

COMPARISON OF COMPOSITE RESIN AND RESIN MODIFIED GLASS IONOMER RESTORATIONS ON DENTINAL HYPERSENSITIVITY IN NON-CARIOUS CERVICAL LESIONS

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ABSTRACT

Dentin Hypersensitivity (DH) is frequently encountered in teeth with Non Carious Cervical Lesions (NCCLs) and often requires restoration with an adhesive material. Although Resin Modified Glass Ionomer (RMGI) and Composite Resin (CR) are both effective in reducing pain of DH, the literature is equivocal regarding the best one for this purpose. The purpose of Present study was to compare the mean decrease in Numeric Pain Assessment Score (NPAS) of DH in NCCLs restored with CR versus RMGI. It was a randomized clinical trial conducted at Operative Dentistry Department, Lahore Medical and Dental College, Lahore. Total 100 patients aged 20 to 60 years with hypersensitive NCCLs were randomly allocated to CR or RMGI groups. Baseline and 24 hours post-operative NPAS were recorded and decrease in pain scores were calculated. Data was analysed in SPSS version 19.0 using independent sample t-test. The mean pain scores at baseline in CR and RMGI groups were 6.50 ± 1.82 and 6.70 ± 1.69 respectively. At 24 hours both groups showed significant decrease in mean pain scores which were 3.20 ± 1.38 and 4.50 ± 1.32 respectively. Independent sample t-test showed that the decrease in pain in CR was higher than RMGI and the difference was statistically significant (P value < 0.001). Conclusion: It was concluded that both materials were effective in reducing DH in NCCLs and CR was significantly more efficient than RMGI.

MeSH Key words: Non carious cervical lesion, dentin sensitivity, resin-based composite, glass ionomer cements.

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INTRODUCTION

Non-Carious Cervical Lesions (NCCLs) have increased over time as the population ages.¹ They involve loss of cervical enamel of teeth and exposure of dentin because of reasons other than dental caries. NCCLs frequently lead to dentin hypersensitivity (DH), where teeth give a painful response to thermal, tactile or chemical stimuli.² Numeric Pain Assessment Score (NPAS) is used to measure the severity of DH as well as to assess the effect of treatments in reducing it.³ A treatment which is effective in reducing DH is expected to show a decrease in NPAS.

Various treatments for DH in NCCLs have been documented which range from over the counter dentifrices to restorations of such lesion with various restorative materials.⁴ It has been observed that the restorations reduced DH immediately and to greater

extent than dentifrices.³ However, NCCLs are one of the most difficult lesions to restore with regards to adhesion, because their cervical margin is generally in dentin or cementum and the dentin present at their base is sclerotic.⁵ Various tooth-coloured materials have been used to restore NCCLs. These include resin modified glass ionomer (RMGI) and composite resin (CR). Desirable properties for suitable restorative materials include pleasing aesthetics, resistance to wear, bonding to dentine, an ability to flex with the tooth, and easy handling.⁶

Until recently, conventional glass-ionomer based materials were preferred for restoring NCCLs.⁷ Glass ionomers have been shown to reliably bond to dentin through an ionomer exchange reaction. RMGIs are chemically similar to conventional Glass ionomers, in addition they contain free monomers and side groups on the poly(acid) chain which polymerise after light activation.⁸ These modifications improve the strength, wear resistance, aesthetic appearance and water resistance of the material.⁸ RMGIs have shown effectiveness in decreasing DH in NCCLs in various studies.⁹

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In a study by Powell et al glass ionomer restorations and CR were compared and both materials were equally effective in reducing DH to a significant extent.¹⁰ Similarly, Strober et al found the difference in the two materials to be insignificant.¹¹ In another study by Tantbirojn et al, RMGI was found to significantly reduce sensitivity (*P* value <0.0001) compared to resin based desensitizer.⁹ Since there was no consensus in the literature, the objective of present study was to compare the mean decrease in Numeric Pain Assessment Score (NPAS) of DH in NCCLs restored with CR versus RMGI.

METHODOLOGY

It was a randomized clinical trial conducted in Operative Dentistry Department, Lahore Medical and Dental College, Lahore between November 2015 to April 2016. Non-probability consecutive sampling technique was used to take 100 patients. Patients aged 20 to 60 years, of both genders, having NCCLs with up to 2 mm deep defects and associated with NPAS of DH of at least 3 were included in the study. NPAS was determined by administering a one-second air blast at the cervical area with a triple syringe held parallel to the occlusal plane while adjacent teeth were covered with cotton. Patients indicated the intensity of pain on a 0 to 10-point scale. Patients who had; caries or restoration on any area of involved tooth, teeth acting as abutments, gingival recession extending up to or beyond the mucogingival junction, periodontal treatment in last three months, any contraindication to direct restoration, patients used anti-inflammatory drugs or desensitizers within last six weeks, gastroesophageal reflux disease, bruxism, occupational or dietary acid exposure, and pregnant patients were excluded from the study.

Informed consent was obtained and restorations were carried out on the same day by post graduate residents. Patients were randomized to either CR or RMGI group using lottery method. The patients were not disclosed the type of restoration carried out.

In Group 1 (CR group) total etch method of dental adhesion was employed. Etching of NCCL was done for 15 seconds using 37% phosphoric acid (Super Etch, SDI Limited, Australia) and thoroughly rinsed with water for 5 seconds, excess moisture was lightly dried with air. An adhesive agent (Adper Single Bond Plus, 3M ESPE, USA) was applied according to manufacturer's instructions, thoroughly air dried for 5 seconds and light cured. A microhybrid composite (Filtek Z250, 3M ESPE, USA) was applied in increments up to 2 mm thick each, contoured and light cured.

In Group 2 (RMGI group) NCCL was conditioned using 10% poly acrylic acid (Dentin Conditioner, GC corporation, Japan) for 10 seconds and washed for 10 seconds. Excess moisture was wiped with a dry cotton pellet. RMGI (Riva Light Cure, SDI Limited, Australia) was manually mixed according to manufacturer's recommended method, applied to the cavity in one increment, adapted to shape and light cured. Both

Composite and RMGI restorations were later finished and polished using CompoSite Polishing Kit (Shofu INC. Japan).

Patients were recalled 24 hours after the procedure. The restored teeth were tested again for DH using the previously mentioned method.

Data was analysed in SPSS version 19.0. Mean decrease in NPAS was calculated by subtracting 24-hour postoperative NPAS score from baseline NPAS in both treatment groups. Mean decrease in NPAS in both groups was compared using independent sample t-test. Statistical significance was considered at *P* value ≤ 0.05 . Data was stratified for age, gender and baseline NPAS. Post-stratification t-test was applied with *P* value of ≤ 0.05 as significant.

RESULTS

Demographic data is summarized in Table-1. Baseline NPAS of DH were comparable in both groups. Reduction in NPAS was statistically higher in CR when compared to RMGI, (*P* value < 0.001; Table-2). When data was stratified for age, significantly greater reduction in mean NPAS in CR group was found among younger patients (20-39 years old), while insignificant change was seen in older patients (40-60 years) (Table-3). Segregating the results according to gender, significantly greater reduction in NPAS after CR restoration was found compared to RMGI restorations among male patients, while insignificant difference was seen with both restorations among female patients (Table 3). Patients with moderate baseline pain (NPAS 3-6) had significantly greater relief with CR compared to RMGI restorations, while both materials had equal effectiveness among patients with severe baseline pain (NPAS 7-10) (Table-3).

DISCUSSION

NCCLs and their associated symptom of DH are fairly common.¹² The available management options include dentifrices, sealants and restorations.¹³ Some studies show restorations to be more effective in reducing DH than dentifrices.^{3, 14} CR and RMGI are the two most commonly used materials for restoring NCCLs.¹⁵ In the present study, CR restorations were generally more effective than RMGI in reducing sensitivity associated with NCCLs. Other studies that had directly compared composite and RMGI in NCCLs found no difference in reduction of DH.^{16, 17} Microhybrid composite has relatively more filler and less resin content, and thus exhibits less polymerisation shrinkage.¹⁹ The use of microhybrid composite might explain the greater effectiveness of CR in reducing DH in present study.

NCCLs generally increase with age because of cumulative loss of tooth structure with time.²⁰ While DH is more common in younger patients whose dentinal tubules are wider.²¹ Different results were obtained in present study depending on age of patients; greater effectiveness of CR was seen in younger patients while

TABLE 1: DEMOGRAPHICS: COMPARISON OF GENDER (NUMBER OF SUBJECTS) AND AGE OF PATIENTS (YEARS)

	Gender (n)			Age (years)
	Male	Female	Total	
Composite Resin	28	22	50	41.88 ± 10.82
RMGI	30	20	50	45.04 ± 11.68
Total	58	42	100	43.46 ± 11.32

TABLE 2: COMPARISON OF BASELINE, POSTOPERATIVE (24HOURS) AND PAIN CHANGE IN BOTH GROUPS

		Mean ± S.D.	Minimum	Maximum	P value
Baseline NPAS	Composite Resin	6.50 ± 1.82	3.00	10.00	0.571
	RMGI	6.70 ± 1.69	3.00	10.00	
	Total	6.60 ± 1.75	3.00	10.00	
24- hour Postoperative NPAS	Composite Resin	3.20 ± 1.38	0.00	6.00	<0.001
	RMGI	4.50 ± 1.32	2.00	7.00	
	Total	3.85 ± 1.50	0.00	7.00	
Reduction in NPAS	Composite Resin	3.30 ± 1.94	0.00	7.00	<0.001
	RMGI	2.20 ± 2.07	0.00	7.00	
	Total	2.75 ± 2.07	0.00	7.00	

TABLE 3: COMPARISON OF CHANGE IN NPAS IN BOTH GROUPS WITH RESPECT TO AGE GROUPS, GENDER AND BASELINE NPAS

Age groups	Study groups	Mean ± S.D.	P value
20-39	Composite Resin	3.64 ± 1.75	0.036
	RMGI	2.33 ± 2.16	
40-60	Composite Resin	2.96 ± 2.09	0.135
	RMGI	2.12 ± 2.04	
Gender	Study groups	Mean ± S.D.	P value
Male	Composite Resin	3.00 ± 2.03	0.032
	RMGI	1.86 ± 1.92	
Female	Composite Resin	3.71 ± 1.79	0.10
	RMGI	2.66 ± 2.22	
Baseline NPAS	Study groups	Mean ± S.D.	P value
3-6	Composite Resin	2.15 ± 1.56	0.001
	RMGI	0.92 ± 0.81	
7-10	Composite Resin	4.65 ± 1.40	0.032
	RMGI	3.48 ± 2.16	

equal effectiveness of CR and RMGI in older patients. This could be explained on the basis of formation of sclerotic dentin in old age, which reduces the bonding efficiency of CR.⁵ In contrast to present study, an Iranian study found greater sensitivity with CR in younger patients as compared to older age patients.²² Their explanation of this observation was the greater amount of tertiary dentin in older age which reduces

DH.²² Further research can be done in future to investigate any difference in the pathogenesis of DH and recommend the most effective material according to age.

An interesting finding in present study was different treatment response depending on gender. The difference in perception and expression of pain among males and

females is a controversial topic. Daneshpoo et.al's results did not reveal any difference among males and females.²² Several studies indicate increased reporting of pain among females while males tended to hide or conceal their pain.²³ Such a difference could confound the response to different restorative materials. An in-depth systematic review revealed that although there was insignificant difference among males and females in several pain modalities (e.g. chemical and Ischemic pain), there was strong evidence that females had less threshold for thermal pain (hot and cold) than males.²⁴ This might explain why there was no significant difference in DH in CR or RMGI in females in present study.

CONCLUSION

It was concluded that CR and RMGI were both effective materials for restoration of hypersensitive NCCL in present study and CR was significantly more effective in this regard.

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