RESEARCH ARTICLE

Bioceramics based pulp capping; evaluation of Post operative pain in teeth diagnosed with reversible pulpitis

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Abstract

Objective: To evaluate the frequency of postoperative pain after using Bioceramics as a direct pulp capping agent in reversible pulpitis.

Method: The descriptive, cross-sectional study was conducted at the Department of Operative Dentistry, Bakhtawar Amin Dental College, Multan, Pakistan, from June to December 2023, and comprised patients of either gender aged 16-55 years requiring direct pulp capping. Preoperative pain was assessed and radiographs were taken. During the procedure, Bioceramics material, i.e Biodentine was applied to the exposure site. A postoperative radiograph was taken and the intensity of postoperative pain was noted on 24-hour follow-up. Data was analysed using SPSS 27.

Results: Of the 114 patients with mean age 29.5±9.7 years, 66(57.9%) were females and 48(42.1%) were males. Preoperative mild pain was reported by 74(64.9%) patients, moderate pain by 38(33.3%) and severe pain by 2(1.8%). Postoperative pain was reported by 8(7%) patients; mild by 6(75%) and moderate by 2(25%). Postoperative pain was higher among females than males, but the difference was not significant (p>0.05).

Conclusion: The frequency of postoperative pain in patients having Bioceramics, such as biodentine as pulp capping agent reduced, indicating that it could be effectively used in cases with reversible pulpitis.

Key Words: Bioceramics, calcium silicate, Pulpitis, Reversible pulpitis.

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Introduction

When the pulp is exposed as a result of caries, trauma or iatrogenic exposure during tooth preparation, direct pulp capping is utilised.[1] Pulp capping therapy, which involves bioceramic materials on the vulnerable pulp to promote the hard-tissue barrier, preserves the vitality of the pulp, if it is completely exposed, or only covered with a thin layer of dentin.[2] Cold stimulation causes a heightened yet brief reaction in reversible pulpitis. Permanent, spontaneous pain that responds to cold stimuli in an excessive and persistent manner is a hallmark of irreversible pulpitis.[3,4]

Ideal properties for pulp capping material are for it to be radiopaque, insoluble, dimensional stable, biocompatible, bioactive and adhesive to both dentin and the restoration.[5,6] The ingredients that have been utilised most frequently include calcium hydroxide (CaOH), mineral trioxide aggregate (MTA), and calcium silicate cement based bioceramics i.e., Biodentine.[7] Biodentine is used for the repair of root perforation, pulp capping, and dentine replacement in deep cavities or lesions.[8] Biodentine has adequate mechanical hardness, exceptional biocompatibility, bioactivity and average setting time of 12 minutes. It does not cause any tooth discolouration compared to other materials.[9] One of the successful clinical outcomes of direct pulp capping is the reduction in human pulpal pain response based on visual analogue scale (VAS) which is similar and comparable across various medicaments.[10]

The current study was planned to evaluate the frequency of postoperative pain after using bioceramics such as Biodentine as a direct pulp capping agent in reversible pulpitis.

Patients and Methods

The descriptive, cross-sectional study with Non-probability purposive sampling technique, was conducted at the Department of Operative Dentistry, Bakhtawar Amin Dental College, Multan, Pakistan, from June to December 2023. After approval from the institutional ethics review board, the sample size was calculated using the World Health Organisation (WHO) calculator with 95% confidence level, 5% margin of error, and frequency of pain after direct pulp capping with Biodentine 8%.[11]

Those included were patients of either gender aged 16-55 years who had vital permanent teeth with no periapical

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pathology associated with tooth on radiographs, had reversible pulpitis for 4-5 weeks, and had restorable teeth. Patients having teeth with uncontrolled pulpal bleeding, developmental anomalies, internal resorption or pulp calcifications were excluded.

After taking informed consent from the subjects, a detailed history was taken, followed by a clinical examination. The clinician evaluated the intensity of preoperative pain using VAS. Preoperative radiographs were taken of each patient. The procedure started with the clinician administrating local anaesthesia and proper tooth isolation with cotton rolls. Complete removal of caries and cavity preparation was done with a high-speed hand-piece using sterile diamond round bur or spoon excavator. Bleeding was controlled with cotton pellets moistened with normal saline. Bioceramics material, Biodentine was mixed and applied to the exposure site. Final restoration was done with resin composite. A postoperative radiograph was taken immediately after the procedure. The clinician then evaluated the pain intensity using VAS on 24-hour follow-up. The entire procedure was performed by the designated dentist, and was observed by the specialist dentist.

Data was analysed using SPSS 27. Quantitative variables were presented as mean ± standard deviation, while qualitative variables were presented as frequencies and percentages. Stratification was done with regard to age, gender, duration of disease, and postoperative pain. Post-stratification, chi-square test was used to determine the effect on frequency of postoperative pain. P ≤ 0.05 was taken as significant.

Results

Of the 114 patients with mean age 29.5±9.7 years (range: 16-55 years), 66(57.9%) were females and 48(42.1%) were males. Mean duration of illness was 4.4±0.5 weeks (range: 4-5 weeks). All 114(100%) patients reported preoperative pain on presentation. Mean VAS score was 4.3±1.4 (range: 2-8). Preoperative mild pain was reported by 74(64.9%) patients, moderate by 38(33.3%) and severe by 2(1.8%) (Figure). Mean postoperative VAS score was 0.24±0.9 (range: 0-5). Postoperative pain was reported by 8(7%) patients; mild by 6(75%) and moderate by 2(25%) (Table 1). Postoperative pain was higher among females than males, but the difference was not significant (p=0.464) (Table 2).

Table-1: Postoperative pain in patients with irreversible pulpitis (n=114).

Characteristics	Frequency	Percentages
Pain		
Yes	08	07
No	106	93
Degree of Pain (n=8)		
Mild	06	75
Moderate	02	25

Table-2: Gender distribution with respect to postoperative pain.

Gender	Post-operative pain		
	Yes	No	p-value*
Male	2 (4.2)	46 (95.8)	0.464
Female	6 (9.1)	60 (90.9)	

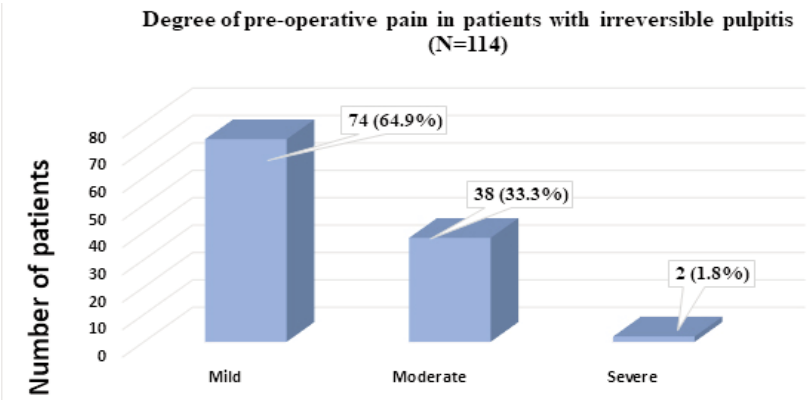

Figure: Degree of preoperative pain in patients with irreversible pulpitis.

Discussion

In the current study, the mean age of the patients was 29.5 years, which was in line with a study which reported it to be 30.93 years.[12]

A comparative study[11] involving 100 subjects aged 19-50 years showed 4(8%) patients out of 50 reported pain based on human pulpal pain response using VAS on the first day of pulp capping with Biodentine, while 46(92%) reported no pain compared to 3(6%) out of 50 in the MTA group. There was no significant difference between the groups (p>0.05).

There is a scarcity of data on clinical outcomes for Bioceramics alone as a pulp capping material in the Pakistani population in terms of human pulpal pain response based on VAS. Biodentine is comparable to MTA in clinical outcomes, but has better mechanical properties.[9-11]

In a study by Kumar K et al[12], bioceramics such as Biodentine and MTA were compared during pulpotomies of cariously exposed symptomatic permanent teeth. In the Biodentine (63%) and MTA *67%) groups, the majority of

patients did not experience any pain.

Soni KH et al[13] found no postoperative pain following pulpotomy, which is similar to what we found. Eighty three percent of Biodentine patients had no pain seven days later. Eghbal et al[14] and Barngkgei et al[15] reported findings that were similar. In a study by Taha NA et al,[16] permanent molar teeth in 52 individuals between the ages of 19 and 69 were included with symptomatic vital pulps. The results of a complete pulpotomy with biodentine were investigated. After two days, 93.8% of people reported total pain alleviation. In another study on bioceramics materials by Rana JM et al[17], there were 100 vital permanent molars in the maxilla and mandible that had reversible pulpitis symptoms, with 50 patients each in Biodentine Group-A and endosequence root restoration material Group-B. According to VAS, 3(6%) patients in Group-B and 4(8%) in Group-A had mild pain at one-month and three-month follow-ups, while the remaining patients were asymptomatic (p=0.695).

According to a study by Nowicka et al[18] on Biodentine's performance in critical pulp treatment operations for permanent molars, there was no postoperative pain and no evidence of pulp inflammation upon follow-up. This finding was in line with research by Warwar et al,[19] who found that dental pulp from elderly patients had a decreased ability to recover from an inflammatory insult because it frequently becomes more fibrous with less vascular supply than dental pulp from young patients, which has a larger pulp space, abundant blood supply, increased cellular content, and a quicker inflammatory response.

Conclusion

Biodentine was found to be an effective direct pulp capping agent in cases with reversible pulpitis, maintaining pulp vitality with minimal discomfort.

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JP: Concept and writing.
MAR & SA: Data collection.
MA: Data analysis.
US: Editing.
ZH: Writing.