

Correlation between Nerve Conduction Velocity and Clinical Parameters in Patients with Neuralgic Upper Limb Pain Treated with Pregabalin and Gabapentin

Dr Priyanka¹, Dr Beena², Dr Hitendr Kumar³

¹Senior resident deptt of physiology Pgims, Rohtak, Priyankashivangi69@gmail.com

²Professor, deptt of physiology, Pgims, Rohtak, beenaphy8@gmail.com

³DM, cardiology, reserchhub062@gmail.com

ABSTRACT

Background: Neuralgic pain in the upper limb may affect clinical function and peripheral nerve conduction. Its management is often with Pregabalin and Gabapentin.

Methods: 60 patients were included in a comparative study, with 30 patients in each of the treatment groups. Pain and neuropathic symptoms were measured by Numerical Rating Scale (NRS) and Pain Detect Questionnaire (PDQ) at baseline, 2 weeks and 6 weeks. Bilateral motor and sensory nerve conduction parameters of median, radial, and ulnar nerves were also evaluated.

Results: A significant reduction in NRS and PDQ scores was seen in both groups over 6 weeks ($p < 0.001$). Median and ulnar nerve conduction parameters were broadly similar in the two groups. There were no significant differences between the groups. In general, correlations between nerve conduction parameters and NRS/PDQ were weak.

Conclusion: Both Pregabalin and Gabapentin groups showed an improvement in the clinical parameters during the follow-up with more or less similar electrophysiological findings. Further studies with larger sample sizes may provide additional evidence for the association between clinical improvement and nerve conduction changes.

How to Cite: Dr Priyanka, Dr Beena, Dr Hitendr Kumar, (2024) Correlation between Nerve Conduction Velocity and Clinical Parameters in Patients with Neuralgic Upper Limb Pain Treated with Pregabalin and Gabapentin, Vascular and Endovascular Review, Vol.7, No.2, 567-570

INTRODUCTION

The **nerve conduction study** is performed to evaluate nerve function. It tests the speed impulses travel through a nerve. A NCV test shows the condition of the best surviving nerve fibers^{1,2}.

Principle of Nerve Conduction Studies: Orthodromic conduction sends impulses in the same direction as physiological conduction, i.e. toward the spinal cord for sensory conduction and to muscle for motor conduction. Antidromic conduction is in the reverse direction. Sensory complaints can be evaluated by a sensory NCS. A supramaximal stimulus is delivered to a nerve and the response is recorded, often by a surface electrode placed over the course of the nerve at a fixed distance from the stimulation site. Conduction velocity is calculated by dividing the measured distance between the stimulation and recording sites by the distal latency^{3,4}.

The speed of conduction of both sensory and motor fibers is determined by the integrity of myelinated fibers and the preservation of saltatory conduction between individual nodes of Ranvier.

Pain is often measured using scales. The Numerical Rating Scale or NRS lets patients rate their pain from 0 to 10. This simple scale helps track pain intensity over time. The Pain Disability Questionnaire or PDQ measures how much pain limits a person's activities. These tools are helpful for understanding how pain affects a patient's life. They are based on self-report and are subjective⁵.

Pregabalin and gabapentin are commonly used to treat neuralgic pain. Both work by affecting calcium channels in nerve cells. This helps reduce the signals that cause pain. These medicines are often used for conditions like neuropathy or nerve irritation. After starting treatment doctors look at pain scores and disability levels to see if the patient is getting better. Nerve conduction studies may be repeated to see if nerve function is improving^{6,7,8}.

This study looked at how nerve conduction results relate to measures in patients with neuralgic upper limb pain. It focused on the radial and ulnar nerves. The goal was to see if changes in NCS correlated with changes in NRS and PDQ scores over time. This approach was used to check whether improvements in nerve function matched improvements in pain and disability. The findings help understand how much nerve function and symptoms are linked during treatment, with pregabalin and gabapentin.

METHODOLOGY

The present comparative clinical study was conducted on 60 patients with neuralgic upper limb pain and divided into two groups 30 each, group I received Pregabalin and group II received Gabapentin. Clinical assessment was done with the Numerical Rating Scale (NRS) and Pain Detect Questionnaire (PDQ) at baseline, 2 weeks and 6 weeks. Patient satisfaction was also evaluated at follow-up. **Nerve conduction studies** were performed bilaterally for the **median, radial, and ulnar nerves**, including motor and sensory parameters such as amplitude, latency, and conduction velocity. The relationship between nerve conduction parameters and clinical scores (NRS and PDQ) was also evaluated using correlation analysis. Data were expressed as **mean $\pm$ SD**. Unpaired *t*-test, chi-square test, and ANOVA were used as applicable, with ***p* < 0.05** considered statistically significant.

RESULT

A total of **60 patients** were included, with 30 patients in each treatment group. Both groups showed a significant reduction in **NRS and PDQ scores** over the 6-week follow-up period (*p*<0.001). Nerve conduction parameters of the median and ulnar nerves were broadly comparable between the Pregabalin and Gabapentin groups, with no significant between-group differences (*p*>0.05). Patient satisfaction improved during follow-up in both groups. Correlation analysis showed mostly weak associations between nerve conduction parameters and NRS/PDQ scores.

Table 1. Correlation between NCV and NRS at 6 weeks

Nerve	Side	Type	Pregabalin r	Gabapentin r
Median	Right	Motor	-0.040	-0.085
Median	Right	Sensory	0.118	0.040
Median	Left	Motor	0.064	0.053
Median	Left	Sensory	0.202	-0.129
Radial	Right	Motor	-0.244	0.027
Radial	Right	Sensory	-0.143	-0.208
Radial	Left	Motor	0.206	-0.032
Radial	Left	Sensory	-0.131	-0.210
Ulnar	Right	Motor	0.093	-0.104
Ulnar	Right	Sensory	0.031	0.184
Ulnar	Left	Motor	-0.158	-0.223
Ulnar	Left	Sensory	0.182	-0.345

Figure 1. Six-week correlation between NCV and NRS

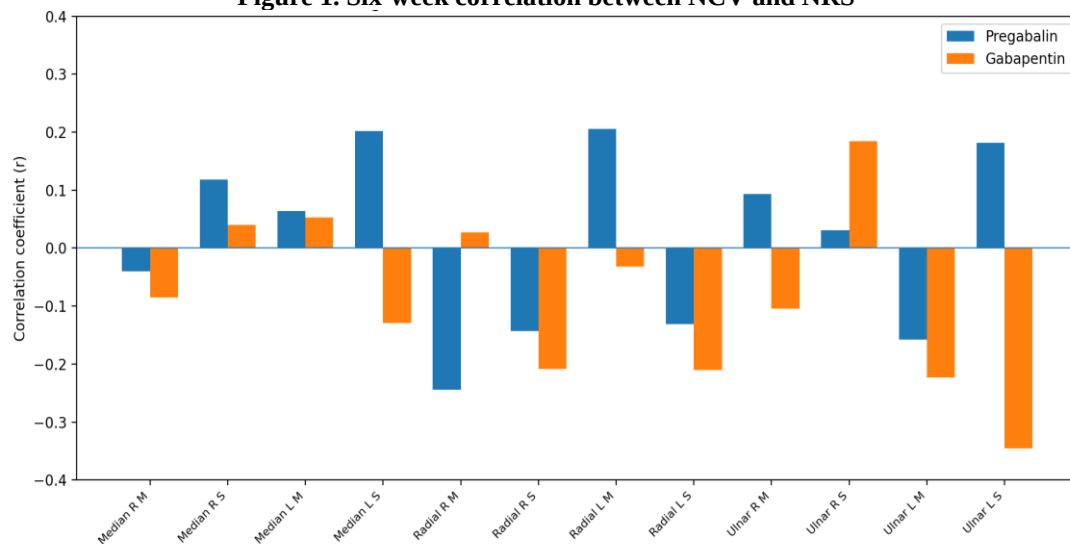
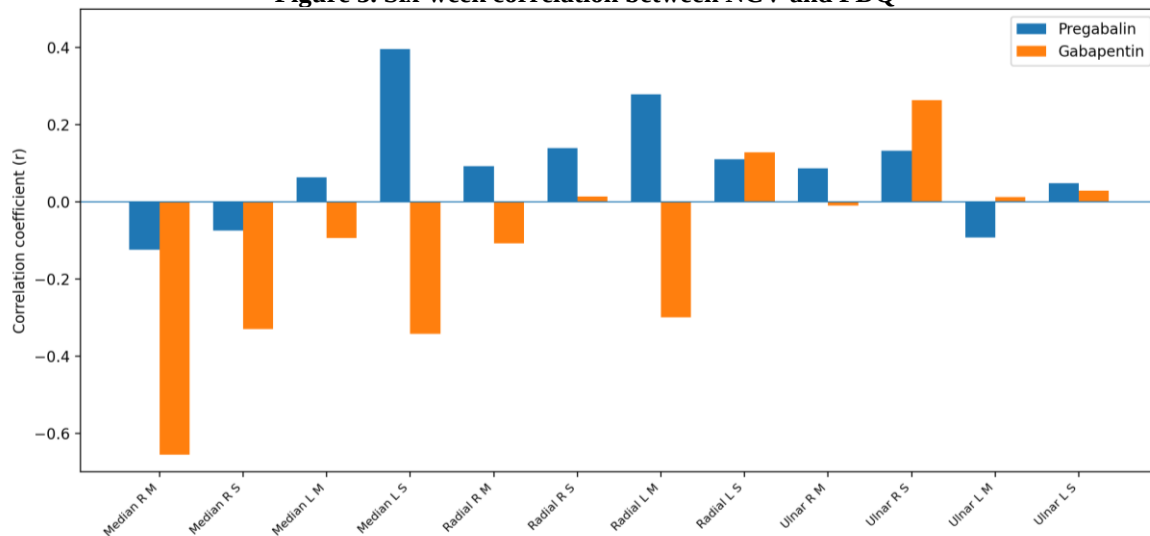


Table 2. Correlation between NCV and PDQ at 6 weeks

Nerve	Side	Type	Pregabalin r	Gabapentin r
Median	Right	Motor	-0.124	-0.655
Median	Right	Sensory	-0.075	-0.330
Median	Left	Motor	0.064	-0.094
Median	Left	Sensory	0.396	-0.342
Radial	Right	Motor	0.093	-0.108
Radial	Right	Sensory	0.140	0.014
Radial	Left	Motor	0.279	-0.300
Radial	Left	Sensory	0.110	0.128
Ulnar	Right	Motor	0.087	-0.009
Ulnar	Right	Sensory	0.133	0.264
Ulnar	Left	Motor	-0.093	0.013
Ulnar	Left	Sensory	0.048	0.029

Figure 3. Six-week correlation between NCV and PDQ



DISCUSSION

We had correlated the nerve conduction velocity with pain score by NRS and PDQ at 0, 2 and 6 weeks. There were both positive and negative correlations between nerve conduction velocity and pain scores either by NRS or PDQ. But no correlation was statistically significant. We had observed that there was significant improvement in pain scores with the 6 weeks of treatment of either by pregabalin or gabapentin. But there was no significant improvement in nerve conduction study parameters with the 6 weeks of treatment of either by pregabalin or gabapentin; suggesting that pregabalin and gabapentin do not reverse pathophysiology of neuralgic upper limb pain. Thus, our findings suggested that both pregabalin and gabapentin had resulted in subjective improvement in pain by acting on central nervous system. Fehrenbacher et al found that the predominant mechanism of action of pregabalin is thought to be through its presynaptic binding to the subunit $\alpha 2\text{-}\delta$ subunit of voltage-gated calcium channels which in turn leads to reduced release of neurotransmitters e.g. glutamate, substance P and calcitonin gene related peptide. Patient satisfaction was assessed using a four-point scale⁹. Six weeks after treatment 19 patients in group I and 25 patients in group II reported excellent satisfaction; and 10 patients in group I and five patients in group II reported good satisfaction. One patient in group I showed fair satisfaction but no patient in group II had fair or poor satisfaction. When patient satisfaction was compared in between the two groups, patients in gabapentin group had better satisfaction as compared to patients in pregabalin group at 2 weeks ($p < 0.05$) (Table 17). However, at the end of six weeks, patient satisfaction was statistically comparable in between the two groups ($p > 0.05$). Bekawi et al observed that overall patient satisfaction with pain management was significantly higher ($p < 0.001$) in pregabalin versus gabapentin or control groups¹⁰.

CONCLUSION

Both Pregabalin and Gabapentin were associated with improvement in clinical parameters over the 6-week follow-up period. NRS and PDQ scores decreased significantly in both groups. Median and ulnar nerve conduction parameters remained broadly comparable between the two groups, with no significant between-group differences. Correlations between nerve conduction parameters and clinical scores were generally weak. Overall, both treatment groups showed improvement in clinical outcomes with comparable electrophysiological findings.

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