Content available at: https://www.ipinnovative.com/open-access-journals

IP Indian Journal of Conservative and Endodontics

Journal homepage: https://www.ijce.in/

Reveiw Article

Achieving predictable contacts and contours: A review

Shivali Tyagi[1]*, Shravan Rathi[1], Vineeta Nikhil[1]

[1] *Dept. of Conservative Dentistry and Endodontics, Subharti Dental College and Hospital, Meerut, Uttar Pradesh, India*

ARTICLE INFO

Article history:
Received 03-07-2024
Accepted 23-07-2024
Available online 05-09-2024

Keywords:
Contacts and contours
Matrix band
Matrix system
Proximal surfaces

ABSTRACT

Restoring surface cavities and replacing the lost tooth structure from caries, trauma, decay, damage and other causes to their natural anatomy is one of the main objective of restorative dentist. Enhanced comprehension of the interproximal relationship enables clinicians to more effectively preserve or restore these structures. To preserve the natural form of the tooth while restoring, the shape and contour of restoration can be given by various matrix systems. This paper is an attempt not only to make the reader understand about the normal anatomic contacts and contours and various matrix system available recently but also it helps the clinician to select the best matrix system for the specific clinical situation to achieve predictable contacts and contour to enhance longevity of dental restorations.

Key Message: Importance of use of matrix band in clinical dentistry for obtaining ideal contacts and contours.

1. Introduction

Optimising the shape of teeth has consistently been the ultimate goal in restorative dentistry. It's essential not just for replacing absent tooth structure but also for restoring the ideal form and function.[1] Johnson famously remarked that understanding "contact point" and "interproximal space" should be fundamental for any dental practitioner.[2] The positioning of contacts and contours, vulnerability to dental decay, treatment methods, and their role in preventive dentistry have been carefully considered in both theory and practice for centuries.[3] The initial approach to treating proximal caries involved removing the decay and filling the cavity with suitable materials, without considering the tooth's form and function. The early theory of caries, which suggested that decay starts at the tooth contact point, led to a prophylactic concept aiming for complete and permanent separation of adjacent teeth to create self-cleansing spaces. While this approach did reduce caries rates, it faced criticism for causing tooth disfigurement, food impaction on the gum line, tooth sensitivity, and tooth drifting. In approximately 1890, the concept of contoured restorations emerged, based on idea of caries developing beneath the contact point. These contoured restorations aimed to restore the correct shape of the interproximal space, promoting gum health and patient comfort. This, in turn, safeguarded the stomatognathic system, ensuring harmony and balance.[4]

Atkinson et al. introduced the concept of matricing in 1897 as a means to create contoured fillings.[4] Matricing involves replacing lost dental structure during preparation by constructing a temporary wall opposite the axial walls of the preparations.[5]

Matrices play an indispensable role in restorative dentistry, with matricing being a crucial step in the placement of various types of restorations. Due to the diversity in matrix systems, it is essential for clinicians to be knowledgeable about them

* *Corresponding author.*
E-mail address: drshivalityagi70@gmail.com (S. Tyagi).

https://doi.org/10.18231/j.ijce.2024.025

2. Discussion

2.1. Ideal contacts

The proximal contact, also known as the "contact area," denotes the surface where the proximal surfaces of adjacent teeth meet. Initially, during tooth eruption, this interaction occurs at a point, termed a "point contact." Over time, due to proximal attrition, it evolves into a "contact area." Typically positioned in the upper middle third of the crown of most teeth, the contact area facilitates natural embrasures and supports effective maintenance of the interproximal region.[6]

Optimal contacts play vital roles in:

1. Maintaining dental arch stability by transmitting forces along the long axis of teeth,
2. Protecting the interdental papilla against food impaction, and
3. Influencing speech and aesthetics, particularly in the anterior region.

Improper restoration of contact areas can lead to teeth displacement, lifting forces, tooth rotation, occlusal contact discrepancies, and food impaction. This may result in periodontal trauma, causing pain, inflammation, and bleeding.

3. Matricing and Matrices

Matricing involves replacing lost dental structure during preparation by constructing a temporary wall opposing the axial walls of the preparations. A matrix serves as a tool to secure the restoration in the tooth while it sets.[5]

3.1. Ideal requirements of dental matrices include

1. Rigidity for stability.
2. Accurate recreation of natural tooth form and interproximal contact.
3. Effective sealing of proximal and gingival wall areas.
4. Minimal thickness for precision.
5. Flexibility for adaptability.
6. Bio-compatibility for safe use.
7. Stability for durability.
8. Adequate optimal transmittance for optimal outcomes.[7]

3.2. Matrix system depending on location can be of two types

1. Anterior matrix system
2. Posterior matrix system

3.2.1. Anterior matrix systems

It can be classified into**:** transparent matrix, non-transparent matrix, and rigid matrix system.

3.2.1.1. Transparent matrix system. These are utilized for tooth-coloured restorations due to their capacity to transmit light during the polymerization process.[8]

3.2.1.1.1. Mylar strip.

1. Indications
   (a) Restoring Class lll and Class lV tooth preparation.[9]
   (b) When the neighbouring tooth possesses a flat contact area, the mylar strip can be applied employing a pull-through technique.[8]
2. Advantage
   (a) Easy to utilize
   (b) Cost-effective.[9]
3. Disadvantage
   (a) Flexibility of this matrix can pose difficulties in shaping large areas.
   (b) Ensuring stability of the matrix during restoration is a common concern.[10]

3.2.1.1.2. Bioclear matrix system. The Bioclear matrix system was pioneered by Dr. David Clark in 2007.[11]

1. Features
   (a) Excellent cervical adaptation, preservation of the gingival papilla, simplified matrix selection, and clear indication of the proper orientation by each matrix's incisal tab.
2. Indications
   (a) Aesthetic procedures involving small restoration areas.
   (b) Used for both anterior and posterior restorations.[8]

3.2.1.1.3. Transparent Crown. This is also referred as a strip crown.

1. Indications
   (a) Utilized in both primary and permanent dentition.
   (b) Used in treatment of microdontia in incisors or peg-shaped lateral incisors.[8]

3.2.1.1.4. Contoured anterior matrix

S-Shaped matrix band. In this technique, a stainless-steel matrix band is taken and contorted into an 'S' shape using a mouth mirror handle.

1. Indications
   (a) To restore the distal portion of canine and premolar teeth.
   (b) Slot restorations for Class II cases.[9]

Blue view varistrip: It's a contoured anterior matrix designed to offer the optimum curvature and band height for all anterior restorations.

1. Indications
   It can be used for class IV restorations and diastema closure.[8]

3.2.1.2. Non- transparent matrix system.

3.2.1.2.1. Unica anterior. It is developed through a collaboration between Polydentia and Style Italiano.

1. Indications
   Unica anterior matrix system is recommended for Class III, IV, and V anterior restorations, as well as for direct composite veneers.
2. Features
   Unica anterior matrix is both simple to use and cost-effective. It enables simultaneous restoration of the proximal and cervical margins, considerably reducing the chair time.[8]

3.2.1.2.2. Unica minideep. It is particularly made from a malleable alloy that conforms to the required shape for smaller anterior teeth.

1. Indication
   Unica Minideep is recommended for use on maxillary and mandibular lateral incisors, mandibular central incisors, conoid teeth, triangular teeth, peg laterals, and teeth with narrow cervical diameters.[8]

3.2.1.2.3. Fusion anterior matrix system. Garrison Dental introduced the Fusion Anterior Matrix System.

1. Indications
   Restorations such as Class III and IV crowns and composite veneers for the anterior teeth.
2. Features
   It ensures a secure seal at the cervical margin while preserving the ideal tooth anatomy.[8]

3.2.1.2.4. Burtonbands anterior matrix system. They were designed by Dr. Matthew Burton.

1. Indications
   Class V anterior restoration (seals the gingival margin).
2. Advantages
   (a) Complete accessibility to the restoration.
   (b) Ability to shape and ensure proper proximal contact through the burnishable nature and narrower profile of the metal matrix compared to plastic strips.[8]

3.2.1.3. Rigid matrix system.

3.2.1.3.1. Modified putty index using mylar strip. A putty index of the incisors is created by using either the direct or indirect technique. This index is made using either addition or condensation silicone putty materials.[9]

1. Indications
   When employing a rigid matrix to restore the palatal surface, it establishes the accurate contour and length of the incisal edge, which can subsequently support the buildup of composite material on the labial surface.[12]
2. Limitations
   (a) A second appointment is necessary to have both the mylar strip and the index inserted together.
   (b) It necessitates the assistance of four hands.[13]

3.2.2. Posterior matrix system

Caries extending onto the proximal aspects of molars and premolars are categorized as class II caries. The establishment of proper contact and contour in such cases becomes a challenge for the dentists. In order to combat this hurdle, varieties of matrix systems had been developed.[7]

Posterior matrix system can be divided into:

1. On the basis of matrix retainers:
   (a) Depending on mode of retention
      i. With retainer-Ivory no.1, Ivory no.8 etc.
      ii. Without retainer -Auto matrix, Compound supported etc.
   (b) Depending on the cavity preparation for which it is used
      i. Class I cavity with buccal and lingual extension - Double banded Tofflemire matrix.
      ii. Class II cavity- Single banded Tofflemire matrix, Ivory no.1, Ivory no.8, Copper band matrix, T band matrix, Auto matrix and Pre countered sectional matrix.[7]
2. On basis of types of matrix available:
   (a) Custom-made or anatomic matrix - E.g. Compound- supported matrix.
   (b) Mechanical matrix- E.g. Ivory No.1, Ivory No.8, Tofflemire matrix.
   (c) Preformed - E.g. Circumferential matrix system, Sectional matrix system.[14]

3.2.2.1. Mechanical retainer.

3.2.2.1.1. Ivory matrix No. 1. It consist of a matrix holder with two semicircular arms, one of which is slanted, and a claw at the end and also consist of screw, positioned opposite to the matrix band holder.[9]

1. Indications
   (a) Used for restoring unilateral class II restoration.[7]

3.2.2.1.2. Ivory matrix no. 8. This matrix comprises a band that wraps around the entire tooth crown. The band's circumference can be modified using the adjusting screw located in the retainer.[9]

1. Indications
   (a) For unilateral or bilateral Class II preparations (MOD).[7]

3.2.2.1.3. Tofflemire matrix. Also, referred to as the universal matrix, this design was pioneered by B.R. Tofflemire.[5]

1. Indications
   (a) Tooth preparations with buccal or lingual extensions under Class l.
   (b) Class II tooth preparations, either unilateral or bilateral.
2. Advantages:
   (a) Simple to utilize
   (b) Study and inherently stable
   (c) Offers excellent contact and contours
   (d) Easily removable
   (e) Applicable from both facial and lingual aspects
   (f) Cost-effective
3. Disadvantages:
   (a) Doesn't achieve optimal or straight contacts and contours for posterior composite restorations.[7]

3.2.2.1.4. Steele's siqveland self-adjusting matrix holder. It's frequently employed for tapering teeth, particularly where there's significant difference between the diameters of the cervical and occlusal thirds of the tooth.

1. Indications
   (a) Various compound and complex tooth preparations in the posterior region.
2. Advantage
   (a) Able to conform accurately to tooth contours.
   (b) With Steele's Siqveland self-adjusting matrix holder, achieving anatomical adaptation of the band is feasible without the need for wedges.[5]

3.2.2.1.5. Omni matrix. The Omni-Matrix (Ultradent) is a disposable matrix retainer with pre-loaded band.

1. Indications
   (a) Class V composite restorations.
   (b) Pivoting head allow it access any area of mouth.
2. Advantages
   (a) Simple and rapid in application.
   (b) Minimizes the risk of cross-infection.
3. Disadvantages
   (a) Costlier.[15]

3.2.2.2. Custom - made.

3.2.2.2.1. Compound supported matrix. Sweeney provided the description of Compound supported matrix.

1. Indications
   (a) Restoring a Class II cavity preparation involving either one surface or both.
   (b) Cases where adjacent teeth is missing.
2. Advantages
   (a) Offers superior contact and contour.
   (b) Exceptionally rigid and stable.
   (c) Simple to remove.
3. Disadvantages
   (a) Time-consuming.[9]

3.2.2.2.2. T-Shaped matrix band. It's a preformed matrix band made of brass, copper, or stainless steel without a retainer.

1. Indications
   (a) Tooth preparations for unilateral or bilateral Class II (MOD) cases.
2. Advantages
   (a) Simple to use.
   (b) Cost-effective.
3. Disadvantages
   (a) Inherently unstable.[9]

3.2.2.2.3. Copper bands. These are cylindrical in shape and available in different sizes, hence can be selected accordingly.

1. Indications
   (a) Particularly suited for severely decayed teeth (especially pin amalgam restorations).
   (b) Ideal for Class II cavities with extensive buccal or lingual extensions.
2. Advantages
   (a) User-friendly
   (b) Offers excellent contours.
3. Disadvantages
   (a) Incompatible with resin restorations.
   (b) Requires a significant amount of time.[9]

3.2.2.3. Preformed.

3.2.2.3.1. Auto matrix . The Auto-matrix or retainer-less matrix was given by L.D. Chaulk Co. Milford in 1977.

1. Indications
   (a) In inclined and partially erupted teeth.
   (b) For complex amalgam restorations.
   (c) In patients unable to tolerate retainers.
2. Advantages
   (a) Ease of use is enhanced by the absence of interference from a retainer.
   (b) Quick implementation.
3. Disadvantages
   (a) Proximal contouring poses a challenge as the bands lack pre-contouring.
   (b) High Cost.[7]

3.2.2.3.2. Circumferential matrix.
Preformed circumferential matrices are more useful for badly broken-down and is more precise for complex restorations.

Circumferential matrix can be of different types:-

Palodent 360 circumferential matrix system: The Palodent 360 is an innovative circumferential matrix system that doesn't require a retainer or applicator.

1. Indications
   (a) Beneficial for complex Class II cases where adjacent teeth are absent, excessive tooth structure loss prohibits sectional matrix use, or when dealing with misaligned or severely rotated teeth.
   (b) Palodent 360 matrix bands along with Palodent Plus retention rings, provides temporary interproximal space.[7]

Meta-fix matrix system: It was manufactured by Kerr company.

1. Indications
   Best suited for class II MO/DO/MOD composite restorations.[16]

3.2.2.3.3. Sectional matrix. Sectional matrix system was introduced by Dr. Alvin Meyer in 1986

1. Indications
   (a) Suitable for minor to moderate Class II cavities affecting one or both proximal surfaces of the tooth.
   (b) Employed for both amalgam and composite material restorations.
2. Advantages
   (a) Easy to utilize with excellent visibility.
   (b) The anatomically contoured bands ensures ideal contact points and indentation.[7]

To achieve anatomically accurate contacts with posterior composites, it's essential to create enough space between the teeth in contact to accommodate both the thickness of the matrix band and the polymerization shrinkage of the composite resin. The introduction of "sectional matrices and contact rings" marked the initial effective solution for achieving proper posterior composite contacts.[17]

4. Basic Principle of Contact Rings

These rings function by creating a slight separation between adjacent teeth. They can be classified based on their development into two categories:

1. First generation systems and
2. Second-generation systems

4.1. First generation systems

The initial contact ring systems, emerging in the late 1990s, encompassed products such as the Palodent Bitine, Contact matrix, and the Composi-Tight.[1]

4.1.1. Problems with early contact rings

1. Risk of ring collapse or displacement with wide proximal boxes.
2. Ring stacking, wherein one ring is placed over another for MOD restoration.
3. Gradual loss of springiness due to repeated usage and sterilization.[17]

4.2. Second-generation systems

In response to the limitations of first-generation rings, recently introduced second-generation rings aim to overcome these issues. Examples include the Composi-Tight 3D Soft Face Ring System, Palodent Plus, Bioclear, V, V3, V3 Blue, and V4 Clear Metal Ring System.[1]

5. Instruments to Develop Ideal Contacts and Contours

Various strategies have been introduced to achieve optimal contacts and contours when performing direct posterior composite restorations. Noteworthy among these strategies are:

1. Contact forming instruments
2. Ceramic inserts
3. Light tips.[1]

6. Conclusion

A tooth is a dynamic, living organ made up of various tissues, constantly adapting to the forces of chewing and speech. When tooth tissue is lost due to factors like decay, injury, or wear, proper management is essential. Treating missing tooth structures offers dentists a wide array of techniques and materials, requiring a comprehensive understanding of the necessary tools and resources. To simplify the reconstruction of proximal contact surfaces, significant focus has been placed on developing various matrix systems. These systems aim to reduce the complexity associated with inserting different restorative materials.

Understanding about the different matrix systems, its techniques and advances helps the clinician to select the best matrix system for the specific clinical situation to achieve predictable contact and contours with the available restoration.

7. Source of Funding

None.

8. Conflicts of Interest

The authors have no financial interests or conflicts of interests.

Acknowledgments

None.

References

1. Raghu R, Srinivasan R. Optimizing tooth form with direct posterior composite restorations. *J Conserv Dent*. 2011;4(4):330–6.
2. Johnson C. Textbook of operative dentistry. New York: National Medical Book Co; 1938.
3. Fee AH. Contacts and contours. *J Am Dent Assoc*. 1940;27(7):1035–45.
4. Bauer JG, Crispin BJ. Evolution of the matrix for Class 2 restorations. Operative Dentistry. 4th ed. and others, editor. Winter Publishing House; 1986. p. 1–38.
5. Garg N, Garg A. Evolution of the matrix for class 2 restorations. Textbook of operative dentistry. 3rd ed. and others, editor. Jaypee Brothers Medical Publishers Ltd; 2010. p. 193–212.
6. Shivakumar AT, Kalgeri SH, Dhir S. Clinical considerations in restorative dentistry-A narrative review. *J Int Clin Dent Res Org*. 2015;7(2):122–9.
7. Patekar V, Mankar N, Burde K, Achanta A. Choice of matrix system in dentistry: A review. *J Dent Med Sci*. 2022;10(11):120–6.
8. Urkande NK, Mankar N, Nikhade PP, Chandak M, Ikhar A, Patel A, et al. Anterior matrix systems for composite restorations: A review. *Cureus*. 2023;15(4):37145. doi:10.7759/cureus.37145.
9. Raghu R, Matrices SS. Clinical operative dentistry principles and practice. 2nd ed. Emmess Medical Publishers; 2011. p. 159–63.
10. Goyal A, Nikhil V, Singh R. Diastema closure in anterior teeth using a posterior matrix. *Case Rep Dent*. 2016;p. 2538526. doi:10.1155/2016/2538526.
11. Clark D. The bioclear matrix and peg lateral treatment. *Inside Dent*. 2011;7(5):112–6.
12. Dietschi D. Layering concepts in anterior composite restorations. *J Adhes Dent*. 2001;3(1):71–80.
13. Lesage BP. Aesthetic anterior composite restorations: A guide to direct placement. *Dent Clin N Am*. 2007;51(2):359–78.
14. Marlynda A. A Historical Review of Dental Matrices. *Malays Dent J*. 2011;33(2):1–7.
15. Gilmour AS, James T, Bryant S, Gardner A, Stone D, Addy LD, et al. An in vitro study on the use of circumferential matrix bands in the placement of class II amalgam restorations. *Br Dent J*. 2008;204(6):310–11. doi:10.1038/bdj.2008.202.
16. Vashisht P, Gupta S, Mittal R. Latest trends in composite restoration matricing. *Heal Talk*. 2014;6(4):16–8.
17. Keogh TP, Bertolotti RL. Creating tight, anatomically correct interproximal contacts. *Dent Clin N Am*. 2001;45(1):83–102.

Author biography

Shivali Tyagi, Post Graduate

Shravan Rathi, Associate Professor

Vineeta Nikhil, Professor and HOD

Cite this article: Tyagi S, Rathi S, Nikhil V. Achieving predictable contacts and contours: A review. *IP Indian J Conserv Endod* 2024;9(3):111-116.