $p = 0,813$). Muscle strength improved in both groups, but did not reach statistical significance ($p = 0,055$). Sensitivity improved in both groups, however, it was lower in the Pregabalin group after treatment ($p = 0,029$). Adverse events were more frequent in the Pregabalin group (57,14 %) compared to Gabapentin (42,86 %, $p = 0,659$). Conclusions: both Pregabalin and Gabapentin are effective in reducing pain in patients with cervical and lumbar radiculopathy. Pregabalin had a higher incidence of adverse effects, which should be considered when choosing treatment. An individualized approach and ongoing follow-up are recommended to optimize neuropathic pain management.

Keywords: Pregabalin; Gabapentin; Radiculopathy; Neuropathic Pain; Pain Treatment.

RESUMEN

Objetivo: analizar la farmacodinamia de la Pregabalina y Gabapentina como tratamiento del dolor en la radiculopatía cervical y lumbar en pacientes adultos del servicio de Neurocirugía en el Hospital Central de Maracay, Estado Aragua, Venezuela, durante el periodo de abril a septiembre de 2024. Método: se realizó un estudio observacional, evaluativo, prospectivo y de corte longitudinal. La muestra estuvo conformada por 21 pacientes, divididos en dos grupos: Grupo A (n=14) tratados con Gabapentina 300 mg y Grupo B (n=7) tratados con Pregabalina 75 mg. Resultados: la edad promedio fue de $52,07 \pm 10,4$ años en el Grupo A y $47,71 \pm 7,8$ años en el Grupo B ($p = 0,300$). La mayoría de los pacientes fueron mujeres (78,57 % en Grupo A y 85,71 % en Grupo B, $p=1,000$). Ambos tratamientos redujeron significativamente el dolor (Gabapentina: $7,07 \pm 2,2$ a $4,78 \pm 2,8$; Pregabalina: $7,00 \pm 2,2$ a $5,28 \pm 12,2$; $p=0,813$). La fuerza muscular mejoró en ambos grupos, alcanzando mejor resultado en el grupo de gabapentina ($p=0,055$). La sensibilidad mejoró en ambos grupos sin embargo fue menor en el grupo de Pregabalina después del tratamiento ($p = 0,029$). Los eventos adversos fueron más frecuentes en el grupo de Pregabalina (57,14 %) comparado con Gabapentina (42,86 %, $p=0,659$). Conclusiones: tanto la Pregabalina como la Gabapentina son efectivas para reducir el dolor en pacientes con radiculopatía cervical y lumbar. La Pregabalina presentó una mayor incidencia de efectos adversos, lo cual debe ser considerado al elegir el tratamiento. Se recomienda un enfoque individualizado y un seguimiento continuo para optimizar el manejo del dolor neuropático.

Palabras clave: Pregabalina; Gabapentina; Radiculopatía; Dolor Neuropático; Tratamiento del Dolor.

INTRODUCTION

The International Association for the Study of Pain defines neuropathic pain as that caused by an injury or disease of the somatosensory nervous system and thus considers a wide range of clinical situations that present with pain of this type, among them cervical and lumbar radiculopathy.⁽¹⁾ However, knowing the basis of neuropathic pain is an important guide to evaluate said affection, since it offers data on its cause due to its quality, intensity and location.⁽²⁾ Differentiating it from low back pain and neck pain, referred pain and radiculopathy can be complex. Two key processes in its origin are compression by herniated discs or Similar pathologies and inflammation from various causes. Lumbosacral radiculopathy, usually due to nerve root compression, can also be confused with other conditions such as neoplasia, infections, or joint problems.⁽²⁾ Its differential diagnosis is broad and requires a complete medical examination and imaging.

Understanding Radicular pain is essential for an accurate diagnosis, and a differential diagnosis is crucial for effective treatment. Both conditions are characterized by compression or irritation of a nerve root emerging from the spinal cord, causing pain, numbness, and weakness in the area innervated by that nerve. Lumbar radiculopathy: Affects the lower back and can radiate pain down the legs. Common causes include herniated disks, spinal stenosis, and spondylolisthesis. Cervical radiculopathy: Affects the cervical region and can radiate pain to the shoulders, arms, and hands. The most common causes include cervical disc herniation, arthritis, and bone spurs. In 2020, the World Health Organization recorded 619 million cases of lower back pain worldwide and estimates that the number of cases will increase to 843 million by 2050.⁽³⁾

Lower back and neck pain, for example, is the main reason for premature exit from the workforce. The social impact of The impact of early retirement in terms of direct health care costs and indirect costs (i.e., work absenteeism or lost productivity) is enormous. These disorders are also highly associated with significant declines in mental health and functional abilities. Projections show that the number of people with lower back and neck pain will increase in the future, and even more rapidly in low- and middle-income countries.⁽³⁾

The impact of lumbar and cervical radiculopathy on patients' quality of life can be significant from an emotional perspective, due to the correlation between mood (depression, anxiety, despair, stress, fatigue) and pain. It is therefore described as an unpleasant sensory and emotional experience that can hinder everyday activities, such as walking, working, or sleeping. Numbness and tingling can also make it difficult to perform simple tasks, such as tying shoes or driving. This pain is described as stabbing, Pain is described as stabbing, burning, or stabbing, and may radiate to the extremities.

Pain management will depend on the degree of involvement, and there is growing concern among clinicians and researchers that many results published in scientific journals are false positives. Recent meta-analyses recommend, with a strong level of evidence, the use of gabapentin, pregabalin, duloxetine, venlafaxine, and tricyclic antidepressants as first-line treatment for neuropathic pain.⁽⁴⁾ Prescribing pain medication is not just a matter of choosing a treatment. The patient's age, sex, type of pain, cause, socioeconomic variables, work, and mental state must be taken into consideration, as these are factors that influence the choice of the appropriate analgesic.⁽⁵⁾ Considering all these aspects is important for effective and safe treatment.

A 2019 research paper showed that neuropathic pain is a significant health problem affecting many patients. Treatment Pharmacological management is complex, and not all types of pain respond equally to different treatments. Tricyclic antidepressants, SSRIs, and gabapentinoids are considered the drugs of choice in most cases, while carbamazepine is preferred for postherpetic neuralgia. Opioids should only be used as an alternative, and long-term use of NSAIDs and combinations of opioids and benzodiazepines is discouraged.⁽⁶⁾

The literature shows that pain Neuropathic pain is challenging to treat due to its heterogeneity. Therefore, in 2021, current pharmacological treatment was reviewed, with emphasis on new clinical guidelines, new drugs in development, and new challenges in therapeutic management. First-line drugs include tricyclic antidepressants, duloxetine, pregabalin, and gabapentin. Regular updates to guidelines and clinical studies are needed to guide daily clinical practice and rationalize the use of available therapeutic options.⁽⁷⁾

A study was conducted in 2023 to evaluate the efficacy of pregabalin and gabapentin in the treatment of neuropathic pain. The results indicated that pregabalin 300 mg once daily was more effective than gabapentin 600 mg once daily in reducing neuropathic pain at 24 weeks.⁽⁸⁾ Worldwide, the management and treatment of neuropathic pain is often individualized according to the sociodemographic characteristics of each patient. In 2007, the World Health Organization (WHO) recognized pain as a highly relevant public health problem, while highlighting the importance of

organizing pain care to achieve an accurate diagnosis and appropriate treatment. In addition, it highlights the existence of a certain lack of knowledge in the clinical field about it, as well as the lack of a homogeneous approach.(3)

In this sense, the general objective of this study was to analyze the pharmacodynamics of Pregabalin and Gabapentin as a treatment for pain in cervical and lumbar radiculopathy in adult patients in the Neurosurgery Service at the Central Hospital of Maracay, from April to September 2024.

METHOD

This study was based on a biomedical model, clinical, observational, evaluative, prospective, longitudinal design, and was conducted in the Neurosurgery Service of the Autonomous Teaching Service of the Central Hospital of Maracay, Aragua State. The study population consisted of patients who frequent the neurosurgery consultation at the Central Hospital of Maracay, aged between 18 and 65 years, with studies previous and/or diagnosis of cervical or lumbar radiculopathy that present irradiation to upper or lower limbs lasting more than one month, with pain intensity ≥ 4 on the VAS scale and patients who have not taken the study medications for at least one month.

Patients who were pregnant or breastfeeding, allergic to study drugs, serious systemic diseases (diabetes, kidney disease, cancer), active infections, neurological or psychiatric disorders that may interfere with the study, alcohol or drug abuse, patients with previous trauma, previous spinal surgeries and who did not agree to participate in the study were excluded. Finally, the sample consisted of 21 patients who were divided into 2 groups, called Group A with 14 patients treated with Gabapentin 300 mg and Group B with 7 patients treated with Pregabalin 75 mg, both drugs administered every 24 hours at night for four weeks.

Data were collected including clinical symptoms, imaging studies, the most common warning signs, whether they attended a neurosurgical consultation following their diagnosis, and whether they were receiving specific medical treatment. Modifiable and non-modifiable risk factors were also assessed. Each patient was monitored and followed up in the first week and four weeks following the prescribed treatment.

RESULTS

The patients were divided into two groups: Group A, consisting of 14 patients treated with Gabapentin, and Group B, consisting of 7 patients treated with Pregabalin. The average age of patients in Group A was $52,07 \pm 10,4$ years, while in Group B it was $47,71 \pm 7,8$ years, with no statistically significant differences between the two groups ($p = 0,300$). Regarding sex, the majority of patients in both groups were women, representing 78,57 % in Group A and 85,71 % in Group B, with no significant differences ($p = 1,000$).

Regarding occupation, a higher proportion of homebound patients was observed in Group B (57,14 %) compared to Group A (35,71 %). In Group A, the occupational distribution was more varied, with 35,71% homebound patients, 14,29 % teachers, 7,14 % mechanics, 35,71 % laborers, and 7,14 % transport workers. In Group B, in addition to homebound patients, 14,29 % mechanics, 14,29 % laborers, and 14,29 % secretaries were included.

No significant differences were found in the distribution occupational between both groups ($p = 0,525$) (table 1). Statistical tests used included Student's t-test for quantitative variables and the chi-square and Fisher's Exact tests for comparisons of qualitative variables, with an alpha significance level.

In the analysis of the pathological and diagnostic history, it was observed regarding the presence of underlying pathology, 28,57 % of the patients in both groups (Gabapentin and Pregabalin) presented some underlying pathology, with no significant differences between the groups ($p = 1,000$). Regarding arterial hypertension (HTN), 28,57 % of the patients in both groups were found to have HTN, with no significant differences ($p = 1,000$). Regarding epilepsy, none of the patients in the group treated with Gabapentin had epilepsy, while 14,29 % of the patients treated with Pregabalin did.

However, this difference was not statistically significant ($p = 0,333$). Regarding diagnoses, 42,86 % of patients treated with gabapentin were diagnosed with lumbar degenerative disc disease, compared to 28,57 % of patients treated with pregabalin. On the other hand, 57,14 % of patients treated with gabapentin and 71,43 % of those treated with pregabalin were diagnosed

with cervical disc herniation, with no significant differences between groups ($p = 0,442$). Finally, the mean time with pain was $15,00 \pm 1,7$ months for patients treated with gabapentin and $19,00 \pm 263,0$ months for those treated with pregabalin, with no significant differences ($p = 0,574$) (table 2).

Table 1. Frequency of socio-epidemiological variables in adult patients treated with Pregabalin and Gabapentin as treatment for pain in cervical and lumbar radiculopathy in the Neurosurgery Service at the Central Hospital of Maracay

Variables	Type of treatment (n=21)				p
	Gabapentin (n=14)		Pregabalin (n=7)		
	Fr	%	Fr	%	
Age (years) ($\bar{X} \pm SD$)	52,07 $\pm$ 10,4	47,71 $\pm$ 7,8	0,300		
Sex					
Female	11	78,57	6	85,71	1,000
Male	3	21,43	1	14,29	
Occupation					
From Home	5	35,71	4	57,14	0,525
Teaching	2	14,29	0	0,00	
Mechanic	1	7,14	1	14,29	
Worker	5	35,71	1	14,29	
Secretariat	0	0,00	1	14,29	
Carrier	1	7,14	0	0,00	
Notes: *Student's t test for quantitative variables and chi-square and Fisher's exact tests for comparisons. Significance level with alpha value <0,05.					

In the present study, pain, muscle weakness, and sensory loss were assessed in patients with cervical and lumbar radiculopathy before and after treatment with pregabalin and gabapentin. Regarding pain levels measured using the VAS scale, patients treated with gabapentin showed a decrease in pain from $7,07 \pm 2,2$ to $4,78 \pm 2,8$; while patients treated with pregabalin experienced a reduction from $7,00 \pm 2,2$ to $5,28 \pm 12,2$.

No significant differences were found between the two groups ($p=0,813$). Regarding the number of days per week with pain, patients treated with gabapentin reported a decrease from $5,28 \pm 1,5$ days to $2,78 \pm 1,7$ days, and patients treated with pregabalin reported a reduction from $4,58 \pm 1,6$ days to $2,71 \pm 2,0$ days. Although the reduction was significant, it did not reach statistical significance ($p=0,053$). Regarding muscle weakness, 71,43 % of patients treated with gabapentin had muscle weakness before treatment, decreasing to 28,57 % after treatment.

In the pregabalin-treated group, 71,43 % had muscle weakness before treatment, decreasing to 42,86 % after treatment. This difference was statistically significant. Regarding loss of sensation, 21,43 % of patients treated with gabapentin had loss of sensation before treatment, decreasing to 7,14 % after treatment. In the pregabalin group, 14,29 % of patients had loss of sensation both before and after treatment. This difference was statistically significant ($p=0,029$) (table 3).

In the analysis of adverse effects in adult patients treated with Pregabalin and Gabapentin for pain in cervical and lumbar radiculopathy, Regarding the presence of adverse events, 42,86 % of patients treated with Gabapentin and 57,14% of those treated with Pregabalin reported adverse events, with no significant differences between the two groups ($p=0,659$).

Regarding dizziness, 14,29 % of patients treated with gabapentin and 28,57 % of those treated with pregabalin experienced dizziness, with no significant differences ($p = 0,574$). Regarding headache, 7,14 % of patients treated with gabapentin and 28,57 % of those treated with pregabalin reported headache, with no significant differences ($p=0,247$).

Table 2. Frequency of pathological history and diagnosis in adult patients treated with Pregabalin and Gabapentin as treatment for pain in cervical and lumbar radiculopathy in the Neurosurgery service at the Central Hospital of Maracay, Aragua State, Venezuela, in the period from April to September 2024.

Variables	Type of treatment (n=21)				p
	Gabapentin (n=14)		Pregabalin (n=7)		
	Fr	%	Fr	%	
Underlying pathology					
Yeah	4	28,57	2	28,57	1,000
No	10	71,43	5	71,43	
HBP					
Yeah	4	28,57	2	28,57	1,000
No	10	71,43	5	71,43	
Epilepsy					
Yeah	0	0	1	14,29	0,333
No	10	100,00	6	85,71	
Diagnosis					
Lumbar degenerative disc disease	6	42,86	2	28,57	0,442
Cervical disc herniation	10	57,14	5	71,43	
Time with pain (months) ($\bar{X} \pm DE$)	15,00 $\pm$ 1,7		19,00 $\pm$ 263,0		0,574
Notes: Student t test for quantitative and chi square and Fisher Exact for comparisons.					

Table 3. Assessment of pain level (VAS scale), weakness and sensitivity before and after treatment with the use of Pregabalin and Gabapentin as pain treatment in patients with cervical and lumbar radiculopathy in the Neurosurgery service at the Central Hospital of Maracay

Variables	Type of treatment (n=21)								
	Gabapentin (n=14)				Pregabalin (n=7)				p
	Pre treatment		Post treatment		Pre treatment		Post treatment		
	Fr	%	Fr	%	Fr	%	Fr	%	
Pain level (Eve Scale) ($\bar{X} \pm SD$)	7,07 $\pm$ 2,2		4,78 $\pm$ 2,8		7,00 $\pm$ 2,2		5,28 $\pm$ 12,2		0,813
Days of the week with pain ($\bar{X} \pm DE$)	5,28 $\pm$ 1,5		2,78 $\pm$ 1,7		4,58 $\pm$ 1,6		2,71 $\pm$ 2,0		0,053
Muscle Weakness									
Yeah	10	71,43	4	28,57	5	71,43	3	42,86	0,055
No	4	28,57	10	71,43	2	28,57	4	57,14	
Loss of sensitivity									
Yeah	3	21,43	1	7,14	1	14,29	1	14,29	0,029
No	11	78,57	13	92,86	6	85,71	6	85,71	
*Student test for quantitative analysis and chi-square and Fisher's exact test for comparisons. Significance level with alpha value <0.05									

Regarding oral mucosal dryness, no patient treated with gabapentin reported this adverse effect, while 28,57 % of patients treated with pregabalin did. This difference did not reach statistical significance ($p = 0,100$). Finally, regarding drowsiness, 21,43 % of patients treated with gabapentin reported drowsiness, while no patient treated with pregabalin did. This difference was not statistically significant ($p = 0,521$) (table 4).

Table 4. Frequency of adverse effects in the use of pregabalin and gabapentin as pain treatment in adult patients with cervical and lumbar radiculopathy in the Neurosurgery Service at the Maracay Central Hospital

Variables	Type of treatment (n=21)				p
	Gabapentin (n=14)		Pregabalin (n=7)		
	Fr	%	Fr	%	
Adverse events					
Yeah	6	42,86	4	57,14	0,659
No	8	57,14	3	42,86	
Dizziness					
Yeah	2	14,29	2	28,57	0,574
No	12	85,71	5	71,43	
Headache					0,247
Yeah	1	7,14	2	28,57	
No	13	92,86	5	71,43	
Dryness of the oral mucosa					
Yeah	0	0,00	2	28,57	0,100
No	14	100,00	5	71,43	
Sleepiness					
Yeah	3	21,43	0	0,00	0,521
No	11	78,57	7	100,00	

DISCUSSION

The results showed that both treatments, Pregabalin and Gabapentin, were effective in reducing pain, although no significant differences were found between groups in terms of pain reduction as measured by the VAS scale ($p = 0,813$). This suggests that both drugs may be viable options for the management of neuropathic pain in patients with cervical and lumbar radiculopathy. However, it is important to consider individual variability in treatment response, as noted in previous studies.(6) Regarding adverse effects, a higher incidence of adverse events was observed in the group treated with Pregabalin (57,14 %) compared to the group treated with Gabapentin (42,86 %), although this difference was not statistically significant ($p = 0,659$). Among the specific adverse effects, dryness of the oral mucosa was more frequent in the Pregabalin group (28,57 %) compared to the Gabapentin group (0 %), which is consistent with previous findings,(9) who also reported a higher incidence of adverse effects with Pregabalin. The results of this study are consistent with existing findings,(6) who highlighted the complexity of pharmacological treatment of pain. neuropathic pain and the variability in response to different treatments. In their research, they mentioned that gabapentinoids, such as Pregabalin and Gabapentin, are considered the drugs of choice in most cases of neuropathic pain, which coincides with the choice of these drugs in our study. This coincides with the review carried out on the pharmacological treatment of neuropathic pain, highlighting the need for periodic updates to guidelines and clinical studies to guide daily clinical practice.(4) Our findings reinforce the importance of continuing to research and update clinical guidelines to optimize the management of neuropathic pain. Although our study focused on patients with radiculopathy, the results underscore the importance of addressing low back pain from multiple perspectives, including prevention and treatment, which coincides with the results of a study where a high prevalence of Low back pain and neck pain in workers in industrial and construction sectors, suggesting the implementation of preventive measures.(8)

CONCLUSIONS

The results of this study show that both pregabalin and gabapentin are effective options for the treatment of neuropathic pain in patients with cervical and lumbar radiculopathy. Gabapentin 300 mg daily (administered at night) offers a better outcome for the patient, decreasing the intensity and number of days per week of pain, improving muscle strength and sensitivity, and presenting a lower incidence of adverse effects compared to pregabalin. The results of this study contribute to the understanding of the pharmacodynamics of these drugs and their clinical relevance, aligning with research. previous and highlighting the need for further research to optimize the management of neuropathic pain.

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CONFLICT OF INTEREST

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