



ORIGINAL RESEARCH PAPER

Dental Science

EVALUATION OF PROXIMAL CONTACT TIGHTNESS IN CLASS II COMPOSITE RESTORATIONS IN MOLARS USING CIRCUMFERENTIAL MATRIX BAND SYSTEM AND PALODENT V3 SECTIONAL MATRIX SYSTEM. AN IN VITRO STUDY

KEY WORDS: Proximal contact tightness, Tetric N Ceram, Palodent V3 matrix system.

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ABSTRACT

Aim: To evaluate a the proximal contact tightness in class II composite restorations in molars achieved with Circumferential matrix system and Palodent V3 sectional matrix system using Dental floss and RVG's.

Materials and methods: 30 Ivorine lower molars were selected for the study. Standardized MO cavities were prepared using no 245 carbide bur with dimensions 2 x 3 x 6 mm buccolingually, occlusopulpally and mesiodistally with 1 mm of the gingival seat. These prepared ivorine teeth were randomly divided into two groups.

- Group I - Class II cavity restored with Tetric N Ceram nanohybrid composite using Circumferential matrix system (tofflemaire matrix system)
- Group II - Class II cavity restored with Tetric N Ceram nanohybrid composite using Palodent V3 sectional matrix system

The outcome (proximal contact tightness) was evaluated by blinded assessor using dental floss (both waxed and unwaxed floss) and RVG's.

Statistical Analysis: Data was subjected to statistical analysis using Chi-square test and Mann-Whitney U test. A p-value of <0.05 was considered as statistically significant.

Results: Statistical analysis revealed significant difference between the two groups:

The use of Palodent V3 sectional matrix system resulted in reproduction of more optimum proximal contacts than circumferential matrix band system.

Conclusion:

Within the limitations of the current study, it can be concluded that in class II composite resin restorations, restored with Palodent V3 sectional matrix system created optimum proximal contact tightness than traditional circumferential matrix system.

INTRODUCTION.

The aim of restorative dentistry is to attain a good proximal contact and contour. This is essential for optimum form and function of dentition as well as for stimulation and protection of the periodontal complex.

As a material per se, the resin composite has an inherent disadvantage of polymerization shrinkage, lacks condensability and the material is more viscous which tend to slump instead of providing positive proximal pressure on the matrix band.

This leads to poor contact and contour which causes food impaction, recurrent caries and periodontal disease. Therefore research has tried to overcome the existing problems by improving the material characteristics by introduction of newer fillers in composite materials and newer matrix application techniques.

Tofflemaire system which is the circumferential matrix band system is considered as universal system, is used in restoring large three or more surface preparations. In this system the matrix bands can be placed in the retainer head which is stable and easy to place on a prepared tooth. But there are inherent drawbacks such as the push and pull effect, when we pull the mesial contact tight the distal contact opens up and the other is the ledge or flash at the gingival margins. Tofflemaire system also creates flat and straight proximal contours with resin restorations.

Various studies have proved that sectional matrix bands in combination with separation rings can achieve adequate proximal contacts. The introduction of precontoured matrix bands together

with wedge separation such as Palodent V3 sectional matrix system may be a suitable solution in achieving proper contacts and contours.

Therefore the aim of this in vitro study was to evaluate the proximal contact tightness in class II composite restorations in Ivorine molars achieved with Tofflemaire matrix band system and Palodent V3 sectional matrix system.

MATERIALS AND METHODS

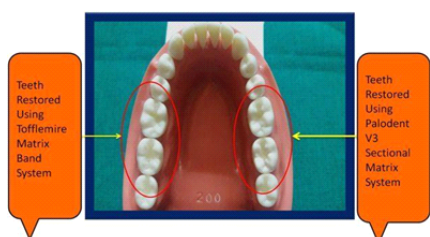
Thirty Ivorine (Nissin co., Nakagyoku, Kyoto, Japan) lower posterior molars were used in this study. Teeth were placed in a manikin model and phantom head during all restorative procedures in order to simulate clinical conditions. Standardized MO cavities were prepared on the ivorine molar tooth using no 245 carbide bur with dimensions 2 x 3 x 6 mm buccolingually, occlusopulpally and mesiodistally with 1 mm of the gingival seat. All restorative procedures were performed by one operator.

These prepared ivorine teeth were randomly divided into two groups

- Group I - 15 Class II cavities restored with Tetric N Ceram nanohybrid composite (Ivoclar Vivadent co. Liechtenstein) using Circumferential matrix system (Tofflemaire matrix system)
- Group II - 15 Class II cavities restored with Tetric N Ceram nanohybrid composite (Ivoclar Vivadent co Liechtenstein) using Palodent V3 sectional matrix system (Dentsply Sirona USA)

In Group 1, After placement of band in Circumferential matrix system, the matrix band was lightly burnished with a hand instrument until no visual space was left between the matrix and adjacent tooth. Also, an explorer was used to check the fit of the matrix band at the gingival margin of the proximal box. Adhesive (Tetric N Bond, Ivoclar Vivadent) was applied according to the manufacturer's instructions and polymerized with a halogen polymerization unit for 10s (Woodpecker LED D, light intensity 650mW/cm²). Following which, with the help of Titanium Coated composite restoring instruments (GDC, India) Tetric N Ceram nanohybrid composite was then placed in three increments of 1mm each. A horizontal gingival, an oblique buccal, and an oblique lingual increment. Each layer was separately cured for 20 s from the occlusal direction. After removal of the matrix band, the restorations were postcured for an additional 20 seconds from the buccal and lingual sides. Restorations were not finished or adjusted in order to prevent changes of the proximal surface.

In Group 2, i.e the Palodent matrix system- Procedure is the same as the above with the exception that the bands were not burnished as they were precontoured.

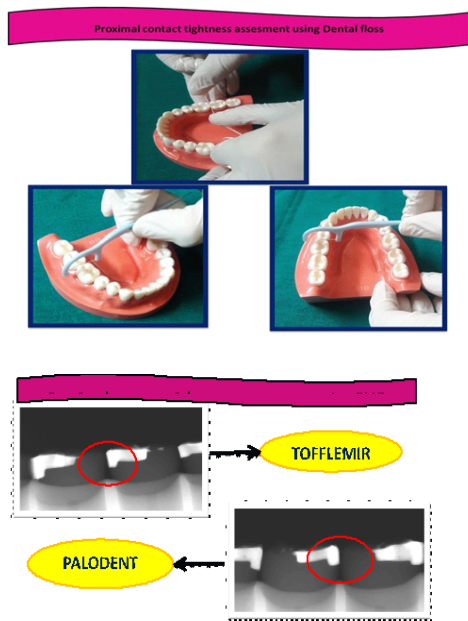


After restoration, the model was removed from the phantom head and the samples were randomly divided and the proximal tightness was evaluated by single blind assessor using Dental floss-waxed (Colgate, India) and unwaxed (Younifloss, china) and RVG (Carestream Kodak Rvg 5200 Digital Radiography System, India) with the following scoring criteria:

Score (1) Open contact : when there is visible space between the two ivory teeth .

Score (2) Optimum contact: when passing of the floss requires some amount of pressure to pass through.

Score (3) Tight contact: when the floss requires maximum pressure and does not pass through easily. Visible fringes are seen. First RVG's were taken and then 12 inch nylon waxed floss was passed between the ivory molars and later followed by unwaxed floss to evaluate the proximal contact tightness.



RESULTS AND STATISTICAL ANALYSIS

The data collected in the study was statistically analysed using Chi-square test and Mann-Whitney U test. A p-value of <0.05 was considered as statistically significant

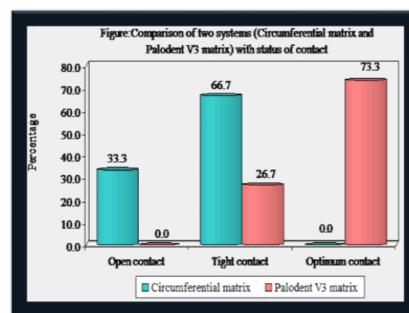
Table 1: Association of matrix system with proximal contacts (Chi square test)

Contact	Circumferential matrix	%	Palodent V3 matrix	%	Total	%
Open contact	05	33.3	0	0.00	05	16.6
Tight contact	10	66.7	04	26.7	14	46.7
Optimum contact	0	0.00	11	73.3	11	36.7
Total	15	100.00	15	100.00	30	100.00

Chi-square= 18.5712 P= 0.0001* (significant)

Table 2: Comparison of two systems (Circumferential matrix system and Palodent V3 matrix system) with contact scores by Mann-Whitney U test

	Median	Sum of ranks	U-value	Z-value	P-value
Circumferential matrix	2.00	140.00			
Palodent V3 matrix	3.00	325.00	20.00	3.8367	0.0001*



Out of 15 cavities restored with Circumferential matrix system : there was open contact with 5 teeth and tight contact with 10 teeth and no optimum contact was seen. Out of 15 cavities restored with Palodent V3 sectional matrix system: there was tight contact with 4 teeth, optimum contact with 11 teeth and no open contact was seen.

The results of the present study showed that, there was significant difference between the two groups:

The use of Palodent V3 sectional matrix system resulted in significantly tighter proximal contacts than circumferential matrix band system.

DISCUSSION

One of the main aims of restorative dentistry is to restore the proximal contact and contour that is lost due to caries, age or trauma . Achieving a good class II posterior restoration requires a material with good handling properties and a matrix system that provides stability and helps in better contouring. Over the last decade, new matrix systems have been introduced specifically for posterior composites restorations.

In the present study, two different matrix systems: circumferential matrix system (tofflemire) and Palodent V3 sectional matrix system were used to create proximal contacts in class II composite restorations. After the restorations, their proximal contact tightness was evaluated using Dental floss and RVG's. Typhodont jaw set was used to standardize the tooth form and contact tightness and to achieve better contour. Tetric N Ceram composite resin was used as it has nanofillers that contain nano-modifier such as the nanomers and nanoclusters that decrease the interstitial

spacing of the filler particles. This results in low shrinkage and shrinkage stress, low wear and fast polishability.

The results of the present in vitro study showed that, there was a statistical significant difference in proximal contact tightness restored using the two matrix systems. The results of our present study are in accordance with that study conducted by MH Saber et al. and D Kampouropoulos et al. Their studies have also found certain limitations with Circumferential matrix system such as it creates flat, straight proximal contours, which may be due to improper wedging, lack of precontoured matrix and band stability and also due to the stiffness of the matrix band where we cannot apply positive proximal pressure while placing the increments. As a result of which the restorations tend to trap food.

On the other hand, Palodent V3 Sectional Matrix System offers various advantages. It is designed to build a strong foundation for class II restorations. This system works as a single unit that contains a smart wedge guard which lowers the risk of interproximal damage of adjacent tooth, anatomical wedges which compress and flare for easy placement and seal and help contour the sectional bands. The matrix band is made of dead soft material and is nylon fiber coated which prevents the composite from sticking or adhering to the band. And a strong Niti ring that is more stable and provides more retention and greater force of separation. Thus each component of the system is optimized for ease of use and performance that resulted in creation of maximum optimum contacts.

In clinical situations, there are multiple factors that affect the contact in posterior class II restorations such as the shape of tooth, spatial relationship with the adjacent tooth, extent of lesion and shape of embrasures. Future studies should focus on the effectiveness of the above mentioned matrix systems using the newer nanofilled composites in various in vivo situations.

CONCLUSION

Within the limitations of the current study, it can be concluded that in class II resin composite restorations, Palodent V3 sectional matrix system creates an optimum proximal contact tightness than when traditional circumferential matrix systems are applied.

CLINICAL RELEVANCE

When restoring Class II posterior composite restorations, proper selection of a composite material with low polymerization shrinkage should be considered such as nanofilled composite resins.

To obtain optimum contact and a successful posterior class II restoration the use of Palodent V3 sectional matrix system is recommended.

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