



CLINICAL EVALUATION OF CENTION-N ALKASITE RESTORATIVE MATERIAL IN TEMPORARY MOLARS

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ABSTRACT

Objective: Evaluate the clinical performance of Centon-N alkasite restorative material for class I cavities in primary molars. **Materials and methods:** A quasi-experimental study was carried out, selecting 45 primary molars with presence of caries in occlusal surface, in 28 children of both genders, between 3-7 years of age, during the period of June – October 2021. The selected teeth were restored with Centon N. The evaluation of the treatment was performed at 6 and 12 months using criteria of the United States Public Health Services modified (USPHS) and the Ryge criteria. Statistical processing was performed with the SPSS-Windows V-20.0, using the Fisher's test at 5% significance. **Results:** At 6 and 12 months, an excellent clinical behavior of the material was observed, without statistically significant differences ($p < 0.05$) between the location of the molar in the arch and the properties of the material. Most of the restorations maintained Alpha values after 12 months. For match color, one restoration scored Bravo (2.2%) and another Charlie (2.2%). Only one case (2.2%) scored Bravo for marginal discoloration, marginal adaptation and anatomic form. There were no cases for secondary caries. **Conclusions:** We can conclude by indicating that Centon-N Alkasite, can be considered an excellent alternative within the restoration materials of class-I cavities in primary molars, maintaining an excellent clinical behavior after 12 months of evaluation.



KEYWORDS: pediatric dentistry; primary molars; restorative dentistry; bioactive materials.

EVALUACIÓN CLÍNICA DEL MATERIAL RESTAURADOR CENTION-C ALKASITE EN MOLARES TEMPORALES

RESUMEN

Objetivo: Evaluar el comportamiento clínico del Alkasite Cention-N como material restaurativo para cavidades clase I en molares primarios. Material y métodos: Se realizó un estudio cuasi-experimental, seleccionando 45 molares primarios con presencia de lesión de caries oclusal, correspondiente a 28 niños de ambos géneros y edades entre los 3 a 7 años, durante el período Junio – Octubre 2021. Los dientes incluidos fueron restaurados con Cention N. La evaluación de los tratamientos fue realizada a los 6 y 12 meses utilizando los criterios de “United States Public Health Services modified (USPHS) y de Ryge”. El análisis estadístico fue realizado con el programa SPSS-Windows V-20.0, empleando la prueba de Fisher al 5% de significancia. Resultados: Se observó un excelente comportamiento clínico del material a los 6 y 12 meses, no se encontraron diferencias estadísticamente significativas ($p < 0.05$) entre la ubicación del molar en la arcada y las propiedades del material. La mayoría de las restauraciones se mantuvieron en valores Alpha luego de 12 meses. Para la similitud en el color, una restauración tuvo puntaje Bravo



(2.2%) y otra Charlie (2.2%). Solo un caso (2.2%) tuvo un puntaje Bravo para descoloración marginal, adaptación marginal y forma anatomica. No se presentaron casos de caries secundaria. Conclusiones: Podemos concluir indicando que el Alkasite Cention-N, puede ser considerado como una excelente alternativa como material de restauración para cavidades clase I en molares primarios, manteniendo un excelente comportamiento clínico posterior a 12 meses de evaluación.

PALABRAS CLAVE: Odontología infantil; molares primarios; odontología restaurativa; materiales bioactivos.

INTRODUCCIÓN

Dental caries is one of the most important health problems worldwide, it is the most common chronic disease and is due to exposure to sugar and other risk factors, lack of effective prevention, as well as limited access to oral care (1). Childhood patients with tooth decay often have pain, difficulty eating and sleeping, as well as poor growth and development (2).

Dentists often face a significant challenge when seeking to select an ideal restorative material. Factors that should be taken into consideration include: caries risk

assessment, oral hygiene, type of dentition, ability to cooperate on the part of the patient, expected parental compliance and the life of the material (3,4).

It is important to recognize that the survival of dental restorations is regulated by various factors such as: the age of the patient, the extent of decay, the type of tooth, as well as its position in the dental arch, the experience of the professional and the properties of the restorative material used (5).



Numerous sealing materials are available for today's dental practice, from amalgams, to modern "Bulk Fill" resinous materials. Amalgam was first used in western dentistry in the 19th century, while glass ionomer cements (GIC) were introduced around the 1970s, composite resins became standard during the 1980s, resin-modified glass ionomers and compomers had a significant boom around the 1990s and recently, the use of "Bulk Fill" resinous materials has recently gained importance thanks to their excellent properties and easy manipulation (6).

In recent years, dentistry has shown considerable progress in the development of a series of restorative materials with better characteristics. Within this progress and in the continuous search for ideal properties to replace lost dental tissue, the use of resin-based materials for the restoration of posterior teeth has become one of the main options (7); however, at present, the main concerns regarding the performance of these materials refers to their durability, wear resistance,

polymerization, marginal seal integrity (2), postoperative sensitivity and secondary caries (8). Cention-N, a new filling material offering advantages of both amalgams and glass ionomer cements (9). It is a basic, resin-based, self-curing powder/liquid restorative with optional additional light-curing. It is radiopaque, and releases fluoride, calcium and hydroxide ions (10). As a dual-cured material it can be used as a full volume (bulk) replacement material. This alkasite Cention-N combines bulk placement, ion release and durability in an aesthetic dual cure product (11). This material has the capability of releasing basic ions when saliva reaches acidic pH levels, preventing demineralization of tooth tissue and countering the acidic attacks by bacteria, similar effect to of bioactive composite resins (12).

The organic monomer is in the liquid. It consists of four different dimethacrylates that represent 21.6% by weight of the final mixed material. A combination of UDMA, DCP, an aromatic aliphatic DMA and DMA PEG-400 is



interconnected (crosslinked) during polymerization, which gives it excellent mechanical properties and good long-term stability. This material does not contain Bis-GMA, HEMA or TEGDMA. The filling is in the powder. Inorganic fillers comprise a barium aluminum silicate glass filler, ytterbium trifluoride, an Isofiller, a calcium barium aluminium fluorosilicate glass filler and a calcium fluorosilicate (alkaline) glass filler with a particle size between 0.1 μm and 35 μm . This Isofiller, acts as a shrinkage stress reliever which minimizes shrinkage force (13). The compressive strength of Cention-N is almost similar to silver amalgam. It is available in A2 shade only because this is commonly used shade and chameleon effect further increased the color matching of restoration with tooth (14).

Despite its excellent characteristics, there is not enough scientific evidence in the literature about its long-term clinical effectiveness; the few available clinical studies indicate that it shows similar behavior to ionomers and composite

resins, and can be considered as the first choice material to replace amalgam (13). The purpose of this work is to evaluate the clinical behavior of Cention N as a restoration material for class I cavities in primary molars.

MATERIALS AND METHODS

Study Population

The study was approved by the Bioethics Committee of the Health Sciences Area of Autonomous University of Zacatecas (Of. 223/2019). Forty-five primary molars of twenty-eight patients of both genders, between 3 and 7 years old were considered. The patients were attended the Pediatric Dentistry Clinic of the Autonomous University of Zacatecas during the period of June-October 2021.

Patients with at least one primary molar with caries lesion on the occlusal surface code 4, 5 or 6 according to ICDAS were selected, and were likely to be restored using a class-I cavity. Were excluded: patients with primary molars with caries lesions of more than one surface, with



defective restoration, some structural defect such as hypoplasia, fluorosis, history of spontaneous pain, clinical evidence of pulp involvement, presence of fistula or abscess, mobility, periodontal disease, non-collaborating patients, with systemic disease, who have received or received some type of medication. The parents received a detailed report and a consent form to authorize the children's participation in the study, in accordance with the principles of the Helsinki Declaration (15).

Experimental Design

A quasi-experimental study was carried out, using non-probabilistic sampling for convenience. Designated patients who fulfill the inclusion criteria were assigned to apply Cention-N, Ivoclar Vivadent® (n = 45).

Clinical Procedures

All patients were evaluated before treatment, and brushing technique was performed. The cavitated lesions were measured in millimeters by means of the

use of a Williams periodontal probe (Hu-Friedy®), both in depth (occlusal-cervical), and in extension (mesio-distal, buccal-lingual and /or palatine) to obtain total dimension of the lesion.

A trained dentist performed all restorative cavities, under absolute isolation, with hand piece and carbide burs (Mani Inc.) under a water cooled spray. The material manipulation was performed by another trained dentist, who served as an assistant and was responsible for recording the general data of the patient, tooth to be treated, type of surface affected, size of the lesion and treatment.

Cention-N Application

After cavity preparation, Cention-N was placed following the manufacturer's instructions, under the adhesive protocol; total surface etching with 37% etching acid (N-Etch, phosphoric acid, Ivoclar Vivadent®) for 30 seconds, cavity washing (60 seconds), air drying, placement of the Tetric N-Bond adhesive



(Ivoclar Vivadent®) by rubbing the surface for 20 seconds, then the adhesive is dispersed with air from the triple syringe until a still and shiny layer is obtained, it is light-cured for 20 seconds (Bluephase-N, 1.200 mW/cm²; Ivoclar, Vivadent). The material was mixed by placing a drop of the liquid on the waxed paper and mixed with the powder between 45-60 seconds (1:4.6), placed in the cavity with teflon instruments and photocured for 30 seconds (Bluephase-N, 1,200 mW/cm²; Ivoclar, Vivadent). Finally, the occlusion was reviewed with articulating paper (Prehma, Medeco Miami, FL) and if necessary adjustments were made with a fine-cut diamond milling cutter. All patients were told not to eat food or liquids, one hour after the application of the material.

Clinical follow up

The restorations were color match, marginal discoloration, marginal adaptation, anatomic form, secondary caries according to modified USPHS and Ryge criteria (16,17), by a pediatric dentist who did not interfere in the execution of the procedures. The follow up considered in the study was 6 and 12 months. The restoration is classified and demonstrated by score; Alfa= Restorations in excellent condition, expected to last for a long time; Bravo= One or more features witch deviated from ideal; restoration may require replacement in the near future; Charlie= Future damage to the tooth or surrounding tissue is likely to occur unless the restoration is replaced or repaired; N/A=Not applicable (Table 1).

Table 1. Modified USPHS and Ryge clinical criteria.

Clinical parameter	Alfa	Bravo	Charlie
<i>Color match</i>	The restoration matches the adjacent tooth structure in color, shade, and translucency	There is a light mismatch in color, shade, and/ or translucency but within the normal range of adjacent tooth structure	There is a mismatch in color, shade and/or translucency outside the normal range of adjacent tooth



			structure
<i>Marginal adaptation</i>	Explorer does not catch or has one way catch when drawn across the restoration/tooth interface	Explorer falls into crevice when drawn across the restoration/tooth interface	Dentin or base is exposed along the margin
<i>Marginal discoloration</i>	There is no discoloration anywhere along the margin between the restoration and the tooth structure	There is slight discoloration along the margin between the restoration and the tooth structure, but the discoloration has not penetrated along the margin in a pulpal direction	The discoloration has penetrated along the margin in pulp direction
<i>Anatomic form</i>	General contour of the restoration follows the contour of the tooth	General contour of the restoration does not follow the contour of the tooth	The restoration has an overhang
<i>Secondary caries</i>	There is no clinical diagnosis of caries	N/A	Clinical diagnosis of caries at restoration margin

Statistical analysis

Statistical processing was performed using the SPSS-Windows V-20.0 program (SPSS, Inc., Chicago, IL, USA). Percentages and frequencies were calculated through descriptive variables such as gender, clinical success. Means and standard deviation were obtained for quantitative variables such as age. For the

comparative analysis, Fisher's test was used at a significance level of 5%.

RESULTS

After 12 months of evaluation, all the patients concluded the study, being distributed in 16 (57.14%) of the male sex and 12 (42.86) of the female sex, showing a mean age of 5.146 ± 1.359 (Table 2).



The total number of teeth evaluated in this period was 45 temporary molars, where the second lower left molar (75) showed a greater number of restorations with 12 (26.67%). Regarding the size of

the lesions, in general a mean of 3.908 ± 0.720 was obtained, observing greater affectation in the mesio-distal extension 4.933 ± 1.452 (Table 3).

Table 2. Distribution of participants according to age and gender

		Gender		
		General	Female	Male
Age	Media	5.1468	5.1875	5.0833
	Standard deviation	1.3596	1.4705	1.2401

Table 3. Dimension of caries lesion

DIMENSION	N	Rank	Min	Max	Media	Standard deviation
Depth	45	3.00	2.00	5.00	3.1778	.61381
Mesio-distal extension	45	7.00	2.00	9.00	4.9333	1.45227
Bucal-lingual or palatine extension	45	3.00	2.00	5.00	3.7333	.75076
General size	45	3.00	2.60	5.60	3.9089	.72042

* The data is expressed in millimeters.



Clinical performance data

The clinical characteristics were assessed in terms of color match, marginal discoloration, marginal adaptation, anatomic form, secondary caries, both at 6 and 12 months.

At 6-month evaluation (Table 4), affectation was found in the color matching criteria, but within the normal range of adjacent tooth structure, observing one case with code bravo (upper molar) and another with code Charlie (lower molar). At 12-months (Table 5), one upper molar had defect in

color matching criteria, marginal adaptation, marginal discoloration and anatomic form but within the normal range of adjacent tooth structure (code Bravo); and one lower molar presented a marked discrepancy in color, shade and/or translucency (code Charlie). The p value was not relevant, the alkasite material showed constant values over a period of time, and so there was no statistically significant difference at the end of 12 months of the study.

Table 4. Clinical evaluation at 6 months

CRITERIA	SCORE	MOLAR LOCATION		TOTAL	P
		Upper	Lower		
Color Match	A	15	28	43	.305
	B	1	0	1	
	C	0	1	1	
Marginal discoloration	A	16	29	45	1.0
	B	0	0	0	
	C	0	0	0	
Marginal Adaptation	A	16	29	45	1.0
	B	0	0	0	
	C	0	0	0	
Anatomic form	A	16	29	45	1.0
	B	0	0	0	



	C	0	0	0	
Secondary caries	A	16	29	45	
	B	0	0	0	1.0
	C	0	0	0	

A: Alpha, B: Bravo, C: Charlie

Table 5. Clinical evaluation at 12 months

CRITERIA	SCORE	MOLAR LOCATION		TOTAL	P
		Upper	Lower		
Color match	A	15	28	43	
	B	1	0	1	.305
	C	0	1	1	
Marginal discoloration	A	15	29	44	
	B	1	0	1	.396
	C	0	0	0	
Marginal Adaptation	A	15	29	44	
	B	1	0	1	.396
	C	0	0	0	
Anatomic form	A	15	29	44	
	B	1	0	1	.396
	C	0	0	0	
Secondary caries	A	16	29	45	
	B	0	0	0	1.0
	C	0	0	0	

A: Alpha, B: Bravo, C: Charlie

DISCUSSION

The incidence of dental caries disease has been experiencing a certain increase in recent years. Its current treatment is related to the modern concept of minimal intervention, which has evolved from a

greater understanding of the disease process and the development of new biomaterials, adhesives, and biomimetics (18).

In the literature, several in vitro studies have demonstrated the ability to release



fluoride ions, the potential for demineralization inhibition, resistance to microleakage and compression, as well as tensile strength offered by alkasite as a restorative material (19,20,21). There are few clinical studies on this material that evaluate its success or failure when used for the restoration of primary teeth. The present study evaluated the clinical performance of Cention N alkasite restorative material for class I cavities in primary molars by means of USPHS (United States Public Health Service) criteria. The USPHS criteria for the clinical evaluation of restorations have been widely used for long-term evaluation and are considered valid for studies with different observation periods (22).

Regarding the aesthetic properties of the color of the restorations made with alkasite at 12 months of evaluation, only one case considered as failure (2.2%) was found, where there was a mismatch in color and it was outside the normal range of adjacent tooth structure. These results are similar to those reported by Derchi et

al. (4), who after 12 months of follow-up had only two cases as failure (3.63%). Sharma et al. (23), do not report any failure after 12 months of being applied to first permanent molars. In this study, one restoration scored Bravo for marginal adaptation, marginal discolouration and anatomical form; none presented secondary caries at the end of the evaluation. These findings can be explained by the low contraction of the material at the time of polymerization, which favors the bonding of the material to the tooth interface, reducing the discoloration of the margins (24). This low polymerization shrinkage is due to the presence of isofillers, which are silane-functionalized prepolymerized filler particles with high flexural strength and low modulus of elasticity. Cention N® is a dual-cure resin compound, which is based on UDMA and contains stress-reducing isofillers, leading to low shrinkage (25).

Failures in marginal adaptation usually occur due to localized bonding problems between the restorative material and the



tooth. For this reason, it is recommended to only selectively etch dental enamel, since when it is etched with phosphoric acid, the bond strength to the enamel increases, decreasing this strength in the dentin, which produces adhesion failures to the dental structure (23). The results of the marginal adaptation in this study were similar to those reported by Dedania et al. (26), where all restorations made with Cention N® showed Alpha scores for marginal adaptation at one year of follow-up.

Among the reasons for the replacement of a restoration is the presence of secondary caries, fracture or complete loss of material (27). This can occur due to incorrect dosing and handling of the material, resulting in the formation of air bubbles and pores in the matrix, causing surface hydrolytic instability and softening. In this study, the presence of secondary caries was not reported, nor loss of retention of the material after 12 months of follow-up, so the restorations maintained a good anatomical form. This evidence is consistent with what was

reported by Attia et al. (22), who did not find the presence of carious lesions adjacent to the restorations made with Cention N. This can be explained by an adequate selection of the participants, the preventive care of the patients, a correct handling of the material and the characteristics of alkacite, where the bonding forces and mechanical properties (flexural resistance, resistance to wear resistance and modulus of elasticity) which are attributed to the presence of barium–aluminium–silicate and calcium–aluminum–silicate glass-based filler particles and cross-linked structure of the polymer (28). Additionally, the ability of the material to release a greater amount of ions (F^- , OH^- , Ca^{2+}) when the pH value is acidic, which prevents demineralization of the dental substrate and prevents secondary caries (29).

Finally, in order to confirm our results, it is recommended to carry out a greater number of clinical studies with longer follow-up periods, with better methodological designs, where the number of samples is increased, including



the participation of multiple calibrated operators to reduce possible risks undetected biases, where the size and depth of the lesions are considered and the possible post-operative sensitivity can be evaluated.

CONCLUSIONS

The restorations made with cention n had an adequate color similar to that of dental structure, showing few defects over time and without the development of secondary caries lesions, so it can be considered as a clinical option for the restoration of primary molars, due to its quality and the short operating time required for its placement.

REFERENCIAS

1. Carlos L, Luengo J, Toscano I, Luévano A, Anaya M. 2017. Conocimientos, creencias y percepción de universitarios mexicanos sobre caries temprana de la infancia. *Acta Universitaria* 2017;27(2):46-52.

2. American Academy of Pediatric Dentistry. Policy on Early Childhood Caries (ECC): Classifications, Consequences, and Preventive Strategies. Oral health policies. *Pediatr Dent* 2020;79-81.

3. Cubero A, Lorigo I, González A, Ferrer M, Zapata M, Ambel J. Prevalence of dental caries in children enrolled in preschool education from a low socioeconomic status area. *Rev Pediatr Aten Primaria* 2019;21(82):47-59.

4. Derchi G, Marchio V, Giuca M, Lardani L. Clinical Performance of Cention™ Alkasite Restorative Material vs. Glass Ionomer Cement used in deciduous teeth: One-year evaluation. *Appl Sci* 2022;12:1-10.

5. López A, Acosta I, López A. Factores relacionados con el fracaso de las restauraciones dentales de resina y amalgama. *Revista* 16 de Abril 2017;56(265):104-12.

6. Ende V, Munck D, Lise P, Meerbeek V. Bulk fill composites: A review of the current literature. *J Adhes Dent* 2017;19:95-109.



7. Borgia E, Baron R, Borgia J. Quality and survival of direct light-activated composite resin restorations in posterior teeth: a 5-to 20-year retrospective longitudinal study. *J Prosthodont* 2019;28(1):195-203.
8. Chaple A. Técnica modificada de restauración de cavidades Clase II utilizando resinas compuestas. *Rev Habanera de Cienc Médicas* 2015;14(3):337-47.
9. Kumar S, Ajitha P. Evaluation of compressive strength between Cention N and high copper amalgam - An in vitro study. *Drug Invent Today* 2019;12(2):255-7.
10. Gupta N, Jaiswal S, Nikhil V, Gupta S, Jha P, Bansal P. Comparison of fluoride ion release and alkalizing potential of a new bulk-fill alkasite. *J Conserv Dent* 2019;22(3):296-9.
11. Chowdhury D, Guha C, Desai P. 2018. Comparative Evaluation of Fracture Resistance of Dental Amalgam, Z350 Composite Resin and Cention-N Restoration in Class II Cavity. *J Med Dent Sci* 2018;17(4):52-6.
12. Lardani L, Derchi G, Marchio V, Carli E. One-year clinical performance of Activa™, Bioactive-Restorative Composite in primary molars. *Children* 2022;9(3):433 <https://doi.org/10.3390/children9030433>
13. Meetkumar D, Nimisha S, Dhaval B, Namrata B, Kasak S. One-year comparative evaluation of clinical performance of silver amalgam and Cention N in simple class I carious lesions in permanent molars. A Split mouth randomized clinical study. *Int J Curr Res* 2018;10(08):72993-6.
14. Todd J. Scientific documentation: Cention N. Ivoclar-Vivadent Press, Schaan, Liechtenstein. 2016 <https://www.ivoclarvivadent.in/p/all/cention-n>.
15. World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *J Am Med Assoc* 2013;(20):2191-4.
16. Wayne S, Schmalz G. Reprinting the classical article on USPHS



evaluation methods for measuring the clinical research performance of restorative materials. Clin Oral Investig 2005;9:209-14.

17. Ryge G, Snyder M. Evaluating the clinical quality of restoration. J Am Dent Assoc 1973;87:369-77.

18. Soneta S, Hugar S, Hallikerimath S, Joshi R, Dialani P, Kohli N. An In Vivo Evaluation of Retention and Antibacterial Efficacy of Posterior High Strength Glass Ionomer Cement and Glass Hybrid Bulk-fill Alkasite Restorative Material as Conservative Adhesive Restoration in Children with Mixed Dentition: A Comparative Study. Int J Clin Pediatr Dent 2022;15(5):529-34. doi:10.5005/jp-journals-10005-2435.

19. Iftikhar N, Devashish B, et al. A comparative evaluation of mechanical properties of four different restorative materials: an in vitro study. Int J Clin Pediatr Dent 2019;12(1):47-9.

20. Kaur M, Mann N, Jhamb A, et al. A comparative evaluation of compressive strength of Cention N with glass ionomer cement: an in-vitro

study. Int J Appl Dent Sci 2019;5(1):5-9.

21. Meshram P, Meshram V, Palve D, et al. Comparative evaluation of microleakage around class V cavities restored with alkasite restorative material with and without bonding agent and flowable composite resin: an in vitro study. Indian J Dent Res 2019;30(3):403-7.

22. Attia R, Sabry R, Elafety A, Essa M. Clinical performance of alkasite dental material and high viscosity glass ionomer restorations in class I Cavities. Comparative study for one year follow up. Egypt Dent J 2022;68:3881-94.

23. Sharma H, Suprabha B, Shenoy R, Rao A, Kotian H. Clinical effectiveness of alkasite versus nanofilled resin composite in the restoration of occlusal carious lesions in permanent molar teeth of children: a randomized clinical trial. Eur Arch Paediatr Dent 2023. <https://doi.org/10.1007/s40368-023-00788-0>



24. Yazici A, Antonson S, Kutuk Z, Ergin E. Thirty-six-month clinical comparison of bulk fill and nanofill composite restorations. *Oper Dent* 2017;42:478–85.
25. Ilie N. Comparative effect of self- or dual-curing on polymerization kinetics and mechanical properties in a novel, dental resin-based composite with alkaline filler. *Materials (basel)*; 2018;11:108.
<https://doi.org/10.3390/ma11010108>.
26. Dedania M, Shah N, Bajpai N. One-year comparative evaluation of clinical performance of silver amalgam and cention-n in simple class I carious lesions in permanent molars randomized clinical. *Int J Curr Res* 2018;10:72993–6.
27. Sreeja G, Azeez N, Reddy H, Aby H, Tewani K. Clinical evaluation of Alkasite based cement v/s Glass ionomer cement in primary dentition using FDI criteria. *J Med Dent Sci Res* 2020;7(6):13-8.
28. Azevedo K, Tannus A, Silveira A, Hafiz A. “Alkasite: A new alternative to amalgam? - Clinical Case Report”. *Int J Dev Res* 2021;11(03):45552-5.
29. Sujith R, Yadav T, Pitalia D, Babaji P, Apoorva K, Sharma A. Comparative Evaluation of Mechanical and Microleakage Properties of Cention-N, Composite, and Glass Ionomer Cement Restorative Materials. *J Contemp Dent Pract* 2020;21(6):691-5.