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ORIGINAL RESEARCH

A Survey on the Current Trends in the Use of Different Core Buildup Materials and Luting Agents in General Dental Practice

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ABSTRACT

Aim: The aim of the survey was to evaluate the current trends in the use of different post and core buildup materials and luting agents.

Materials and methods: The survey questionnaire, aimed toward evaluating the current trends in the use of different post and core buildup materials and luting agents, consisted of 15 questions. This questionnaire was validated by a panel of senior prosthodontists and sent to 600 dental practitioners in Mumbai and Navi Mumbai in a printed format.

Results and conclusion: The results of the survey showed that post and core procedures are routinely performed by dental practitioners. Majority of the practitioners did not use a post for all endodontically treated teeth. A prefabricated metal post and composite core was preferred by practitioners in teeth with loss of more than two-thirds of the tooth structure. Most practitioners preferred a glass fiber post with composite core buildup under a lithium disilicate crown. A glass ionomer-based restorative core was preferred in the posterior region. Majority of the practitioners used glass ionomer cement (GIC) for luting of ceramo-metal crowns. Resin cement was the cement of choice for luting of lithium disilicate crowns. Failure of teeth restored with a post and core was rarely encountered by most practitioners and the most common cause of failure was due to fracture of the tooth.

Keywords: Core buildup materials, Luting agents, Post.

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INTRODUCTION

Caries, trauma, fracture, and attrition may result in loss of part of tooth structure. Endodontic treatment may be required before the form and function of the tooth can be restored. Continuing developments made in endodontic therapy and restorative procedures have enhanced the longevity of endodontically involved teeth.[1] A successful clinical outcome depends on optimum root canal instrumentation and three-dimensional obturation as well as on adequate restorative treatment performed afterward. A loss of more than half of the coronal tooth structure mandates the use of posts.[2] The purpose of a post is to retain a core that can be used to retain the definitive prosthesis. Posts do not reinforce endodontically treated teeth and are not necessary when substantial tooth structure is present after teeth have been prepared. When the remaining coronal tooth structure is very thin after tooth preparation, a post and core may help prevent coronal fractures.[3] These posts vary from a conventional custom-cast post and core to one-visit techniques, using commercially available prefabricated post systems.[1] A wide variety of materials like amalgam, glass ionomer, resin-modified glass ionomer, and composite can be used for core buildup.

Establishment of the retention and resistance form of the tooth preparation is of primary importance. However, the luting agent helps enhance the retention of the indirect restoration, thereby increasing its longevity. Thus, the clinical success of a fixed prosthesis is also dependent on the cementation procedure.

The core buildup material and the luting agent are selected such that they provide optimum retention, esthetics, and durability of the indirect restoration. The application of an appropriately selected post and core buildup material and luting agent will ensure predicable results and successful long-term clinical outcomes. With a vast multitude of materials available in the market, this survey will enable us to know the current trend in the use of post, core buildup material, and luting agent by the dental practitioners and also make available data for the recommended use of these materials.

MATERIALS AND METHODS

A survey was conducted among the dental practitioners of Mumbai and Navi Mumbai who restored endodonti-

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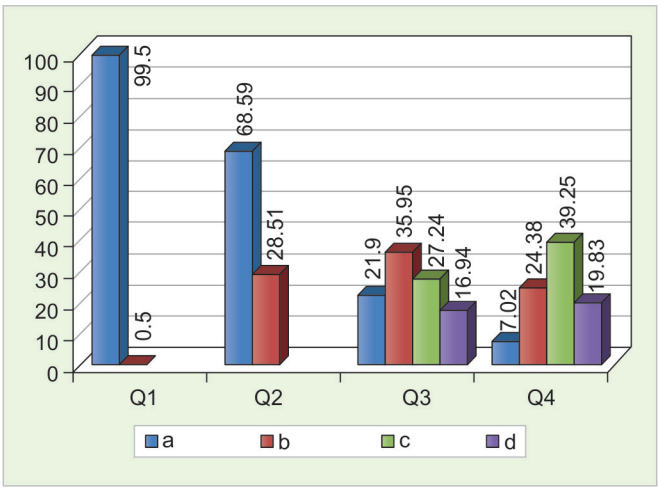
cally treated teeth with post and core buildup procedures. The survey protocol was approved by the Research Committee and Institutional Ethics Committee. The survey questionnaire consisted of 15 questions aimed toward evaluating the current trend in the use of different post and core buildup materials and luting agents. This questionnaire was validated by a panel of experts and was sent to 600 dental practitioners of Mumbai and Navi Mumbai in a printed form. The forms were received, evaluated, and the results were analyzed.

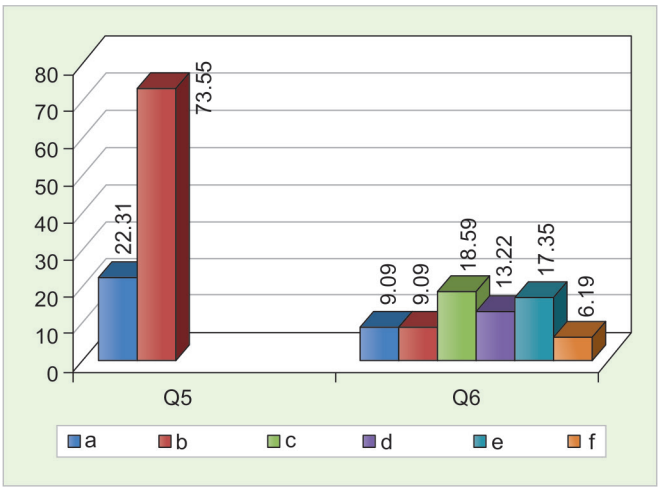
SURVEY FORM

Survey on the Current Trends in the Use of Different Core Buildup Materials and Luting Agents in General Dental Practice

1. Do you perform post and core procedures in your practice?
   (a) Yes (b) No
2. Do you use a post for all anterior endodontically treated teeth?
   (a) Yes (b) No
3. Which post and core do you use in teeth with loss of more than two-thirds of the tooth structure?
   (a) Cast post and core (b) Prefabricated metal posts with composite core buildup
   (c) Glass fiber post and composite core (d) Zirconia post and core
4. Which post and core material do you prefer under a lithium disilicate crown?
   (a) Cast post and core (b) Prefabricated metal posts with composite core buildup
   (c) Glass fiber post and composite core (d) Zirconia post and core
5. Do you use a post in all endodontically treated posterior teeth?
   (a) Yes (b) No
6. Which core material do you prefer in the posterior region?
   (a) Cast post and core (b) Amalgam core with extension in the root canal
   (c) Glass ionomer-based restorative core material (d) Composite: restorative material
   (e) Composite: core material (f) Zirconia post and core
7. Which luting agent do you use for luting a ceramo-metal crown to a cast metal core?
   (a) Zinc phosphate (b) GIC
   (c) Resin-modified GIC (d) Resin cement: self-cure with etch and bond
   (e) Resin cement: dual cure with etch and bond (f) Resin cements: self-etch and bond
8. Which luting agent do you use for luting a ceramo-metal crown to an amalgam core?
   (a) Zinc phosphate (b) GIC
   (c) Resin-modified GIC (d) Resin cement: self-cure with etch and bond
   (e) Resin cement: dual cure with etch and bond (f) Resin cements: self-etch and bond
9. Which luting agent do you advocate for luting a ceramo-metal crown to a resin-modified glass ionomer core?
   (a) Zinc phosphate (b) GIC
   (c) Resin-modified GIC (d) Resin cement: self-cure with etch and bond
   (e) Resin cement: dual cure with etch and bond (f) Resin cements: self-etch and bond
10. Which luting agent do you advocate for luting a ceramo-metal crown to a composite core?
    (a) Zinc phosphate (b) GIC
    (c) Resin-modified GIC (d) Resin cement: self-cure with etch and bond
    (e) Resin cement: dual cure with etch and bond (f) Resin cements: self-etch and bond
11. Which luting agent do you advocate for luting a ceramo-metal crown to a zirconia core?
    (a) Zinc phosphate (b) GIC
    (c) Resin-modified GIC (d) Resin cement: self-cure with etch and bond
    (e) Resin cement: dual cure with etch and bond (f) Resin cements: self-etch and bond
12. Which luting agent do you advocate for luting a lithium disilicate crown to a composite core?
    (a) Zinc phosphate (b) GIC
    (c) Resin-modified GIC (d) Resin cement: self-cure with etch and bond
    (e) Resin cement: dual cure with etch and bond (f) Resin cements: self-etch and bond
13. Which luting agent do you advocate for luting a lithium disilicate crown to a zirconia core?
    (a) Zinc phosphate (b) GIC
    (c) Resin-modified GIC (d) Resin cement: self-cure with etch and bond
    (e) Resin cement: dual cure with etch and bond (f) Resin cements: self-etch and bond
14. How often do you encounter failure of teeth that have been restored with a post and core, followed by placement of a crown?
    (a) Frequently (b) Rarely
    (c) Never
15. Failure is seen due to
    (a) Dislodgement of post (b) Dislodgement of core from the post
    (c) Dislodgement of crown from the core (d) Fracture of the tooth



Graph 1: Q1 to Q4



Graph 2: Q5 to Q6

RESULTS

The results of the survey showed that 99.5% dental practitioners surveyed performed, while 0.5% did not perform post and core procedures in their practice. Posts were not used for all anterior endodontically treated teeth by 68.59% practitioners, whereas 28.51% used a post for all anterior endodontically treated teeth.

In teeth with loss of more than two-thirds of the tooth structure, 35.95% preferred a prefabricated metal post with composite core buildup, 27.27% preferred a glass fiber post and composite core, 21.90% practitioners preferred a cast post and core, and 16.94% preferred a zirconia post and core.

Under a lithium disilicate crown, 39.25% preferred a glass fiber post and composite core, 24.38% preferred a prefabricated metal post with composite core buildup, 19.83% preferred a zirconia post and core, and 7.02% practitioners preferred a cast post and core (Graph 1).

A post was not used in all endodontically treated posterior teeth by 73.55% dental practitioners and 22.31% used a post in all endodontically treated posterior teeth.

In the posterior region, 18.59% preferred a glass ionomer-based restorative core, 17.35% preferred a composite core, 13.22% preferred a composite restorative material, 9.09% practitioners preferred a cast post and core, 9.09% preferred an amalgam core with extension in the root canal, and 6.19% preferred a zirconia post and core (Graph 2).

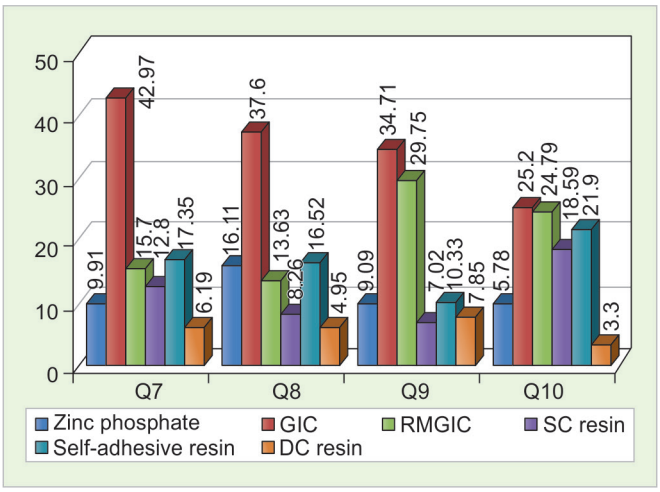
Glass ionomer cement was preferred by 42.97% practitioners for luting a ceramo-metal crown to a cast metal core, 17.35% preferred resin cement: dual cure with etch and bond, 15.70% preferred resin-modified GIC, 12.80% preferred resin cement: self-cure with etch and bond, 9.91% practitioners preferred zinc phosphate cement, and 6.19% preferred resin cement: self-etch and bond.

For luting a ceramo-metal crown to an amalgam core, 37.60% practitioners said they used GIC, 16.52% used resin cement: dual cure with etch and bond, 16.11% used zinc phosphate cement, 13.63% used resin-modified GIC, 8.26% used resin cement: self-cure with etch and bond, and 4.95% used resin cement: self-etch and bond.

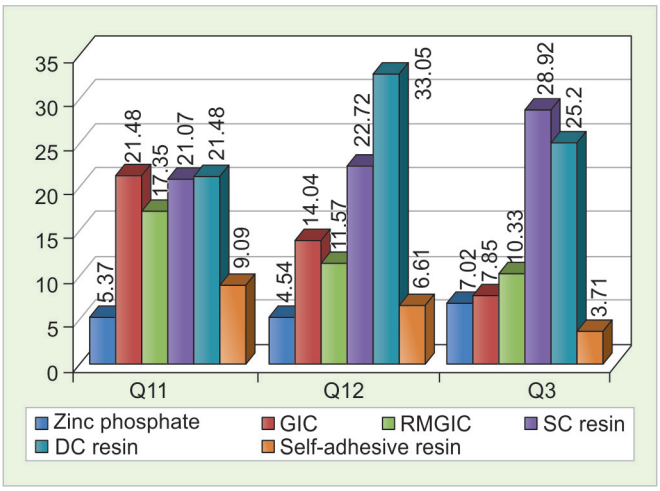
Glass ionomer cement was preferred by 34.71% practitioners for luting a ceramo-metal crown to glass ionomer-based restorative core material, 29.75% preferred resin-modified GIC, 10.33% preferred resin cement: dual cure with etch and bond, 9.09% preferred zinc phosphate cement, 7.85% preferred resin cement: self-etch and bond, 7.02% preferred resin cement: self-cure with etch and bond.

For luting a ceramo-metal crown to a composite core, 25.20% practitioners answered that they advocated the use of GIC, 24.79% advocated resin-modified GIC, 21.90% advocated resin cement: dual cure with etch and bond, 18.59% advocated resin cement: self-cure with etch and bond, 5.78% advocated zinc phosphate cement, 3.30% advocated resin cement: self-etch and bond (Graph 3).

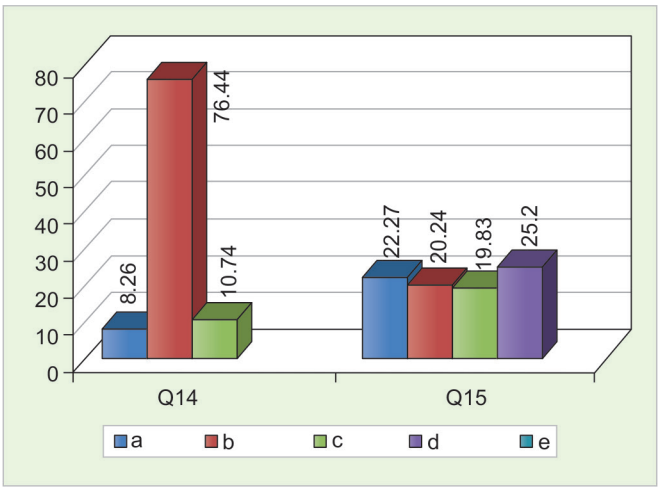
A majority practitioners, 21.48%, preferred GIC for luting a ceramo-metal crown to a zirconia core, 21.48%



Graph 3: Q7 to Q10



Graph 4: Q11 to Q13



Graph 5: Q14 to Q15

preferred resin cement: dual cure with etch and bond, 21.07% preferred resin cement: self-cure with etch and bond, 17.35% preferred resin-modified GIC, 9.09% preferred resin cement: self-etch and bond, and 5.37% preferred zinc phosphate cement.

For luting a lithium disilicate crown to a composite core, 33.05% preferred resin cement: dual cure with etch and bond, 22.72% preferred resin cement: self-cure with etch and bond, 14.04% preferred GIC, 11.57% preferred resin-modified GIC, 6.61% preferred resin cement: self-etch and bond, 4.54% preferred zinc phosphate cement.

Resin cement: self-cure with etch and bond was preferred by 28.92% for luting a lithium disilicate crown to a zirconia core, 25.20% preferred resin cement: dual cure with etch and bond, 16.62% left the question unanswered, 10.33% preferred resin-modified GIC, 7.02% preferred zinc phosphate cement, 7.85% preferred GIC, 3.71% preferred resin cement: self-etch and bond (Graph 4).

Failures of teeth restored with a post and core were rarely encountered by 76.44% practitioners, never encountered by 10.74%, and frequently encountered by 8.26%.

Failure was due to fracture of the tooth observed in 25.20%; 22.27% observed failure due to dislodgement of the post, 20.24% observed failure due to the dislodgement of the core from the post, 19.83% due to the dislodgement of the crown from the core, 7.85% left the question unanswered (Graph 5).

DISCUSSION

Extensive loss of coronal tooth structure necessitates the use of a post. The purpose of a post is to retain a core. When a large portion of the clinical crown has been lost due to damage, it is often impossible to achieve sufficient anchorage of a restoration in the remaining dentin. In such situations, a root canal-retained restoration is required as they provide restorations with enhanced retention and stability.[4] The results of the survey showed that a vast majority of the dental practitioners surveyed performed post and core procedures in their practice.

The requirement of a post in an anterior endodontically treated tooth is determined by the remaining coronal tooth structure and the functional requirements of the tooth. Anterior teeth with minimal loss of tooth structure may be restored conservatively with a bonded restoration in the access opening. A post is of little or no benefit in a structurally sound anterior tooth and increases the chances for a nonrestorable failure. If an endodontically treated anterior tooth is to receive a crown, a post is indicated as after root canal treatment and tooth preparation for a crown, the remaining coronal tooth structure is quite thin. Anterior teeth experience lateral and shear forces, and the pulp chambers are too small to provide adequate retention and resistance without a post.[5] Most practitioners did not use a post for all anterior endodontically treated teeth.

Custom-cast post and cores are recommended when coronal tooth structure loss is moderate to severe.[1] Studies have shown success rate of more than 90% after 5 years of service.[6,7] However, in our survey a prefabricated metal post with composite core buildup was the preferred choice by most practitioners in teeth with loss of more than two-thirds of the tooth structure.

In clinical situations in which the root has extensive damage or exhibits immature development, the use of a custom cast post would compromise esthetics as the gray tint of the metal may show through the thin root wall and the overlying gingival tissue would also appear darker or grayish.

With prefabricated metal posts, the core material can be composite, which may aid in masking the metallic color of the post. A ceramic crown with an opaque substructure may be necessary in situations where complete masking

is difficult. These solutions may not have an effect on the soft tissues unless a white-colored post is also used.

Fiber posts contain either carbon fiber or quartz fiber. They have a modulus of elasticity similar to dentin, which allows them to flex with the root when under stress and distribute the stresses throughout the tooth, making the root less susceptible to fracture. This may however allow movement of the core under a load. If a post has the same modulus of elasticity as the tooth but is thinner in diameter, it will flex more as compared with the tooth under a load. This may lead to microleakage under the crown and core buildup.

Zirconium oxide posts have a high flexural strength, are biocompatible, and are corrosion resistant. However, this material is difficult to cut intraorally and retrieve from the canal for retreatment.[8] Having a higher modulus of elasticity (200 MPa) than natural dentin (16.5–18.5 MPa), catastrophic stresses can be transferred to the root in the absence of a ferrule.[9] Thus, they are more prone to cause root fractures than fiber posts. Also, the surface of zirconia posts does not bond to resin composite materials.[10] Being weaker than metal posts, a thicker post is necessary which may require additional removal of radicular tooth structure.[5] When crown thickness is reduced, the color of foundation restoration shows through the non-opaque thin crown.[1]

In the present study, maximum practitioners surveyed preferred to use a glass fiber post and composite core under a lithium disilicate crown.

Endodontically treated molar teeth should receive a crown, but in most cases do not require a post. Unless the destruction of coronal tooth structure is extensive, the pulp chamber and canals provide adequate retention for a core buildup.[5] Most dental practitioners who participated in the survey did not use a post in all endodontically treated posterior teeth.

The custom cast post and core and silver amalgam are the materials of choice in a high stress situation where esthetics is not a prime concern. Glass ionomer cements perform poorly as a load-bearing core material due to its low fracture toughness. Composite has strength intermediate between amalgam and glass ionomer and is the material of choice when there is remaining coronal tooth structure to help support the core.[11] In the posterior region, a majority of the practitioners preferred a glass ionomer-based restorative core.

For cementation of typical porcelain-fused-to-metal crowns, cements should be easy to use, strong, bond well to the tooth, be insoluble in mouth fluids, cause no postoperative sensitivity, and be able to retain crowns without difficulty during normal service. However, cements should not be so strong that crowns removal is difficult and time consuming. Resin-modified GICs are stronger than conventional zinc phosphate, glass ionomer, and polycarboxylate cements and research has shown that these cements fulfill these characteristics better than other cements.[12] In the present survey, most practitioners preferred glass ionomer cement for luting a ceramo-metal crown to a cast metal core, amalgam core, glass ionomer-based restorative core material and composite core. For luting a ceramo-metal crown to a zirconia core, GIC and resin cement: dual cure with etch and bond were preferred.

The use of an adhesive technique is strongly recommended for all types of glass ceramics, including lithium disilicate, because it increases not only the retention but also the survival rates. Resin cements represent the ideal choice for all types of metal-free restorations, including nonetchable core materials, because of their ability to bond to different substrates, insolubility in the oral cavity, high mechanical resistance, and availability in various dentinal shades. Dual resin cement covers most of the clinical indications. Light-curing luting agents are appropriate for cementing veneers because of their thinness and high transparency. Self-curing cements may be used for less translucent restoration materials, such as alumina and zirconia.[13] If a resin cement is not to be used, a resin-modified GIC is the conventional luting cement of choice.[14] For luting a lithium disilicate crown to a composite core, majority of the practitioners preferred resin cement: dual cure with etch and bond. For luting a lithium disilicate crown to a zirconia core, most practitioners preferred resin cement: self-cure with etch and bond.

In the absence of a post or with the use of metallic posts in endodontically treated teeth, irreversible root fractures were more common. Coronal failures occurred more with the use of fiber posts.[15] The most frequent failure of fiber post restoration is post debonding which can happen on the post/cement or cement/dentin interface. The bond between glass fiber post and composite substrates is difficult to achieve by means of free radical polymerization bonding. This is because the organic component of fiber post is a polymer matrix that is highly cross-linked with a high degree of conversion and a small number of carbon–carbon double bonds on the surface.[2] A vast majority of the practitioners surveyed rarely encountered failures of teeth restored with a post and core.

CONCLUSION

Within the limitations of the present study, it can be concluded that:

- Post and core procedures are routinely performed by dental practitioners.
- Majority of the practitioners did not use a post for all endodontically treated teeth.

- A prefabricated metal post and composite core was preferred by practitioners in teeth with loss of more than two-thirds of the tooth structure.
- Most practitioners preferred a glass fiber post with composite core buildup under a lithium disilicate crown. A glass ionomer-based restorative core was preferred in the posterior region.
- Majority of the practitioners used GIC for luting of ceramo-metal crowns.
- Resin cement was the cement of choice for luting of lithium disilicate crowns.
- Failure of teeth restored with a post and core was rarely encountered by most practitioners and the most common cause of failure was due to fracture of the tooth.

SUMMARY

The survey carried out to analyze the different post and core buildup materials and luting agents for the cementation of the indirect restorations to the tooth–core substrate showed that post and core procedures are routinely performed in clinical practice. However, greater awareness regarding the indications for use of the different posts and selection of the luting agent is necessary.

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