ORIGINAL ARTICLE

EFFECT OF OCCLUSAL REDUCTION ON POST OPERATIVE PAIN IN PATIENT WITH SYMPTOMATIC PERIAPICAL PERIODONTITIS FOLLOWING ENDODONTIC INSTRUMENTATION- A RANDOMIZED CONTROL TRIAL

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Background: Post endodontic treatment pain is the most common complications within the first 72 hours. Various therapeutic modalities are used to reduce post endodontic pain, including use of NaOClirrigant, long-acting anaesthetic, and preoperative drug delivery. One such techniques is to take the treated tooth completely out of occlusion. This study aimed to assess the effect of occlusal reduction versus no occlusal reduction on post endodontic pain. **Methods:** A randomized clinical trial was done from April 2024 to August 2024 in the operative dentistry department of Rawal Institute of Health Sciences, Islamabad. Sixty adult volunteers presented with symptomatic apical periodontitis for endodontic treatment and fulfilling the inclusion criteria were selected by convenience non-probability sampling. The patients were randomly divided into two groups, the occlusal reduction (OR) group and the no occlusal reduction (NOR) group, with 30 patients in each group. The patients of both groups were instructed to complete the VAS at 24 hours after the procedure to rate their pain as mild, moderate or severe and were asked to bring the Performa along at the next scheduled appointment. All the data collected was entered and analysed using (SPSS version 22.0). Chi-square test was used for qualitative variable (frequency of post-operative pain, gender) and independent sample T-test for quantitative variable(age). **Results:** There were 12 (40.0%) males in the non-occlusal group while 14 (46.6%) males in the occlusal reduction group. The majority of participants fell into the 18–30 age range 12 (40.0%) in non-occlusal group and 11 (36.6%) in the occlusal reduction group. Average pain was significantly high in no occlusal reduction group (4.10±1.18 versus 2.11±1.00) and this difference was significant (p<0.001). This difference was also proven as per gender and age stratified analysis. **Conclusion:** Compared to non-occlusal reduction, the patients in occlusal reduction group had noticeably low pain scores.

Keywords: Pain; Occlusal adjustment; Root canal therapy

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INTRODUCTION

Pain is the principal factor driving people to visit a dentist and seek endodontic therapies.[1] One of the most common complications is post-endodontic pain and discomfort, in about 3–50% of cases within the first 72 hours.[1] Numerous investigations have explored the potential causes of re-emergence of pain following root canal procedures that may include inadequate instrumentation, irrigation protocol, irrigant extrusion, missed canals, discomfort before surgery, periapical pathosis, over contoured restorations. The postoperative discomfort and suffering associated with root canal therapy (RCT) are more severe and frequent than those associated with other dental surgical and operative procedures.[2] Tender to percussion and biting are the signs of inflamed apical tissue.[3]

Symptomatic periapical periodontitis is the inflammation of apical periodontium in response to stimuli from infected necrotic pulp entering the apical periodontium and causing release of inflammatory mediators which in turn leads to clinical symptoms such as painful reaction to percussion or palpation and biting.[3] It may be the result of faulty root canal treatment failing to eradicate the stimulus and might serve as a trigger for discomfort post treatment.[3] Other factors causing post-op pain maybe clinician made or patient associated. Post operative factors that can give rise to pain may include leaky temporary restorations and effects of occlusion.[4] Occlusal forces in root canal treated teeth can also trigger mechanical allodynia leading to a prolonged experience of post operative pain. Mechanical allodynia is defined as a decreased in pain threshold, causing pain in response to innocuous mechanical or thermal stimuli.[5]

There are various therapeutic modalities which are used to lessen post endodontic pain. These include the use of NaOCl irrigant, long-acting anaesthetic, and

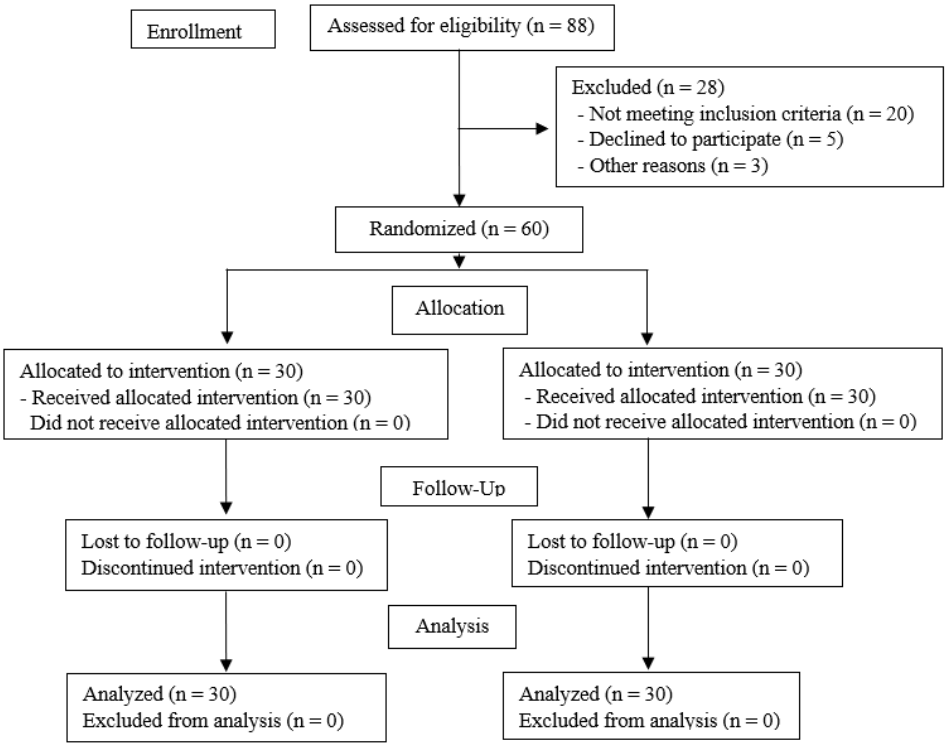
preoperative drug delivery. One of the simple proposed methods to reduce the discomfort following endodontic treatment is to lower the level of the occlusal surface of the tooth that has undergone the treatment.[6] Occlusal reduction reduces the mechanical stimulation of the sensitized nociceptors. Decreased level of strain on the nociceptors in the peri-radicular area is said to decrease the pressure on the inflamed peri-radicular tissues, which in turn decreases the pressure and lessens the incidence of experienced discomfort postoperatively.[7] Several studies have been proposed to look for effectiveness of occlusal reduction on post-op pain. Some studies showed no positive effect on post endodontic pain but those had some limitations like small sample size and multiple visits.

Several investigators have suggested that occlusal reduction does infect reduces the postoperative discomfort and pain experience following endodontic procedures.[8] Asghar S reported that 58.1% of patients from the occlusal reduction group had no pain as compared to 49.1% who had no pain in non-occlusal reduction group.[9] Zaman H *et al*. observed that average post instrumentation pain score was considerably lower in occlusal reduction group (2.60±0.70) compared to non-occlusal reduction group (4.40±0.97).[2] The current study aimed to further evaluate the effectiveness of occlusal reduction of contacts in reducing pain following root canal therapy in teeth with apical periodontitis showing symptoms, as the findings of prior studies are inconsistent. This study would help the dentists to make the endodontic procedure less painful for the patients.

MATERIAL AND METHODS

This six-month study took place at the Rawal Institute of Health Sciences' Operative Dentistry Department in Islamabad from April to August 2024. The study design was Randomized Control Trial.The WHO sample size calculation tool was used to determine the sample size with an anticipated mean±SD in occlusal group of 12.60±0.70 and an anticipated mean±SD in non-occlusal group of 24.40±0.97 with a significance level of 5%. The sample size came out to be total 60, and 30 cases in each group. The Patients included in the study were above the age of 18 years of both genders along with apical periodintitis in the maxillary and mandibular posterior teeth, teeth that are tender on percussion tests, moderate to severe preoperative pain VAS (4–10), having a large periapical radiographic radiolucency and patients in good general health. While the patients excluded from the study were those with teeth that had swelling or sinus tracts, mobile of teeth greater than grade 1, teeth with no opposing teeth, medically compromised or those who had taken antibiotics in the past 24 hours.

CONSORT 2010 Flow Diagram



The study was approved and ethical approval (RIHS/RDC/ERC/25/16) was granted by Rawal Institute of Health Sciences. Data was collected from OPD on those patients who fulfilled inclusion criteria. Following radiographic and clinical evaluations, sixty Patients fulfilling the inclusion criteria and aged between 18–60 years from both genders were selected randomly from the Operative Department OPD to participate in this study Subjects were randomly assigned to Group A and B using Lottery method randomization. Patients with occlusal reduction were in group A, whereas patients without occlusal reduction were in group B, which served as the control group. Preoperative pain levels were assessed using a visual analogue scale (VAS), and only patients showing (VAS 4–10) were included, i.e., showing moderate to severe pain according to scale. The patients were given instructions on how to utilize it after being given an explanation. Prior to receiving local anaesthesia, patients were told to finish the VAS. Two cartridges of local anaesthesia containing 1:100,000 epinephrine and 2% lidocaine were then used to anesthetize the teeth (MedicaineR. Inj, HuonCo., Ltd, Korea).

In two sessions, a single operator completed the endodontic therapy. The canal was cleaned and shaped during the first visit, then it was filled with gutta-percha and the access cavity was shut on the second visit. Biomechanical preparation of the canals was done during the initial visit, following the assessment of working length using a digital periapical radiograph. After first instrumenting the root canals to file size no. 20, the coronal section of the canal was prepared with gates-glidden bur sizes 1 and 2. During root canal preparation, an irrigant solution of 1.3% sodium hypochlorite (ParcanR. Sol, CedexFrance) was utilized in between each instrument. A temporary restorative substance was used to close the access cavity following the biomechanical preparation. The OR group patients had all of their occlusal contacts on cusps and marginal ridges removed by 1 mm using a high-speed hand piece of diamond bur with ample spray of water after the existence of occlusal contacts was confirmed using articulating paper. In the NOR group, occlusal reduction was not performed. Within 24 hours following the surgery, in both presented groups patients were asked to finalize the VAS to indicate whether they were in pain or not. Visual Analogue Scale (VAS) was used for the evaluation, and pain alleviation was defined as a prominent reduction in the scores of pains. The pain shows three or more points from the presenting scale. Patients were instructed to bring the proforma to their subsequent session.

The statistical analysis was conducted using SPSS version 22, which is statistical software for social sciences. The percentages and frequency of categorical variables, such as gender, were calculated. Age as a quantitative variable was calculated in standard deviation and mean. The t-test for independent samples was utilized at the 5% level of significance to compare the effect (pain score) in the two groups. Chi-square test was performed to compare pain relief between the two groups (OR and NOR).

RESULTS

Overall, the mean age was 34.81±11.56 years, with a range of 18–60 years. There were 12 (40.0%) males and 18 (60.0%) females in the non-occlusal group while in the occlusal reduction group, there were 16 (53.3%) females and 14 (46.6%) males. The majority of participants fell into the 18–30 age range 12 (40.00%), followed by the 31-40 age range 10 (33.33%) in the no occlusal reduction group. Conversely, in the occlusal reduction group, the highest proportion was in the 18-30 age range 11 (36.6%), with a lower proportion in the 31–40 age range 7 (23.3%).

The group with no occlusal reduction had a substantially higher mean pain score (4.10±1.18) than the occlusal reduction group (2.1±1.00). The results were found statistically significant (p<0.001).

Stratified by gender, a comparison of the post-operative visual analogue scale pain score without and with occlusal reduction found that the group with occlusal reduction had lower pain scores in both men (p=0.002) and females (p<0.001).The occlusal reduction group experienced substantially decreased pain in the groups of age ranging 18–30 years (p<0.001), 31–40 years (p<0.01), and 41–50 years (p=0.008) when the post-operative pain score on the visual analogue scale was stratified by age. The findings for the 51–60 age range, however, were not statistically considerable (p=0.59).

Table-1: Distribution of demographic attributes across both study groups

	No occlusal reduction (n = 30)	Occlusal reduction (n = 30)
Gender		
Female	18(60.0%)	16(53.3%)
Male	12(40.0%)	14(46.6%)
Age (years)		
18-30	12 (40.0%)	11 (36.6%)
31-40	10 (33.3%)	7 (23.3%)
41-50	6 (20.0%)	7 (23.3%)
51-60	2 (6.6%)	5 (16.6%)

Table-3: Visual scale comparison of post-operative pain scores with and without occlusal reduction

	No occlusal reduction (n=30)	Occlusal reduction (n=30)	*p*-value
Pain score (VAS)			
Mean±SD	4.10±1.18	2.11±1.00	<0.001

Independent sample t test; significant limit of $p \leq 0.05$

Table-4: Visual analogue scale comparison of post-operative pain scores with and without occlusal reduction, stratified by demographic factors

	No occlusal reduction (n=30)	Occlusal reduction (n=30)	*p*-value*
Gender			
Male (n=12)	3.82±1.20	2.32±0.83	0.002
Female (n=18)	4.28±1.15	1.93±1.13	<0.001
Age (years)			
18-30 (n=11)	3.58±0.72	1.87±0.87	<0.001
31-40 (n=7)	4.32±1.12	2.02±1.18	<0.001
41-60 (n=7)	4.88±1.39	2.30±1.29	0.008
51-60 (n=5)	3.72±2.38	2.5±0.62	0.59

Independent sample t test; significant limit of $p \leq 0.05$

DISCUSSION

This study found that occlusal reduction was better in reducing postoperative pain than no occlusal reduction. The average pain score was lower in occlusal reduction group (2.53±1.042) than control group (4.36±1.22) and was statistically significant ($p<0.001$). This shows that pain score significantly reduced in symptomatic apical periodontitis patients with occlusal reduction. Many investigators have witnessed in comparison evidence regarding occlusal reduction in apical periodontitis. In one study, endodontic patients who most likely had postoperative pain were treated with occlusal reduction as an adjuvant treatment. A study conducted by Kumar *et al* showed that after 24 hours of therapy and occlusal reduction patients experienced decreased levels of post operative discomfort.[10] According to the American Board of Endodontics, occlusal reduction was used 80% of the time for essential teeth with apical periodontitis and 48.8% of the time for those without.[11] The numbers were 40.1% and 73.2%, respectively, according to an update study conducted more than ten years later.[12] According to another recent study teeth that underwent occlusal reduction following endodontic treatment exhibited reduced mean pain levels compared to the non-reduction group.[13] In a another research, Emara*et al.* assessed how occlusal redaction affected postoperative pain in posterior mandibular teeth following two non-canal tena visits. They found that, 12 hours after the root filling and canal preparation, occlusal reduction significantly decreased postoperative pain levels in posterior mandibular teeth with apical periodontitis and symptomatic pulpitis.[14] Our study's findings are comparable to these.

The percentage of patients who were pain-free following treatment did not differ between the no occlusal reduction and occlusal reduction groups, despite this fact that the average pain reduction in the occlusal reduction group was considerable in the current research. Similar results have also been observed in several other research. After root canal preparation and calcium hydroxide dressing, Parirokh*et al*. assessed the impact of occlusal reduction on postoperative pain and discovered that there was no significant difference in postoperative discomfort between the groups ($p>0.05$).[15] Similar results to the current study were found by Walton *et al.* and Asghar *et al.,* who found no discernible difference in the incidence of post-instrumentation discomfort following endodontic treatment with or without occlusal tooth reduction.[16,9] Zeidan*et al*. did not observe any prominent difference in postoperative pain between the two presented groups after root canal preparation ($p>0.05$).They found that, in comparison to no occlusal reduction, occlusal surface reduction did not further reduce postoperative discomfort for teeth with irreversible pulpitis and mild percussion soreness.[17] Similary in another recent study by Manigandan *et.al*, post-endodontic discomfort, whether or not occlusal reduction was used, did not significantly vary between the intervention and control groups.[8]

These outcomes support the current study's conclusion that the frequency of pain did not differ between the two groups in a way that was statistically significant. After endodontic treatment, postoperative discomfort is still a common and harmful aftereffect. Relieving the patient's discomfort and restoring the tooth's functionality are the primary objectives of endodontic procedures. Numerous techniques are employed to alleviate this post-instrumentation discomfort, including as pre and postoperative medication, prescription steroids, injection of local acting anaesthetic, and occlusal reduction during the initial endodontic treatment session.[18]

To make endodontic treatments painless, a number of non-pharmacological techniques have been used 6–12. Dental practitioners tended to alter the occlusal surface in order to manage post-operative discomfort, according to result comparison from these two surveys, but there was a little downward trend,

possibly as a consequence of the paucity of solid data Occlusal reduction contributes to the instantaneous alleviation of pain following an operational dental surgery in terms of average pain score (VAS). The impact of occlusal reduction was remained substantial in this study when mean pain reduction was evaluated between age and gender groups. Instrumentation method, local anaesthetic type, intracanal medicine, multiple versus single visit endodontic therapy, and pre-operative (before surgery) pain state are all characteristics that are connected to the physician. Patient-related factors include pain threshold difficulty and patient demographics such as age, gender, and health status.[19, 20]

The current study has many advantages, firstly; pain is a huge suffering after dental procedure and we applied an intervention to reduce this complaint. Secondly, patients undergoing root canal treatment and other operative dental procedures were involved where serious management is done in significant areas like mouth, gums and teeth. There were other restrictions as well. The primary one was the small sample size in each research group, which was mostly brought on by the shorter study time and the study

In brief it can be stated and highlighted that the patients undergoing any root canal treatment or other dental procedures can be opted for occlusal reduction to avoid immediate post operative treatment.

CONCLUSION

The frequency of post-operative pain did not differ between the non-reduction group and the group with occlusal reduction in this study. However, compared to non-occlusal reduction, the occlusal reduction group's mean pain score was noticeably lower. So, this study proves that occlusal reduction in symptomatic apical periodontitis patients can effectively reduce pain.

AUTHORS' CONTRIBUTION

RQ: Supervised research. AF, HT: Literature review, data collection. NM: Write-up. FM, IUN: Data collection.

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