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Original Article

Evaluation of Post Operative Pain Intensity on Pain Scale Following Occlusal Reduction in Teeth Associated with Symptomatic Apical Periodontitis

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ABSTRACT

Objective: To compare the postoperative pain score, in teeth with symptomatic apical periodontitis, with and without occlusal reduction.

Methodology: This randomized controlled trial (RCT) was conducted at Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro with 75 patients in each group selected through non-probability, consecutive sampling. Patients between the age group 18 to 65 years, either gender, ASA status I, VAS pain score >3 with symptomatic apical periodontitis, were included and randomly assigned to Group A (Occlusal Reduction) and Group B (Non-Occlusal Reduction). VAS scores assessed postoperative pain at 12, 24, 48 hours, and 6 days. Tenderness to percussion was evaluated. SPSS was used for statistical analysis, with $p \leq 0.05$ considered significant.

Results: Pain scores were significantly lower in the occlusal reduction group (Group A) at 12 hours (8.40 ± 1.09 vs. 8.75 ± 1.01) and 6 days (2.32 ± 1.42 vs. 3.53 ± 1.70, $p < 0.05$) compared to the non-occlusal reduction group (Group B). Among 18-40 years, Group A had significantly lower pain at 12 hours ($p = 0.038$) and 6 days ($p = 0.000$), while in patients >40 years, pain reduction was significant only at 6 days ($p = 0.005$). By 6 days, pain was significantly lower in both males ($p = 0.002$) and females ($p = 0.001$) in Group A.

Conclusion: This study concluded that occlusal reduction significantly reduces postoperative pain in symptomatic apical periodontitis, with a notable effect by day 6. The reduction was significantly high in younger and female patients. These findings support occlusal reduction as an effective strategy for minimizing post-endodontic pain.

Keywords: Apical periodontitis, Endodontics, Occlusal reduction, Postoperative pain

INTRODUCTION

One of the common postendodontic complications is postoperative endodontic discomfort. Postoperative pain has been documented to occur in 3% to 58% of patients[1]. Different measures have been taken to reduce pain during endodontic treatment such as using analgesics prior to the procedure, long-acting anesthetics and occlusal reduction[2]. Postoperative pain, on the other hand, typically follows a predictable course of decrease in which the pain level is halved on the first postoperative day and then reduced to 10% of the base level on the seventh day[3].

Postoperative pain is multifactorial and cannot be attributed to a single cause. Mechanical, chemical, and microbial factors associated with root canal instrumentation contribute to periapical inflammation, affecting both pain prevalence and intensity. Additionally, pain perception is subjective and influenced by social, cultural, and psychological factors, leading to variability among patients[4]. Percussion and biting sensitivity are reliable indicators of apical inflammation. According to the American Association of Endodontists (AAE) Glossary of Endodontic Terms, symptomatic apical periodontitis is defined as *"Inflammation, usually of the apical periodontium, producing clinical symptoms including a painful response to biting and/or percussion or palpation. It might or might not be associated with an apical radiolucent area".* This condition increases the risk of severe postoperative pain[5].

In a study, the mean pain score at 6 days after instrumentation was significantly lower in the occlusal reduction group than in the non-occlusal reduction group (2.44±0.86 vs. 3.24±0.89; $p = 0.0005$)[6]. The role of occlusal contacts in post-endodontic pain has been highlighted in previous research. However, studies using calcium hydroxide dressing and root canal preparation found no statistically significant difference in postoperative pain between occlusal reduction and non-reduction groups ($p > 0.05$)[6,7]. In a study by Ahmed et al.[8], occlusal reduction significantly reduced postoperative pain intensity at 12 hours (mean reduction 1.84±2.18 in the intervention group vs. 2.64±2.72 in the control group) and 48 hours after root canal instrumentation (mean pain 0.95±1.71 in the occlusal reduction group vs. 1.06±1.90 in the control group). Additionally, occlusal reduction lowered the likelihood of moderate-to-severe pain by 53.2% at 24 hours and 37.7% in the non-occlusal reduction group[8].

METHODOLOGY

It was a randomized controlled trial (RCT) carried out at the Department of Operative Dentistry, LUMHS, Jamshoro. A total of 150 patients, with 75 in each group, were recruited by non-probability, consecutive sampling technique. Symptomatic apical periodontitis (SAP) is an inflammation of the apical periodontium and is characterized by clinical symptoms of pain on biting/chewing and may or may not be associated with a radiolucent area as observed by radiographic examination. The sample size was determined using the OpenEpi sample size calculator, based on the Mean ± SD of the occlusal reduction (OR) group vs. non-occlusal reduction (NOR) group (2.44±0.86 vs. 3.24±0.89)[6], with a 95% confidence level and 80% power of the test. Patients aged 18 to 65 years, of either gender, systemically healthy (ASA status I), with a VAS pain score >3 and pain on biting/chewing, diagnosed with symptomatic apical periodontitis, were included. Patients with no opposing tooth, swelling, sinus, bruxism, recent analgesic use, periodontally

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compromised teeth, or fewer than three teeth on one side were excluded. Ethical approval was obtained from the LUMHS Research Ethics Committee, and written informed consent was secured.

The patients were randomly divided into two groups using computer-generated sequential numbers placed in sealed envelopes, which were opened only before the commencement of the study. The study was conducted in a single-blind fashion. Patients in Group A (Occlusal Reduction, OR) were managed by performing occlusal reduction, which was breaking the contacts between the biting and chewing surfaces of the maxillary and mandibular teeth by 1 mm, using a diamond bur with a high-speed handpiece and water spray. Group B (Non-Occlusal Reduction, NOR) received no occlusal adjustment.

Anesthesia was administered using 2% lidocaine with 1:100,000 epinephrine, and canals were instrumented up to file size No. 20, with Gates-Glidden burs (sizes 1 and 2) for coronal shaping. 1.3% of sodium hypochlorite solutions were used for irrigation.

Postoperative pain assessment was conducted using the VAS scale (0–10) at 12, 24, and 48 hours, with the final pain score recorded 6 days post-obturation. Tenderness to percussion was assessed using a cotton roll and mirror handle tap test. No analgesics were prescribed during the study.

Data was analyzed using SPSS, with independent t-tests for intergroup comparisons, considering $p \leq 0.05$ as statistically significant.

RESULTS

A total of 150 patients were included in the study, with 75 in each group (Group A: Occlusal Reduction, Group B: Non-Occlusal Reduction). The mean ± standard deviation of the age in Group A was noted as 39.57 ± 14.29 years, while in Group B, it was 42.67 ± 16.66 years. Males accounted for 57.3% (n=43) in Group A and 49.3% (n=37) in Group B, while females represented 42.7% (n=32) in Group A and 50.7% (n=38) in Group B.

Regarding pain scores, at 12 hours, the mean pain score in Group A was 8.40 ± 1.09, slightly lower than Group B (8.75 ± 1.01). This trend persisted at 24 hours (7.89 ± 1.22 in Group A vs. 7.97 ± 1.39 in Group B) and 48 hours (6.33 ± 1.18 in Group A vs. 6.68 ± 1.56 in Group B). By 6 days post-instrumentation, Group A had a significantly lower mean pain score (2.32 ± 1.42) compared to Group B (3.53 ± 1.70), as shown in **Table I.**

Table II presents the comparison of pain scores by age group. At 12 hours, a statistically significant difference was observed among patients aged 18–40 years ($p = 0.038$), with Group A experiencing less pain (8.05 ± 1.06) compared to Group B (8.60 ± 1.14). However, for patients older than 40 years, the difference was not statistically significant ($p = 0.586$).

At 24 and 48 hours, no statistically significant differences in pain scores were observed between groups in both age categories ($p > 0.05$).

By 6 days post-instrumentation, a significant reduction in pain scores was seen in the 18–40 age group ($p = 0.000$), with Group A (2.18 ± 1.29) reporting lower pain than Group B (3.51 ± 1.68). Similarly, for patients older than 40 years, Group A (2.46 ± 1.55) had significantly lower pain than Group B (3.55 ± 1.73, $p = 0.005$). Pain scores at 12 hours were higher in females compared to males, with Group A females (8.38 ± 1.07) vs. Group B females (8.87 ± 1.04, $p = 0.056$), while males showed no significant difference ($p = 0.394$).

At 24 and 48 hours, no statistically significant differences were found between genders ($p > 0.05$).

By 6 days post-instrumentation, a statistically significant reduction in pain was observed in both males ($p = 0.002$) and females ($p = 0.001$). Males in Group A (2.30 ± 1.20) reported lower pain than those in Group B (3.30 ± 1.52). Similarly, females in Group A (2.34 ± 1.69) had lower pain than those in Group B (3.76 ± 1.85), as shown in **Table III.**

Table I: Baseline Characteristics and Clinical Response of Patients

Patient Characteristics & Pain Scores		**Group A** (n=75)	**Group B** (n=75)
Age in years, Mean ± SD		39.57 ± 14.29	42.67 ± 16.66
Gender	Male, *n* (%)	43 (57.3)	37 (49.3)
	Female, *n* (%)	32 (42.7)	38 (50.7)
Pain Score at 12 hours, Mean ± SD		8.40 ± 1.09	8.75 ± 1.01
Pain Score at 24 hours, Mean ± SD		7.89 ± 1.22	7.97 ± 1.39
Pain Score at 48 hours, Mean ± SD		6.33 ± 1.18	6.68 ± 1.56
Pain Score after 6 days, Mean ± SD		2.32 ± 1.42	3.53 ± 1.70

Table II: Comparison of Mean Post Instrumentation Pain Scores by Age Group

Age Group (Years)		**Mean**	**± SD**	**P-Value**
Pain Score at 12 hours				
18 – 40	Group A (n=38)	8.05	± 1.06	0.038*
	Group B (n=35)	8.60	± 1.14	
>40	Group A (n=37)	8.76	± 1.01	0.586
	Group B (n=40)	8.88	± 0.88	
Pain Score at 24 hours				
18 – 40	Group A (n=38)	7.57	± 1.24	0.408
	Group B (n=35)	7.82	± 1.31	
>40	Group A (n=37)	8.21	± 1.13	0.700
	Group B (n=40)	8.10	± 1.46	
Pain Score at 48 hours				
18 – 40	Group A (n=38)	6.00	± 0.98	0.121
	Group B (n=35)	6.42	± 1.33	
>40	Group A (n=37)	6.67	± 1.29	0.525
	Group B (n=40)	6.90	± 1.73	
Pain Score after 6 days				
18 – 40	Group A (n=38)	2.18	± 1.29	0.000*
	Group B (n=35)	3.51	± 1.68	
>40	Group A (n=37)	2.46	± 1.55	0.005*
	Group B (n=40)	3.55	± 1.73	

(*) Indicates Statistical Significance

Table III: Comparison of Mean Post Instrumentation Pain Score with Gender Between Groups

Gender		**Mean**	**± SD**	**P-Value**
Pain Score at 12 hours				
Male	Group A (n=43)	8.42	± 1.11	0.394
	Group B (n=37)	8.62	± 0.98	
Female	Group A (n=32)	8.38	± 1.07	0.056
	Group B (n=38)	8.87	± 1.04	
Pain Score at 24 hours				
Male	Group A (n=43)	7.93	± 1.03	0.257
	Group B (n=37)	7.62	± 1.38	
Female	Group A (n=32)	7.84	± 1.46	0.163
	Group B (n=38)	8.31	± 1.33	
Pain Score at 48 hours				
Male	Group A (n=43)	6.25	± 1.07	0.662
	Group B (n=37)	6.37	± 1.42	
Female	Group A (n=32)	6.43	± 1.34	0.148
	Group B (n=38)	6.97	± 1.66	
Pain Score after 6 days				
Male	Group A (n=43)	2.30	± 1.20	0.002*
	Group B (n=37)	3.30	± 1.52	
Female	Group A (n=32)	2.34	± 1.69	0.001*
	Group B (n=38)	3.76	± 1.85	

(*) Indicates Statistical Significance

DISCUSSION

Postoperative pain is a significant concern in endodontic treatment, particularly in patients with symptomatic apical periodontitis, as it can affect patient satisfaction and treatment outcomes. The present study aimed to compare postoperative pain intensity between teeth that underwent occlusal reduction and those that did not. The findings revealed that occlusal reduction significantly reduced pain scores over time, with a notable decrease by day 6.

The results of this study are consistent with Emara et al. (2019)[1], who reported that occlusal reduction significantly reduced postoperative pain in patients with irreversible pulpitis and mild tenderness to percussion. Similarly, Yousaf et al. (2020)[2] found that patients who underwent occlusal reduction experienced lower pain intensity compared to those without occlusal adjustment. However, Kiran et al. (2022)[3] observed that pain reduction followed a natural course regardless of occlusal intervention, suggesting that other factors such as mechanical, chemical, and microbial influences play a role in pain modulation. This aligns with the present study's finding that pain decreased over time in both groups, although it was significantly lower in the occlusal reduction group by day 6.

Additionally, Nguyen et al. (2020)[4] conducted a meta-analysis that concluded occlusal reduction can effectively reduce post-endodontic pain, especially in cases with preoperative percussion sensitivity. This supports the current study's findings, where patients with occlusal reduction had lower pain scores, particularly at 12 hours and 6 days post-treatment.

The role of age and gender in pain perception has also been discussed in previous literature. In the present study, younger

patients (18–40 years) and females reported higher pain levels initially, but occlusal reduction significantly reduced pain by day 6. This finding is in agreement with Tibúrcio-Machado et al. (2021)[5], who stated that younger individuals and females tend to experience higher pain sensitivity due to biological and psychological factors. Similarly, Nagendrababu et al. (2020)[9] highlighted that occlusal reduction is more beneficial for younger patients with symptomatic apical periodontitis, further supporting the current results.

Although the findings suggest that occlusal reduction is an effective strategy for managing post-endodontic pain, Buonavoglia et al. (2021)[10] and George et al. (2016)[11] emphasized that individual variations, microbial infection, and inflammatory responses also contribute to pain perception. This indicates that occlusal reduction should be combined with other pain management strategies for optimal outcomes.

Moreover, the present study supports the conclusions of Ahmed et al. (2020)[8], who found that occlusal reduction significantly lowered postoperative pain at 12 and 48 hours, with sustained relief over time. However, Chagas Carvalho Alves et al. (2021)[12] reported conflicting results, where occlusal reduction did not show a significant difference in pain relief, possibly due to differences in methodology, sample size, and pain assessment techniques.

The clinical implications of this study suggest that occlusal reduction should be considered in endodontic treatment planning, especially for patients with preoperative pain on percussion or biting[13]. The findings also reinforce the importance of individualized pain management approaches based on age, gender, and preoperative symptoms[14,15].

While the study provides strong evidence supporting occlusal reduction, certain limitations should be acknowledged. The study was single-centered, and long-term effects beyond six days were not evaluated. Additionally, patient-reported pain perception is subjective, and other confounding factors such as occlusal force variations and psychological factors were not assessed. Future multi-center trials with longer follow-up durations are recommended to validate these findings.

The findings of this study confirm that occlusal reduction significantly reduces postoperative pain in symptomatic apical periodontitis, particularly in younger patients and females. Given the consistency with previous research, clinicians should consider occlusal reduction as an effective strategy for minimizing post-endodontic pain. However, a multifactorial approach to pain management remains essential for optimizing patient outcomes.

CONCLUSION

This study concluded that occlusal reduction significantly reduces the postoperative pain in symptomatic apical periodontitis, with a notable effect by day 6. The reduction was significantly high in younger and female patients. These findings support occlusal reduction as an effective strategy for minimizing post-endodontic pain.

Conflict of Interest: The authors declare no conflict of interest.

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