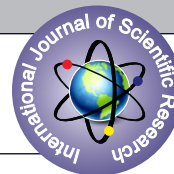


A SURVEY ON THE CURRENT TRENDS OF DIFFERENT POLISHING PROTOCOLS FOR MONOLITHIC ZIRCONIA RESTORATIONS AMONGST DENTAL PRACTITIONERS IN MUMBAI AND NAVI MUMBAI



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ABSTRACT

Aim: The aim of the survey been conducted was to evaluate the current trends of different polishing protocols for monolithic zirconia restorations amongst dental practitioners in Mumbai and Navi Mumbai.

Materials and methods: The survey questionnaire consisted of 10 questions aimed toward the current trends of different polishing protocols for monolithic zirconia restorations amongst dental practitioners in Mumbai and Navi Mumbai. This questionnaire was validated by a panel of experts and was sent to 450 dental practitioners in Mumbai and Navi Mumbai.

Results and conclusion: Majority of dental practitioners preferred Porcelain finishing burs to reduce the high point on monolithic zirconia restorations. Laboratory glazing was reported by 48% of dental practitioners, Chairside polishing was preferred by 15% of dental practitioners, 10% preferred chairside polishing followed by laboratory glazing and 26.4% cemented the crown without any polishing protocol. Porcelain polishing kit for carrying out chairside polishing was preferred by majority as against the zirconia polishing kit. The success rate of monolithic zirconia restorations observed by most of the dental practitioners was 5 years.

Clinical significance: This survey would bring about the awareness of the various methods used to reduce the high point and polish monolithic zirconia restoration.

KEYWORDS:

Monolithic Zirconia, Polishing Protocol, Chairside Polishing, High point adjustment

INTRODUCTION

Zirconia was introduced in dentistry in the early 1990s and used as a coping with layered ceramic. It was advocated as a restoration in crown and bridge to enhance esthetics which was not achieved with ceramometal prosthesis. Zirconia had high strength but had a weak link between the zirconia and the ceramic layer which lead to chipping of ceramic.²⁻⁴

Introduction of the monolithic zirconia in past ten years was to have a monoblock of zirconia to prevent the chipping of the ceramic layer. These are milled using CAD-CAM system. The type of zirconia used is presintered yttrium stabilized zirconia. This has high biocompatibility, flexural strength and fracture toughness.² In the dental laboratory today, different company monolithic zirconia are available mainly LAVA 3M ESPE, ZENOSTAR Ivoclar Vivadent, ZIECON Jyoti zirconia, AIDITE zirconia, BruxZir Zirconia and many more.

Chairside adjustment of zirconia restorations may be required to achieve optimal occlusion, which may be done with diamond finishing points. However, this causes loss of polished surface leading to increased surface roughness, microcracks, phase transformation on the surface.⁵ This roughened surface cause increased wear of opposing tooth during mastication, may propagate crack and lead to the fracture of restoration.⁶ These surfaces are often left unpolished or may be polished chairside or sent to laboratory for polishing. In case of laboratory polishing glazing is carried out which may wear out within few months leading to problems encountered with rough surfaces of zirconia.² There are other methods of polishing roughened zirconia which could be chairside zirconia polishing kits which may polish monolithic zirconia restorations effectively.

This survey was designed to gain information about the current trends of different polishing protocols for monolithic zirconia restorations amongst dental practitioners in Mumbai and Navi Mumbai.

MATERIALS AND METHODS

A survey was conducted among the dental practitioners in Mumbai and Navi Mumbai advocating the use of zirconia restorations. This survey was approved by the Research Committee and Institutional Ethics Committee. The survey questionnaire consisted of 10 questions aimed toward the current trends of different polishing protocols for monolithic zirconia restorations. Questionnaire was validated by a panel of experts and was sent to 450 dental practitioners as a printed

form. The survey forms were received and evaluated to assess the protocol followed by the dental practitioners for polishing of monolithic zirconia after occlusal correction.

SURVEY FORM

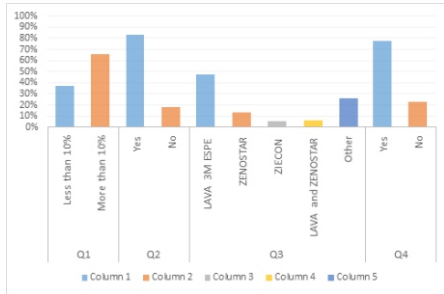
- What is the percentage of Zirconia crowns in your practice?
 - Less than 10%
 - More than 10%
- Do you use monolithic zirconia in your practice?
 - Yes
 - No
- Which is the most commonly used monolithic zirconia in your practice?
 - LAVA 3M ESPE
 - ZENOSTAR Ivoclar Vivadent
 - ZIECON Jyoti zirconia
 - AIDITE zirconia
 - Any other please mention _____
- If required do you reduce high points on the surface of zirconia crowns for occlusal adjustments?
 - Yes
 - No
- With what do you reduce the high point on monolithic zirconia?
 - Diamond abrasive points
 - Tungsten carbide bur
 - Porcelain finishing burs
 - Zirconia finishing burs
- What do you do after reduction of high point of monolithic zirconia crowns?
 - Cement the crown
 - Send it to laboratory for glazing
 - Do chairside polishing
 - Do chairside polishing and send it to lab for glazing
- What do you use for chairside polishing of zirconia?
 - Porcelain polishing bur/kit, name _____
 - Polishing paste, name _____
 - Chairside zirconia polishing kit, name _____
 - Any other _____
- Do you encounter fracture of monolithic zirconia restorations?
 - Yes
 - No
- If yes, what is the time span between the cementation and fracture of restorations you encountered?
 - Few months
 - 1 year
 - 3 years

d) 5 years

10. Do you prefer monolithic zirconia over veneered zirconia?
a) Yes b) No

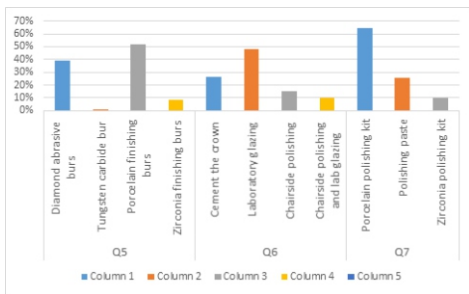
RESULTS

Questionnaires were received and evaluated, results were analyzed. Frequencies and percentages of all the questions and answers were calculated. The results of this study showed that 66% of dental practitioners used more than 10% of Zirconia restorations in their practice. Monolithic zirconia was used by 82.7% of dental practitioners in their practice. Out of which 47.2% used monolithic zirconia of LAVA 3M ESPE, 13.6% used ZENOSTAR Ivoclar Vivadent, 7% used both, 5.4% of dental practitioners used ZIECON Jyoti zirconia and 26.3% used other companies of monolithic zirconia which included BruxZir Zirconia. Among the dental practitioners 77.2% practitioners reduced high points on the surface of monolithic zirconia restorations for occlusal adjustments. (Graph 1)



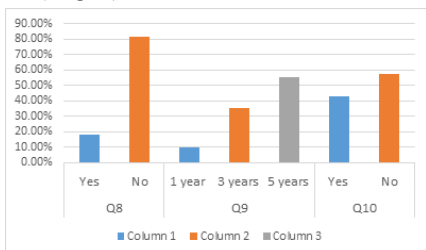
Graph 1(Q.1-Q.4)

Porcelain finishing burs were used by 51.7% of dental practitioners for the reduction of the high point on monolithic zirconia restoration, whereas 38.8% used diamond abrasive points which are used for tooth preparation and 8.1% dental practitioners utilized Zirconia finishing burs. After reduction of high point of monolithic zirconia restorations 48% of dental practitioners sent it to laboratory for glazing, 10% did chairside polishing and sent it to laboratory for glazing, 15% did only chairside polishing whereas 26.4% cemented the crown without any polishing of the surface. For chairside polishing of zirconia 64.28% of dental practitioners preferred Porcelain polishing kit, 25.7% preferred Diamond Polishing paste whereas 10% preferred the use of Chairside zirconia polishing kit. (Graph 2)



Graph 2 (Q.5-Q.7)

Fracture of monolithic zirconia restorations were encountered by 18.1% of dental practitioners in their practice. Out of which 55% of dental practitioners encountered 5 years of time span between the cementation and fracture of restorations, 35% encountered 3 years of time span and 10% encountered fracture in a year. Veneered zirconia was preferred over monolithic zirconia by 57.2% of dental practitioners. (Graph 3)



Graph 3(Q.8-Q.10)

DISCUSSION

This survey was carried out among dental practitioners advocating the use of zirconia restorations in their practice across Mumbai and Navi Mumbai. There is a change in trend from layered zirconia to monolithic zirconia. Monolithic zirconia is increasingly being used for crown and bridge restorations. This is attributed to increased hardness, wear resistance, fracture toughness, minimum tooth preparation of monolithic zirconia, resistance to corrosion and has low thermal conductivity.^{7,9} Nakamura et al¹⁰, carried out a study to evaluate fracture resistance of monolithic zirconia molar crowns with reduced thickness, they concluded that monolithic zirconia crown with chamfer width of 0.5 mm and occlusal thickness of 0.5 mm can be used in the molar region in terms of fracture resistance.¹⁰ In the present survey 66% of dental practitioners used Zirconia crowns and out of these 82.7% of dental practitioners use monolithic zirconia in their practice.

Among these 47.2% of dental practitioners used monolithic zirconia of LAVA 3M ESPE, others used ZENOSTAR Ivoclar Vivadent, ZIECON Jyoti zirconia and other companies of monolithic zirconia which included BruxZir Zirconia. All of these provide yttrium stabilized zirconia presintered blocks which then can be milled according to the design of the restoration made on the CAD software.⁷ It was shown from the study that LAVA 3M ESPE monolithic zirconia is widely used by dental practitioners followed by BruxZir Zirconia.

Among the dental practitioners 77.2% practitioners reduced high points on the surface of monolithic zirconia restorations for occlusal adjustments. The hardness of zirconia is high (1,160–1,300 HV), but lower than alumina (1,800–2,200 HV) and diamond (10,200 HV). Therefore, zirconia can be adjusted by the instruments coated with fine diamond abrasive grains. Coarse diamond burs can lead to microfracturing of the monolithic structure. This may affect the longevity of the restoration.⁹ Zirconia finishing burs are specifically manufactured with the fine diamond abrasives to reduce surface roughness of zirconia restorations, however in the present study the use of porcelain finishing burs (51.7%) and diamond abrasive points (38.8%) was more than the zirconia finishing burs (8.1%) which was preferred least by the dental practitioners. The increased use of porcelain finishing burs could be because of the earlier zirconia was layered with ceramic however, monolithic zirconia required specific type of burs to carry out reduction and polishing. Lack of availability and other more economical options may be the reasons for less preferred zirconia finishing burs. Many dental practitioners considered zirconia as an all ceramic material, however zirconia is a white metal and is an upcoming bioceramic.¹¹

After reduction of high point the monolithic zirconia can be polished chairside or in the laboratory which includes glazing. In vitro studies have reported that roughened zirconia surfaces cause wear of opposing enamel and hence need to be polished to reduce surface roughness.¹²⁻¹⁴ A study conducted by Janyavula S. et al¹⁵ evaluated wear of tooth structure opposing monolithic zirconia crowns divided into polished, glazed, and polished then reglazed groups, concluded that highly polished zirconia is wear-friendly to the opposing tooth than the glazed zirconia, and if the esthetics demands a glazed restoration, polishing the surface before glazing is advised. In the present study it was observed that after reduction of high point on monolithic zirconia restoration majority dental practitioners preferred sending it to laboratory which may be due to smooth finish obtained by glazing and less availability and popularity of chairside zirconia polishing kits. Chair-side polishing of zirconia is efficient, removes surface roughness, easy for the clinician and eliminates repeated laboratory procedures.^{7,13} Dental practitioners can opt for either methods of polishing the roughened surface of monolithic zirconia depending on the requirement of the case. For the chairside polishing, 64.28% of dental practitioners preferred Porcelain polishing kit for chairside polishing of zirconia, 25.7% preferred Diamond Polishing paste whereas 10% preferred the use of Chairside zirconia polishing kit.

Fracture of monolithic zirconia restorations were encountered by 18.1% of dental practitioners in their practice. Out of which 55% of dental practitioners encountered 5 years of time span between the cementation and fracture of restorations, 35% encountered 3 years of time span and 10% encountered fracture in a year. This involves number of factors other than surface roughness like the amount of the

occlusal load, the size and location of occlusal contacts and thickness of restoration. Due to attrition of adjacent natural teeth with time the restoration remains high and fracture under masticatory load may occur. A dental laboratory survey conducted by Sulaiman T. et al¹⁵, total of 39 827 restorations were evaluated over the reported period of 5 years, 2.06% of all anterior monolithic zirconia restorations failed because of catastrophic fracture of the restoration, whereas only 0.99% of all posterior monolithic zirconia restorations, so the overall fracture rate was low 1.09%. Whereas a dental laboratory survey over the period of 5 years conducted by Abdulmajeed A. et al¹⁶ reported overall rate of fracture of veneered zirconia was 3.47%. Layered zirconia restoration were preferred by 57.2% as expressed by the dental practitioners. This may be contributed to the aesthetic properties, cost effectiveness and years of practice of layered zirconia or ignorance to the introduction of the monolithic zirconia.²

Monolithic zirconia has been introduced to overcome the shortcomings of layered zirconia. However, the need to polish reduced surface of monolithic zirconia needs to be emphasized for the longevity of the restoration. More studies need to be carried out to observe the effect of the monolithic zirconia has on the opposing tooth and whether it is of advantage as a restoration.

CONCLUSION AND SUMMARY

Through analysis of the observations in this survey and within the limitations of the study, the following were the conclusions:

- Majority of dental practitioners preferred Porcelain finishing burs to reduce the high point on monolithic zirconia restorations.
- Laboratory glazing was reported by 48% of dental practitioners, Chairside polishing was preferred by 15% of dental practitioners, 10% preferred chairside polishing followed by laboratory glazing and 26.4% cemented the crown without any polishing protocol. Porcelain polishing kit for carrying out chairside polishing was preferred by majority.
- The success rate of monolithic zirconia restorations observed by most of the dental practitioners was 5 years.

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