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Incidence of False Positive Percussion Test in Adjacent Teeth in Posterior Permanent Maxillary Molars and Anterior Permanent Maxillary Incisors Presenting with Symptomatic Irreversible Pulpitis with Symptomatic Apical Periodontitis

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ABSTRACT

Objective: To compare the incidence of false positive percussion test in adjacent teeth in posterior permanent maxillary molars and anterior permanent maxillary incisors diagnosed with symptomatic irreversible pulpitis with symptomatic apical periodontitis.

Study Design: Cross-sectional observational study.

Place and Duration of Study: 5 Military Dental Centre Hyderabad, Pakistan from Nov 2023 to Jan 2024.

Methodology: 60 patients (30 male and 30 female) ranging from 20-40 years with symptomatic irreversible pulpitis with symptomatic apical periodontitis presenting to out-patient department were selected through convenience sampling. They were tested for incidence of false positive percussion test in adjacent teeth in maxillary posterior molars and maxillary anterior incisors. Chi square statistics were used to compare the groups.

Results: The patients selected for posterior maxillary molars percussion test for adjacent teeth revealed 04(13%) patients with no pain, 05(17%) patients with mild pain, 06(20%) patients with moderate pain, 15(50%) patients with severe pain. The patients selected for anterior maxillary incisors percussion test for adjacent teeth revealed 15(50%) patients with no pain, 07(23%) patients with mild pain, 06(20%) patients with moderate pain and 02(7%) patients with severe pain on percussion. The *p*-value was 0.001 which is highly significant.

Conclusion: The incidence of false positive percussion test in adjacent teeth in posterior maxillary molars is more as compared to the maxillary anterior incisors.

Keywords: Percussion Text, Maxillary Anterior Incisors, Posterior Maxillary Molars, Periodontal Ligament.

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INTRODUCTION

Diagnosis is an important requirement for an effective and precise treatment for any disease. Diagnosis in Dentistry is the key for a treatment plan that can not only treat the disease but also provide psychological satisfaction in terms of cost and time.[1] The different signs used for diagnosis in dentistry include the cold test, the electric pulp test for determining the vitality of the tooth but sometimes even these tests may be misleading in situations like presence of deep caries in teeth adjacent to the tooth in question and trauma leading to pulpal necrosis in teeth in close proximity, trauma due to vertical root fracture or cracks initiated by hard food objects and in direct trauma to teeth due to an accident.[2] The sign of pain on percussion only helps to diagnose the involvement of periodontal ligament due to inflammation in the periodontal ligament caused by trauma from occlusion or egress of micro-organisms from the intra radicular compartment of the tooth to the extra-radicular peri-apical portion of the tooth. This sign is based on the role of the proprioceptors located in the periodontal ligament that play an important role in diagnosis of pupal and periodontal diseases where the micro-organisms or trauma has initiated an inflammatory response in the periodontal ligament (PDL) of the tooth.[3] Previous literature indicated a prevalence of false positive percussion test results in posterior teeth of approximately 19%.[4]

Apical Periodontitis is one of the dental conditions where the pulpal vascularity is dysfunctional and the pulp undergoes necrosis leading to growth of mixed predominantly anaerobic flora. The outflux of micro-organisms or their by-products from the intra-radicular compartment to peri-radicular area initiates a cascade of defense mechanism involving immune cells, humoral antibodies and intracellular mediators.[2] This outflux

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finds its way into the peri-radicular tissues through the apical and lateral foramina with a well localized tissue destruction due to mechanoreceptors found in Periodontal ligaments (PDL).[5,6]

Pain on percussion is the common test used by the dentist to diagnose the peri-apical inflammation of the tooth where the A beta Fibers located on the Periodontal ligament transmits signal to mesencephalic nucleus in Central nervous system perceived as pain when percussed by any hard instrument.[7] Though the dentist must use all the necessary endodontic tests for diagnosis of pulp and peri-apical disease but for peri-apical status, this test plays an important role.[8-9]

This study would enlighten the dental fraternity about the incidence of false positive results of pain on percussion in adjacent tooth in posterior and anterior regions of the maxillary arch. By focusing on the maxillary arch, this study aims to provide valuable data that will help dentists improve diagnostic accuracy and treatment planning, ultimately leading to better patient outcomes and would also allow the clinician to be vigilant in misdiagnosis based on percussion test and always include other methods of diagnosis in the armamentarium such as peri-apical radiographs and the intensity of pain on percussion for selecting the tooth for relieving the pain using the non-surgical endodontic therapy.

METHODOLOGY

This cross-sectional observational study was conducted at 5 Military Dental Centre Hyderabad, Pakistan from November 2023 to January 2024. Ethical approval was obtained from the Bioethical Committee of 5 Military Dental Centre (Bioethical Committee Form No. 3). The sample size was calculated using the Epi Info™ Sample Size Calculator, taking the population proportion (prevalence of false positive tests) as 19%[4], with a 95% confidence level and a 5% margin of error.

A total of 60 patients (30 males and 30 females) aged 20–40 years were enrolled through convenience sampling. This age group is considered at higher risk for dental conditions such as irreversible pulpitis and apical periodontitis, owing to increased prevalence of dental caries, trauma, and related pulp and periodontal diseases. Clinical examination was performed using mouth mirror No. 5 and dental explorer No. 23 (cowhorn explorer) under proper illumination.

Inclusion Criteria: Patients presenting with continuous pain, a history of severe pain to cold aggravated by lying down, and severe pain on chewing, without systemic disease or physical/mental disability were included.

Exclusion Criteria: Patients with a history of periodontitis and evident bone loss in maxillary molars and incisors. Patients with systemic conditions such as diabetes, autoimmune disorders, or other diseases affecting inflammatory response were excluded.

According to the eligibility criteria, maxillary molars and incisors with at least one adjacent tooth and deep carious lesions with remaining dentin thickness of 0.5 mm (confirmed on periapical radiographs) were enrolled. Teeth were further assessed to ensure absence of cracks using tooth slooth and transillumination. Pain intensity was measured using the Visual Analogue Scale (VAS) ranging from 1 to 10, where 1 indicated minimal pain and 10 severe pain. Only teeth with deep carious lesions showing percussion pain scores between 7 and 10 on VAS were evaluated.

Patients with systemic conditions such as diabetes, autoimmune disorders or other diseases affecting inflammatory response were excluded as these may alter disease presentation and affect diagnostic reliability. Pulp vitality was assessed using a cold test with Endo Frost (Roeko GmbH, Whaledent, Coltene). Pain intensity of adjacent teeth on percussion was also recorded using VAS.

All findings were documented on a predesigned data collection form. Patients with pain in posterior maxillary molars were categorized as Group-A, while those with pain in anterior maxillary incisors were categorized as Group-B. Data analysis was performed using Statistical Package for Social Sciences Version 26.0, and the Chi-square test was applied to determine statistical significance.

RESULT

The patients selected for posterior maxillary molars percussion test for adjacent teeth revealed 04(13%) patients with no pain, 05(17%) patients with mild pain, 06(20%) patients with moderate pain, 15(50%) patients with severe pain. The patients selected for anterior maxillary incisors percussion test for adjacent teeth revealed 15(50%) patients with no pain, 07(23%) patients with mild pain, 06(20%) patients with moderate pain and 02(7%) patients with

severe pain on percussion as shown in Table-I. The *p*-value was 0.001, which is highly significant.

Table-I: Frequency of Percussion test in Posterior Maxillary Molar and Anterior Maxillary Incisors Adjacent Teeth (n=60)

	Pain on percussion in adjacent teeth				*p*-value
	No pain n(%)	Mild pain n(%)	Moderate pain n(%)	Severe pain n(%)	
Posterior Maxillary Molars (n=30)	4(13%)	5(17%)	6(20%)	15(50%)	0.001
Anterior Maxillary Incisors (n=30)	15(50%)	7(23%)	6(20%)	2(7%)	

DISCUSSION

The findings of this study highlight significant differences in the incidence of false positive percussion tests between posterior maxillary molars and anterior maxillary incisors in patients diagnosed with symptomatic irreversible pulpitis and symptomatic apical periodontitis. Specifically, the results show that posterior maxillary molars had a higher incidence of severe pain on percussion in adjacent teeth compared to anterior maxillary incisors. This disparity was statistically significant, with a *p*-value of 0.001.

For posterior maxillary molars, the study revealed that 13% of patients reported no pain, 17% reported mild pain, 20% reported moderate pain and 50% reported severe pain on percussion of adjacent teeth. In contrast, for anterior maxillary incisors, 50% of patients reported no pain, 23% reported mild pain, 20% reported moderate pain, and only 7% reported severe pain on percussion of adjacent teeth. This significant difference indicates a higher propensity for false positive results in the posterior region.

The results align with and expand upon previous research in the field. For instance, a study by Seltzer *et al.*,[10] found that percussion tests in posterior teeth often yielded higher pain responses due to the complex root anatomy and the greater density of proprioceptors in the periodontal ligament of molar. Similarly, Gutmann and Harrison,[11] reported that diagnostic tests, including percussion can be less reliable in posterior teeth because of the potential for referred pain from adjacent teeth or other areas of the maxillary arch.

However, the high incidence of severe pain on percussion in posterior maxillary molars found in this study is particularly notable and underscores the need for dentists to exercise caution when relying solely on this test for diagnostic purposes in this region.[12] This finding supports the hypothesis that false positive results in percussion tests are more prevalent in posterior teeth due to their anatomical and physiological characteristics.

One of the key contributions of this study is the comparative analysis between different regions of the maxillary arch highlighting the variability in diagnostic accuracy.[12] This regional comparison is relatively underexplored in existing literature, and the findings provide new insights that can inform clinical practice. The significant difference in false positive rates between posterior and anterior teeth suggests that additional diagnostic tools and methods should be employed, particularly in the posterior region, to avoid misdiagnosis and ensure effective treatment planning.

The study also emphasizes the importance of a comprehensive diagnostic approach, incorporating multiple tests and clinical evaluations as in previous studies.[13] While percussion tests remain a valuable tool, their limitations must be acknowledged, and adjunctive methods such as periapical radiographs and assessing the intensity of pain should be used to corroborate findings as suggested in existing literature.[14-15]

The hypothesis of this study proposed that false positive percussion tests are more common in posterior maxillary molars compared to anterior maxillary incisors. The results confirm this hypothesis, demonstrating a statistically significant higher incidence of severe pain on percussion in posterior teeth and is in harmony with previous studies.[16-18]

The study concludes that dentists should be aware of the higher likelihood of false positive percussion test results in posterior maxillary molars compared to anterior maxillary incisors. This awareness can help in refining diagnostic protocols and reducing the risk of misdiagnosis. By integrating multiple diagnostic tools and being vigilant about the limitations of each test, clinicians can achieve more accurate diagnoses and better treatment outcomes for patients with symptomatic irreversible pulpitis and symptomatic apical periodontitis.

Further research is recommended to explore the underlying mechanisms contributing to the variability in pain perception and diagnostic accuracy across different regions of the dental arch. Additionally, studies involving larger sample sizes and diverse populations could provide more comprehensive insights into this important aspect of dental diagnostics.

CONCLUSION

The incidence of false positive percussion test is more in the maxillary posterior molars than in the maxillary anterior incisors.

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Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

HHK & JAS: Conception, study design, drafting the manuscript, approval of the final version to be published.

HS: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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