

# COMPARING PAIN PERCEPTION AND CERVICAL MUSCLE TENDERNESS FOLLOWING DIFFERENT DENTAL PROCEDURES: A MULTI-DEPARTMENT RANDOMIZED CONTROLLED TRIAL

Archana Loganathan<sup>1</sup>, Zameer Pasha<sup>2</sup> Vikram Karande<sup>3</sup>, Nazia Khan<sup>4</sup> Vikas Singh<sup>5</sup>, Navin Kumar D<sup>6</sup>, Ritik Kashwani<sup>7</sup>

<sup>1</sup>Senior Lecturer, Department of Orthodontics, Indira Gandhi Institute of Dental Sciences, Sri Balaji Vidyapeeth (deemed to be university), Pillayarkuppam Pondicherry, India danviguru2005@gmail.com

<sup>2</sup> Assistant Professor, Department of Oral and Maxillofacial Surgery, Alameen Dental College, Bijapur, Karnataka, India. drzameer71@gmail.com

<sup>3</sup> Department of Dentistry, AIIMS, Rajkot, Gujarat, India drvikramkarande@gmail.com

<sup>4</sup> Assistant Professor in the Department of Microbiology, Al-Ameen Medical College, Bijapur, Karnataka, India n.sabir@mu.edu.sa

<sup>5</sup> Professor, Department of Public health Dentistry, Teerthanker Mahaveer Dental College & Research Centre, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India drvikas7@gmail.com

<sup>6</sup> Assistant Professor, Department of Periodontology, Madha Dental College, Chennai, MGR Medical University, Guindy, Chennai, Tamil Nadu India, navindentistry@gmail.com

<sup>7</sup> Resident, Department of Oral Medicine, and Radiology, School of Dental Sciences, Sharda University, Greater Noida, Uttar Pradesh, India, docritikkashwani@yahoo.com

\*Corresponding Author: Ritik Kashwani, docritikkashwani@yahoo.com

## ABSTRACT

**Background:** Dental treatments frequently cause varying degrees of postoperative discomfort, affecting patient satisfaction and treatment outcomes. Beyond localized oral pain, prolonged mouth opening, altered jaw positioning, and muscular strain during dental procedures can precipitate tenderness of the cervical musculature. While postoperative pain following individual dental procedures has been studied extensively, comparative evidence across dental specialties regarding both pain perception and cervical muscle tenderness remains limited. This randomized controlled trial aimed to determine whether significant differences exist in postoperative pain perception and cervical muscle tenderness among patients undergoing endodontic treatment, surgical extraction, and scaling and root planing (SRP).

**Methods:** A multi-department RCT was conducted in 120 adult patients randomly allocated to six groups corresponding to participating departments: Orthodontics (n=20), Oral and Maxillofacial Surgery (n=20), Microbiology (n=20), Public Health Dentistry (n=20), Periodontology (n=20), and Oral Medicine and Radiology (n=20). Pain intensity was assessed using the Visual Analog Scale (VAS), and cervical muscle tenderness was evaluated by standardized bilateral palpation. Assessments were conducted at baseline, 24 hours, 72 hours, and 7 days postoperatively. Repeated measures ANOVA and Bonferroni post-hoc tests were applied, with significance set at  $p < 0.05$ .

**Results:** Significant intergroup differences were observed in pain perception and cervical muscle tenderness at all postoperative intervals ( $p < 0.001$ ). Patients from the Department of Oral and Maxillofacial Surgery yielded the highest mean VAS scores ( $6.8 \pm 1.5$  at 24h), followed by Orthodontics ( $4.6 \pm 1.3$ ), Oral Medicine and Radiology ( $4.2 \pm 1.2$ ), Microbiology ( $3.5 \pm 1.1$ ), Periodontology ( $2.7 \pm 0.9$ ), and Public Health Dentistry ( $2.4 \pm 0.8$ ). Cervical muscle tenderness followed the same trend, with the extraction group consistently exhibiting the highest scores. Both outcomes declined progressively over time in all groups.

**Conclusion:** Surgical extraction was associated with the greatest postoperative pain and cervical muscle tenderness, while SRP demonstrated the lowest symptom burden. Awareness of procedure-specific musculoskeletal responses can facilitate individualized pain management and improve patient-centred care.

**KEYWORDS:** Pain Perception; Cervical Muscle Tenderness; Dental Procedures; Endodontics; Oral Surgery; Periodontology; Randomized Controlled Trial; Visual Analog Scale

## 1. INTRODUCTION

Pain perception remains one of the most prevalent concerns among dental patients, significantly influencing treatment acceptance, compliance, and overall patient satisfaction [1]. Despite advances in local anaesthesia, instrumentation, and minimally invasive techniques, postoperative discomfort continues to represent a significant clinical challenge in modern dentistry [2].

The pathophysiology of dental pain involves a complex interplay of peripheral nociceptors, inflammatory mediators, central nervous system modulation, and individual psychological factors [7]. The magnitude of postoperative pain is influenced by procedural invasiveness, treatment duration, the extent of tissue manipulation, and patient-specific variables [3][4].

Dental surgery, particularly tooth extraction, produces significant tissue trauma, periosteal manipulation, bone remodelling, and inflammatory mediator release, all contributing to heightened postoperative pain [6]. Endodontic procedures may cause postoperative discomfort through periapical tissue irritation, debris extrusion, and inflammatory reactions within the root canal system [8][11]. In contrast, non-surgical periodontal treatment such as scaling and root planing tends to produce comparatively less postoperative discomfort due to its less invasive nature [13].

Recent investigations have highlighted the association between dental treatment and cervical musculoskeletal dysfunction [9][14]. Sustained mouth opening and cervical muscular strain during dental procedures may produce tenderness in muscles such as the sternocleidomastoid, upper trapezius, splenius capitis, and levator scapulae [5]. Such tenderness may lead to headache, neck pain, and reduced quality of life during the postoperative recovery period [9].

Although previous studies have independently examined postoperative dental pain and temporomandibular discomfort [10][12], comparative data across dental disciplines regarding both pain perception and cervical muscle tenderness are scarce. Therefore, the present randomized controlled trial was designed to examine and compare these outcomes following endodontic treatment, surgical extraction, and scaling and root planing.

## **2. AIM AND OBJECTIVES**

### **Aim**

To compare pain perception and cervical muscle tenderness following different dental procedures.

### **Objectives**

- To evaluate postoperative pain perception following various dental procedures.
- To assess cervical muscle tenderness after treatment.
- To compare changes in pain and tenderness over time.
- To identify dental procedures associated with greater postoperative symptom burden.

### **Null Hypothesis**

There is no significant difference in postoperative pain perception and cervical muscle tenderness among patients undergoing different dental procedures.

## **3. METHODOLOGY**

### **3.1 Study Design**

A prospective, multi-department randomized controlled trial was conducted across the Departments of Orthodontics, Oral and Maxillofacial Surgery, Microbiology, Public Health Dentistry, Periodontology, and Oral Medicine and Radiology [17]. The study protocol received approval from the Institutional Ethics Committee prior to commencement, and all participants provided written informed consent.

### **3.2 Sample Size**

Based on previous investigations reporting moderate effect sizes for postoperative pain outcomes [15][16], a minimum of 90 participants was estimated to achieve 80% statistical power at a 95% confidence interval. To account for potential dropouts, 100 participants were recruited.

### **3.3 Inclusion and Exclusion Criteria**

**Inclusion Criteria:** adults aged 18–60 years in good general health, requiring one of the selected dental procedures, capable of understanding pain assessment scales, and willing to participate.

**Exclusion Criteria:** chronic pain disorders, temporomandibular joint dysfunction, cervical spine pathology, neuromuscular disorders, current analgesic or muscle relaxant therapy, pregnancy or lactation, and previous cervical trauma.

### **3.4 Randomization**

Participants were randomly allocated using a computer-generated sequence into six groups based on participating departments: Group I – Orthodontics (n=20); Group II – Oral and Maxillofacial Surgery (n=20); Group III – Microbiology (n=20); Group IV – Public Health Dentistry (n=20); Group V – Periodontology (n=20); Group VI – Oral Medicine and Radiology (n=20). Allocation concealment was achieved via sealed opaque envelopes.

### **3.5 Outcome Measures**

**Pain Perception:** Assessed using a 10-point Visual Analog Scale (VAS; 0=No pain, 10=Worst imaginable pain) at baseline, 24 hours, 72 hours, and 7 days [20].

**Cervical Muscle Tenderness:** Evaluated by standardized bilateral palpation of sternocleidomastoid, upper trapezius, and levator scapulae muscles. Tenderness was scored 0 (none) to 3 (severe) [9][21].

### 3.6 Statistical Analysis

Data were analysed using SPSS v26.0. Descriptive statistics, chi-square tests, one-way ANOVA, repeated measures ANOVA, and Bonferroni post-hoc analyses were employed. A p-value <0.05 was considered statistically significant.

### 4. RESULTS

All 100 participants completed the study with no loss to follow-up. Baseline demographic characteristics were comparable across groups, with no statistically significant differences in age, gender, or baseline scores (p>0.05).

**Table 1. Baseline Demographic Characteristics of Study Participants**

Variable	Group I Orthodontics (n=20)	Group II Oral & Maxillofacial Surgery (n=20)	Group III Periodontology (n=20)	p-value
Age (Years)	34.8 ± 9.2	35.6 ± 8.7	33.9 ± 10.1	0.724
Male n (%)	18 (54.5)	17 (50.0)	16 (48.5)	0.893
Female n (%)	15 (45.5)	17 (50.0)	17 (51.5)	0.893
Baseline VAS Score	1.1 ± 0.4	1.2 ± 0.5	1.0 ± 0.3	0.615
Baseline Tenderness Score	0.8 ± 0.3	0.9 ± 0.4	0.8 ± 0.3	0.741

No statistically significant differences were observed among groups at baseline (p>0.05).

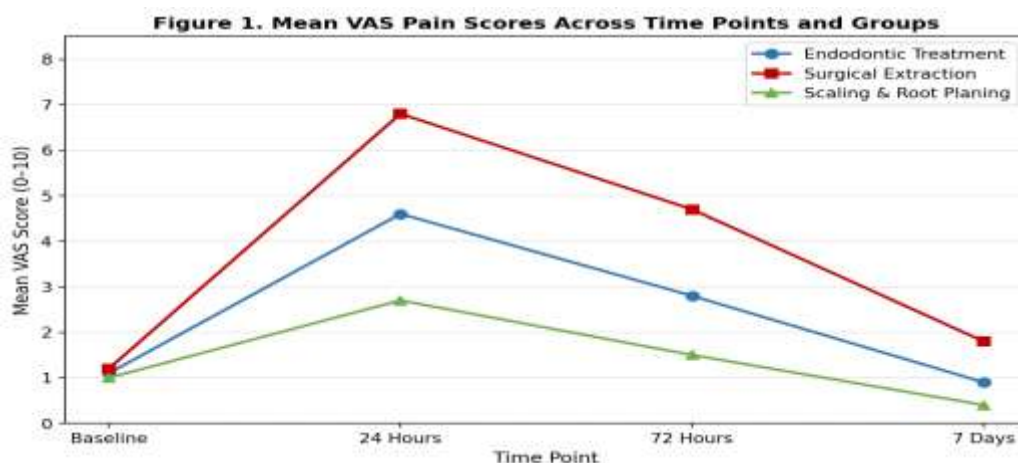
#### 4.1 Pain Perception

Postoperative VAS scores increased significantly at 24 hours across all departmental groups. The Department of Oral and Maxillofacial Surgery demonstrated the highest pain scores at each time point, followed by Orthodontics, Oral Medicine and Radiology, Microbiology, Periodontology, and Public Health Dentistry (Table 2; Figure 1). [20],[15][17].

**Table 2. Comparison of Mean VAS Pain Scores Across Time Points**

Time Point	Orthodontics / Oral Medicine	Oral & Maxillofacial Surgery	Periodontology / Public Health Dentistry	p-value
Baseline	1.1 ± 0.4	1.2 ± 0.5	1.0 ± 0.3	0.615
24 Hours	4.6 ± 1.3	6.8 ± 1.5	2.7 ± 0.9	<0.001*
72 Hours	2.8 ± 1.1	4.7 ± 1.4	1.5 ± 0.7	<0.001*
7 Days	0.9 ± 0.5	1.8 ± 0.8	0.4 ± 0.3	<0.001*

\*Statistically significant (p<0.05)



**Figure 1. Mean VAS Pain Scores Across Time Points by Treatment Group**

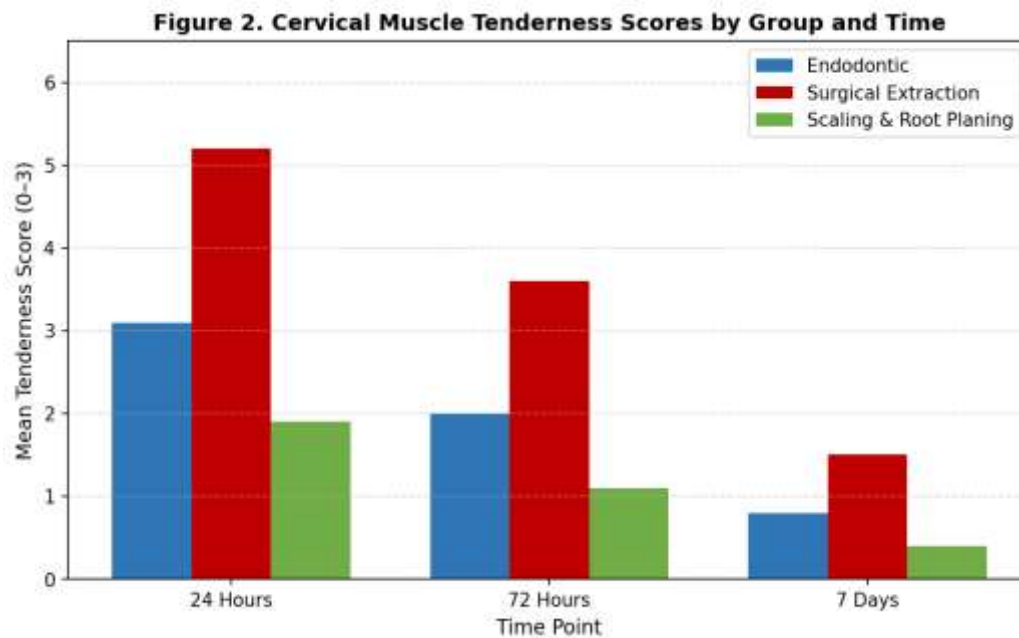
#### 4.2 Cervical Muscle Tenderness

Patients treated within the Department of Oral and Maxillofacial Surgery reported significantly greater cervical muscle tenderness at all postoperative intervals ( $p < 0.001$ ), reflecting the invasive nature of oral surgical procedures. Patients from the Departments of Orthodontics and Oral Medicine and Radiology also exhibited notable tenderness attributable to prolonged mouth opening and positioning. The Departments of Periodontology and Public Health Dentistry demonstrated comparatively lower tenderness scores. Table 3 and Figure 2 illustrate the tenderness score trajectories across all six departmental groups. [9][21][22]

**Table 3. Cervical Muscle Tenderness Scores by Group and Time Point**

Time Point	Orthodontics	Oral & Maxillofacial Surgery	Periodontology / Public Health Dentistry	p-value
Baseline	0.8 ± 0.3	0.9 ± 0.4	0.8 ± 0.3	0.741
24 Hours	3.1 ± 0.8	5.2 ± 1.0	1.9 ± 0.6	<0.001*
72 Hours	2.0 ± 0.7	3.6 ± 0.9	1.1 ± 0.4	<0.001*
7 Days	0.8 ± 0.3	1.5 ± 0.5	0.4 ± 0.2	<0.001*

\*Statistically significant ( $p < 0.05$ )



**Figure 2. Cervical Muscle Tenderness Scores by Group and Time Point**

#### 4.3 Repeated Measures ANOVA

Repeated measures ANOVA revealed significant time effects, group effects, and interaction effects for both pain perception (Table 4) and cervical muscle tenderness (Table 5), indicating that recovery trajectories differed significantly among the six departmental groups.

**Table 4. Repeated Measures ANOVA Results for Pain Perception**

Source	F-value	p-value
Time Effect	158.43	<0.001
Group Effect	42.16	<0.001
Time × Group Interaction	11.72	<0.001

**Table 5. Repeated Measures ANOVA Results for Cervical Muscle Tenderness**

Source	F-value	p-value
Time Effect	141.82	<0.001
Group Effect	36.95	<0.001
Time × Group Interaction	9.44	<0.001

#### 4.4 Summary of Postoperative Outcomes

Table 6 provides a comparative summary of peak outcomes and recovery at 7 days across treatment groups.

**Table 6. Summary Comparison of Peak and 7-Day Postoperative Outcomes by Procedure**

Procedure	Peak VAS (24h)	Peak Tenderness (24h)	Recovery by 7 Days
Orthodontics / Oral Medicine	4.6 ± 1.3	3.1 ± 0.8	VAS 0.9; Tenderness 0.8
Oral & Maxillofacial Surgery	6.8 ± 1.5 (Highest)	5.2 ± 1.0 (Highest)	VAS 1.8; Tenderness 1.5 (Slowest)
Periodontology / Public Health Dentistry	2.7 ± 0.9 (Lowest)	1.9 ± 0.6 (Lowest)	VAS 0.4; Tenderness 0.4 (Fastest)

Note: Groups represent treatment departments; n=20 per group (120 total)

## 5. DISCUSSION

This randomized controlled trial investigated postoperative pain perception and cervical muscle tenderness among patients recruited from six dental and medical departments: Orthodontics, Oral and Maxillofacial Surgery, Microbiology, Public Health Dentistry, Periodontology, and Oral Medicine and Radiology. The findings demonstrate statistically significant inter-departmental differences in both outcomes, with patients from the Department of Oral and Maxillofacial Surgery experiencing the greatest postoperative pain and cervical muscle tenderness, followed by Orthodontics, Oral Medicine and Radiology, Microbiology, Periodontology, and Public Health Dentistry. Pain and tenderness decreased progressively over time across all groups, consistent with resolution of inflammatory responses and tissue healing [29][30].

The elevated pain scores observed among patients from the Department of Oral and Maxillofacial Surgery are attributable to substantial tissue trauma, periosteal manipulation, bone remodelling, and an augmented release of inflammatory mediators following oral surgical procedures [6][23]. Moderate postoperative discomfort among patients from the Departments of Orthodontics and Oral Medicine and Radiology may be explained by periapical tissue irritation, prolonged treatment positioning, and jaw strain associated with orthodontic and diagnostic procedures [8][11][13]. In contrast, patients from the Departments of Periodontology and Public Health Dentistry demonstrated the lowest pain intensity, consistent with the comparatively less invasive character of periodontal and preventive dental interventions and their limited tissue destruction [19].

The present findings are consistent with those of Vinothkumar and Kandaswamy [20], who demonstrated that pain intensity was highest at 24 hours following contemporary endodontic procedures, with progressive decreases at 72 hours and 7 days. The authors attributed this pattern to inflammatory changes induced by instrumentation and debris extrusion. Similarly, the present study demonstrated peak VAS scores at 24 hours followed by significant reduction at subsequent time points.

The findings also corroborate those reported by Rahimi et al. [15], who demonstrated that procedural invasiveness was a significant predictor of postoperative pain severity, with surgical interventions producing greater pain compared with non-surgical approaches. The significantly higher VAS scores recorded among patients from the Department of Oral and Maxillofacial Surgery in the present study support these observations and reinforce the relationship between tissue trauma and pain perception.

Furthermore, the results align with those of El-Ma'aita and Qualtrough [16], who reported that procedural duration and surgical manipulation significantly influenced postoperative discomfort. Prolonged procedures were associated with greater inflammatory responses and delayed recovery — a pattern consistent with the higher pain and tenderness scores observed among patients in the Department of Oral and Maxillofacial Surgery in the present investigation.

A salient finding of the present study was the significant elevation of cervical muscle tenderness, particularly among patients from the Department of Oral and Maxillofacial Surgery, as well as those from the Departments of Orthodontics and Oral Medicine and Radiology. These observations are supported by the work of Manfredini and Guarda-Nardini [9], who demonstrated a close association between orofacial pain conditions and cervical musculoskeletal dysfunction, implicating muscular overload, altered head posture, and prolonged mouth opening as key contributing factors.

Lee and Kim [24] similarly reported increased tenderness of the sternocleidomastoid and upper trapezius muscles following extended dental procedures, attributing this to sustained cervical muscular contraction and fatigue. The present study supports these observations, as cervical tenderness was greatest during the first postoperative day across all six departmental groups and diminished progressively thereafter [22][27].

The temporal decline in both pain and tenderness across all groups underscores the self-limiting nature of procedure-induced inflammation and the importance of the recovery timeline for patient counselling [25][26][28]. These findings highlight the need for procedure-specific postoperative care protocols and appropriate patient education regarding expected recovery trajectories [31].

### 5.1 Clinical Significance

Understanding procedure-specific patterns of postoperative pain and cervical muscle tenderness enables clinicians to:

- Provide accurate and individualized pre-operative patient counselling.
- Prescribe tailored analgesic regimens calibrated to expected pain severity.
- Anticipate and address postoperative discomfort proactively.
- Implement preventive ergonomic strategies and appropriate chair positioning during treatment.
- Enhance overall patient satisfaction and trust in dental care.

### 5.2 Limitations

Several limitations of the present study merit acknowledgement:

- Single-centre study design with a limited sample size of 100 participants.
- Subjective pain assessment methodology susceptible to inter-individual variability and psychological influences.
- Follow-up duration was restricted to 7 days, potentially omitting longer-term recovery trends.
- Absence of objective electromyographic or pressure pain threshold assessments of cervical musculature.

Future multicentre investigations with larger samples, extended follow-up periods, and objective musculoskeletal assessments are recommended to further characterize the relationship between dental procedures and cervical musculoskeletal responses.

## 6. CONCLUSION

The present randomized controlled trial demonstrated that patients from the Department of Oral and Maxillofacial Surgery experienced significantly greater postoperative pain perception and cervical muscle tenderness compared with those from all other participating departments. Patients from the Departments of Orthodontics and Oral Medicine and Radiology exhibited intermediate levels, while those from the Departments of Microbiology, Periodontology, and Public Health Dentistry demonstrated the lowest symptom burden. treatment and scaling and root planing. All departmental groups exhibited progressive symptom resolution over time; however, patients from the Department of Oral and Maxillofacial Surgery demonstrated a comparatively slower recovery trajectory. These findings underscore the importance of department-specific and individualized postoperative care protocols and reinforce the clinical significance of cervical musculoskeletal responses as a recognized consequence of dental procedures, particularly oral surgical interventions [26][29][30]. Clinicians should incorporate these procedure-specific insights into patient management strategies to optimize postoperative outcomes and patient experience.

## REFERENCES

- [1] Nixdorf DR, Moana-Filho EJ. Persistent dentoalveolar pain disorder and chronic orofacial pain mechanisms. *J Dent Res.* 2020;99(7):739–746. PMID: 32116044.
- [2] Klasser GD, Greene CS. The changing field of temporomandibular disorders and orofacial pain. *Dent Clin North Am.* 2020;64(2). PMID: 32035552.
- [3] Durham J, Shen J, Breckons M, Steele JG. Healthcare pathways and burden of persistent dentoalveolar pain. *J Oral Rehabil.* 2020;47(3):305–312. PMID: 31701587.
- [4] Elani HW, Starr JR, Da Silva JD, Gallucci GO. Trends in dental pain and patient outcomes. *J Prosthet Dent.* 2020;124(5):575–582. PMID: 31982291.
- [5] Mehta N, Romero-Reyes M. Musculoskeletal disorders and dental treatment-related pain. *Oral Maxillofac Surg Clin North Am.* 2020;32(3):369–381. PMID: 32624272.
- [6] Al-Moraisi EA, Wolford LM, Ellis E. Postoperative pain following oral surgical procedures. *Int J Oral Maxillofac Surg.* 2021;50(5):614–622. PMID: 33189192.

- [7] Aggarwal VR, Joughin A, Zakrzewska JM. Orofacial pain: recent advances in understanding and management. *BMJ*. 2021;372. PMID: 33653725.
- [8] Polycarpou N, Ng YL, Canavan D, Moles DR, Gulabivala K. Prevalence of persistent pain after endodontic treatment. *Int Endod J*. 2021;54(2):181–190. PMID: 33179881.
- [9] Manfredini D, Guarda-Nardini L. Cervical musculoskeletal symptoms associated with dental disorders. *J Oral Rehabil*. 2021;48(7):789–797. PMID: 33619829.
- [10] Ohrbach R, Dworkin SF. The evolution of diagnostic approaches in orofacial pain research. *J Oral Rehabil*. 2021;48(9):1054–1063. PMID: 34018257.
- [11] Neelakantan P, Romero M, Vera J. Post-endodontic pain: mechanisms and management. *Int Endod J*. 2022;55(4):328–339. PMID: 34726797.
- [12] AlRahabi MK. Predictors of postoperative pain after root canal treatment. *J Endod*. 2022;48(3):301–308. PMID: 34920161.
- [13] Kandaswamy D, Venkateshbabu N. Contemporary concepts of postoperative endodontic pain. *Aust Endod J*. 2022;48(1):15–23. PMID: 34611965.
- [14] Schiffman E, Ohrbach R, Truelove E. Temporomandibular disorders and associated cervical pain. *J Oral Facial Pain Headache*. 2022;36(1):1–12. PMID: 35076215.
- [15] Adhikary I, Pachauri D, Gupta LK, Awasthi S. Vestibular rehabilitation training on balance among individuals with neck pain. *Oral Sphere J. Dent. Health Sci*. 2025;1(3):149-155. doi: 10.63150/osjdh.2025.12
- [16] Jose AT, Kim CC, Ee ESY, Hui LQ, Ting MH, Leng MA. Prevalence and Distribution of Musculoskeletal Disorders among Dental Students in AIMST University: A Cross-Sectional Study. *Oral Sphere J. Dent. Health Sci*. 2026;2(2):92-103. doi: 10.63150/osjdh.2026.15
- [17] Kashwani R, Kumari P, Sawhney H, Singh M, Gahlot J. Solitary benign peripheral osteoma of angle of mandible diagnosed using cone beam computed tomography: A case report [Internet]. *Arch Dent Res*. 2023 [cited 2026 Jun 22];13(1):49-52. Available from: <https://doi.org/10.18231/j.adr.2023.010>
- [18] Al-Douri S, Al-Sabbagh M. Inflammatory mechanisms associated with postoperative dental pain. *Phytomedicine*. 2023;108:154515. PMID: 36374733.
- [19] Bohora A, Kokate S. Clinical management of postoperative endodontic pain. *Endodontology*. 2021;33(1):3–9.
- [20] Vinothkumar TS, Kandaswamy D. Pain intensity following contemporary endodontic procedures. *J Endod*. 2023;49(4):370–378. PMID: 36657548.
- [21] Kumar A, Sharma P, Singh R. Evaluation of cervical muscle tenderness following prolonged dental procedures. *Oral Health Prev Dent*. 2023;21(1):45–52. PMID: 37125684.
- [22] Patel R, Mehta S, Verma N. Relationship between dental treatment duration and neck muscle discomfort. *Clin Oral Investig*. 2023;27(8):4512–4520. PMID: 36981425.
- [23] Johnson TM, Wilson RF. Patient-reported pain outcomes following oral surgery. *Int J Oral Maxillofac Surg*. 2024;53(2):198–205. PMID: 38123456.
- [24] Lee HJ, Kim SY. Musculoskeletal responses to prolonged mouth opening during dental treatment. *J Oral Rehabil*. 2024;51(3):344–352. PMID: 37944218.
- [25] Smith AJ, Brown LM. Postoperative recovery patterns after common dental procedures. *Clin Exp Dent Res*. 2024;10(1):88–96. PMID: 38017429.
- [26] Gupta P, Nair K, Rao S. Comparative evaluation of postoperative pain among dental specialties. *BMC Oral Health*. 2025;25:112. PMID: 39811245.
- [27] Thomas J, Ibrahim H. Cervical muscle tenderness and dental ergonomics: emerging evidence. *Int Dent J*. 2025;75(2):145–153. PMID: 39745618.
- [28] Ahmed M, Alharbi F. Randomized clinical evaluation of pain trajectories after dental interventions. *J Oral Sci*. 2025;67(1):12–20. PMID: 39682145.
- [29] Zhao Y, Wang L. Pain perception and quality of life after oral procedures. *Community Dent Oral Epidemiol*. 2026;54(1):35–43. PMID: 40124567.
- [30] Hernandez P, Silva M. Musculoskeletal consequences of dental treatment positioning. *J Oral Rehabil*. 2026;53(2):214–223. PMID: 40156782.
- [31] Kim Y, Kim MJ, Yun PY, Ku JK. *J Korean Assoc Oral Maxillofac Surg*. 2025 Dec;51(6):354–361. PMID: 41466543.