

Relationship Between Degenerative Cervical Myelopathy and Trigeminal Neuralgia

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Abstract

Background: The involvement of the spinal trigeminal tract affects the cervical spinal cord. People with Trigeminal Neuralgia (TN) are more likely to experience concurrent degenerative cervical myelopathy (DCM) compared to a matched control group without TN.

Objectives: The main goal of this study was to determine the existence and strength of a relationship between Trigeminal Neuralgia (TN) and Degenerative Cervical Myelopathy (DCM).

Materials and Methods: This cross-sectional study was conducted at Bacha Khan College of Dentistry from January 2023 to January 2025, at the Department of Oral Medicine, included 100 patients with neurological disorders. TN and degenerative Myelopathy were assessed using clinical evaluations. In the first step, the study's findings were statistically analyzed to determine whether DCM and TN had any relational significance. The p-value was calculated. The research was conducted in accordance with established ethical standards, and the participants were informed and witnessed all procedures. SPSS 22.0 was used to analyze all the data.

Result: Most patients were men mean age 52.22 ± 8.22 years. There were 41 patients with rural residency and 59 patients with urban residency. The majority of the patients, (78%) were married. The assessment of the gathered information indicated that DCM was significantly related to TN, with a calculated p-value of 0.001. While evaluating the results obtained from the sample of 100 patients, it was apparent that a remarkable proportion suffered from both DCM and TN simultaneously. We found that, 65% of cases had DCM and 35% had TN. The frequency of both DM and TN was found in 45% of cases. We found a strong correlation between DM and TN ($p = 0.001$).

Conclusions: This study shows a strong correlation between Trigeminal neuralgia (TN) and degenerative cervical myelopathy (DCM), emphasizing the necessity of multidisciplinary cooperation and additional investigations. When DCM and TN coexist, early identification and specialized therapy strategies are essential for improving patient outcomes.

Keywords: Cervical Spinal Cord, Degenerative Cervical Myelopathy, Neurological Disorders, Trigeminal Neuralgia

Introduction

Trigeminal neuralgia (TN) and degenerative cervical myelopathy (DCM) are the most severe and crippling neurological disorders.¹ It is possible for the superior cerebellar artery to impinge on the nerve or any blood vessel closer to the nerve root, causing the terrible facial pain that is TN causes. The pain is caused by excessive stimulation of the trigeminal nerve nuclei

in the brainstem.¹

Patients may experience TN in response to mild stimuli such as touching their face, eating, drinking, speaking, or even brushing their teeth. DCM, also known as cervical spondylotic myelopathy [CSM], explains spinal cord compression and dysfunction caused by degenerative abnormalities in the spine.¹ Spinal abnormalities can cause a wide range of symptoms, including numbness or tingling in the arms and hands, decreased coordination, and uneven stride.²

Although TN and DCM seem to be completely different conditions, a new study has shown that they might have some traits and etiological elements in common.³ This raises intriguing questions regarding the interaction between the two. In degenerative cervical myelopathy (DCM), a common condition, compression of the spinal cord, in this case, inside the cervical spine, re-

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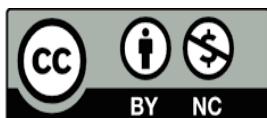
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sults in a range of neurological symptoms.³ Recent research has highlighted instances where individuals with DCM who underwent spinal surgery reported remission of TN symptoms after the procedure, suggesting a potential role of cervical spinal pathology in the genesis of TN.³ DCM may be a risk factor for TN, as it was recently discovered that people with TN had it almost 12 times more frequently than those without TN.⁴

Patients with cervical spine pathology may be more likely to develop, or experience worsening TN due to circulatory problems, inflammation, or direct compression of the spinal trigeminal tract within cervical segments C3-C4, from which the spinal trigeminal nucleus extends.^{5,6} These new findings challenge the long-held belief that neurovascular injury is the sole cause of TN suggesting that compression of the cervical cord or inflammation of the spinal trigeminal tract may also be potential causes in certain cases.⁷

The lack of agreement on the pathogenesis of TN has led to an increased focus on diseases affecting the spinal trigeminal nucleus, also known as the trigeminal tract, as a potential cause. According to several recent case studies, TN may be more common in individuals with cervical spine degenerative diseases.⁷ Remission of TN was described in certain cases after cervical spine surgery for degenerative cervical myelopathy (DCM), a common disorder involving compression of the spinal cord.⁸

To the best of our knowledge only one study which was larger than a case report or series, investigated the possibility of a connection between TN and DCM. Twenty patients participated in a new case-control research that found a strong correlation between TN symptoms and cervical disc displacement, an injury that indents the cervical spinal cord above the C4 vertebra.⁹ Although preliminary evidence from a small sample suggests a potential connection between cervical cord compression and TN based on neuroanatomical data, this finding has not been confirmed.

Starting at the base of the skull and continuing all the way down to the fourth cervical segment the pars caudalis the spinal trigeminal tract supplies the trigeminal nerve's sensory branches. The primary objective of this study conducted at the Department of Oral Medicine, Mardan Medical Complex [MMC], Pakistan was to evaluate the association between TN and DCM. Previous research has linked spinal cord compression and dysfunction of the trigeminal nerve to the development of diabetic macular degeneration and type 2 diabetes^{10, 11}, which is why our study is im-

portant. Multiple professionals must contribute to personalized care in order to meet each patient's demands.¹²

This study explores the possible relationship between TN and DCM because current research suggests both clinical and structural connections between the two disorders. Our goal in evaluating this link is to promote early diagnosis and interdisciplinary, coordinated treatment for improved results.

Material and Methods

The data was obtained from the cross-sectional study established from January 2023 to January 2025. Data collected from the study conducted at Department of Oral Medicine, MMC. The ethical approval was taken from Bacha Khan Medical College under ethical number **801/BKMC**. This study was a retrospective cross-sectional, single-center study. The participants were enrolled using consecutive sampling. Data were calculated using $z = 1.96$, which is the z-statistic for the 95% confidence level with an expected prevalence value and margin of error (d) specified in the sample size calculation. Individuals with having symptoms indicative of either TN or DCM who were 18 years of age or older were eligible to participate in the study.

Patients with a history of cervical spine or trigeminal nerve injury or surgery, or those younger than 18 years, were excluded from the study. Participants with any other neurological or systemic diseases that may have affected the interpretation of the results were also excluded. A thorough clinical examination was performed to diagnose Trigeminal Neuralgia and Degenerative Cervical Myelopathy. Step one involved the statistical analysis of the study results to determine whether there was a relationship between DCM and TN. Subsequently the researchers determined the p-value.

This study followed all accepted ethical guidelines, and the subjects were informed and present at every step of the process. The plans' stated goal was to produce sufficient evidence of a connection between the two neurological diseases. Pearson's chi-squared test was used for statistical analysis. Data were analyzed using SPSS 22.0. Categorical variables were represented using percentages and frequencies. When continuous variables were included, they were evaluated using appropriate parametric or non-parametric tests, with a significance level of $p < 0.05$.

Results

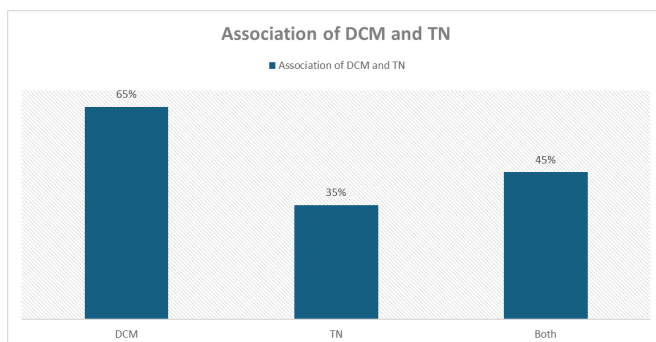
The average age of the 100 participants was 52.22 ± 8.22 years. The gender distribution showed that there were slightly more men (55%) than women (45%), with a male-to-female ratio of roughly 1.2:1. In terms of residence, 59% of the participants lived in cities, and 41% came from rural areas. Married people comprised 78% of the participants, while single peo-

Table 2: Demographic Characteristics of Study Participants

Parameter	Total Participants (n=100)
(Female)	45 (45%)
(Male)	55 (55%)
Age (years)	Mean $\pm$ SD: 52.22 $\pm$ 1.11
Residence	
Rural	41 (41%)
Urban	59 (59%)
Marital Status	
Married	78 (78%)
Unmarried	22 (22%)

ple comprised 22%. Table 1 offers a thorough synopsis of the participant's demographic features.

Of all the participants, 35% had Trigeminal Neuralgia (TN) and 65% had Degenerative Cervical Myelopathy (DCM). Notably 45% of patients presented with both DCM and TN, suggesting that the pathogenesis of these neurological disorders may overlap or co-occur. This co-occurrence percentage is calcu-


Figure-1: Association Between Degenerative Cervical Myelopathy (DCM) and Trigeminal Neuralgia (TN)

lated based on the total study population. Figure 1 describes the association between prevalence and co-occurrence of TN and DCM in the study population.

Pearson's chi-square test was used to assess the association between DCM and TN. With a p-value of 0.001, the analysis showed a statistically significant correlation between DCM and TN which was well below the traditional criterion of significance

Table 2: Summary of Statistical Analysis Results

Statistical Measure	Value
p-value	0.001
Significance Level	< 0.05
Statistical Test Used	Pearson's chi-squared test (or other applicable test)

($p < 0.05$). The two disorders appear to be strongly correlated, which calls for more research into the potential shared etiological variables or mechanisms. Table 2 summarizes the statistical findings.

Discussion

Within the realm of neuropathic pain therapy, the intersection of TN and DCM constitutes a multifaceted paradigm that requires further investigation. It is necessary to reevaluate chiropractic therapies within the context of this interaction since there is growing data that suggests a two-way connection between cervical spinal disease and thoracic pain.^{3, 14} Chiropractic care, which has traditionally centered on restoring the biomechanics and function of the spine may offer therapeutic promise for a wide range of neuropathic disorders, including those affecting muscles and tendons.^{15, 16}

Of our 100 participants, 65 percent had DCM, 35 percent had TN, and 45 percent had both diseases simultaneously. These results imply that the pathophysiology of DCM and TN may co-occur or overlap. The findings of this research add to the increasing amount of literature that has shown a link between TN and DCM. Several previous studies¹⁷ have suggested that spinal cord compression and trigeminal nerve dysfunction may be the respective causes of DCM and TN development. Our study adds to the evidence supporting this link and shows that the best way to treat these complex neurological disorders is by combining multiple disciplines in a multidisciplinary setting. When comparing our results with those of previous studies, it is evident that there are both similarities and differences. Our study confirms a link between TN and DCM and highlights the need for multidisciplinary care, adding new insight to previous findings.¹⁸ Our research is the first of its kind to investigate the coexistence of DCM and TN as well as any potential interactions between them. Prior studies have consistently concentrated on the different characteristics and therapies of TN and DCM in particular.¹⁹ In addition to contributing to the body of current research, this should serve as a reminder to everyone that when we encounter individuals exhibiting neurological symptoms, it is incorrect to assume that they are suffering from a single illness. The study group's incidence of trigeminal neuralgia (TN) and degenerative cervical myelopathy (DCM) is very close to previous research.. This is significant because it a common feature. In our study, DCM affected most participants, and TN was present in a significant percentage of patients.²⁰

This result is consistent in line with the results of previous studies that were carried out. Numerous studies have reached come to a consensus on this issue, highlighting the pervasiveness of these neurological conditions and demonstrating the how urgently need for the development of control strategies. Control strategies must be developed. Our study supports earlier research that highlighted the value of integrating pertinent domains in the treatment of TN and DCM.¹² Our study highlights the close link between TN and DCM

and offers new insights beyond previous research.²¹ Building on previous research that only suggested a common etiology, our findings indicate a direct connection between spinal cord compression and trigeminal nerve dysfunction. A considerable percentage of people were found to have both illnesses, highlighting the necessity of interdisciplinary cooperation in clinical evaluations. The significant co-occurrence rate emphasizes the necessity of a cooperative, multidisciplinary approach in patient evaluation and raises the possibility that DCM and TN have similar origins. When patients show TN-like symptoms but the results of diagnostic tests are uncertain, clinicians should think about the possibility of concurrent DCM. This study provides a new viewpoint on the relationship between TN and DCM, as our conclusion highlights.^{4,}
²² Our research revealed a significant association between these two neurological disorders, a phenomena that is poorly understood. This study advances our knowledge of these complex illnesses and emphasizes

the importance of interdisciplinary care because DCM and TN are common among our patients.

Limitation

This study had some limitations. First, the cross-sectional design limits the capacity to show causality between TN and DCM. Second, the sample size was small and derived from a single location, thereby limiting the findings' generalizability. Finally, clinical diagnosis without improved imaging correlation may have further diagnostic heterogeneity.

Conclusion

This study demonstrates a strong correlation between trigeminal neuralgia (TN) and degenerative cervical myelopathy (DCM), emphasizing the need for multidisciplinary cooperation and further investigation. Early recognition and tailored treatment approaches are essential for improving outcomes when TN and DCM occur together.

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Author Contributions

1. **Nadia Mansoor** : Conceptualization of the study, study design, and overall supervision.
2. **Tahira Hussain** : Data collection, clinical assessment, and coordination of participants.
3. **Neelofar Rehman** : Literature review, data interpretation, and drafting of the manuscript.
4. **Muhammad Naeem** : Statistical analysis and interpretation of results.
5. **Sawaira Noor** : Data entry, questionnaire administration, and assistance in data analysis.
6. **Arfa Rehman** : Critical revision of the manuscript and final approval of the version to be published.