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RESEARCH ARTICLE

KNOWLEDGE AND AWARENESS OF DENTAL PRACTITIONERS REGARDING ZIRCONIA IMPLANTS IN DENTISTRY

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ABSTRACT

Aim: To evaluate knowledge and awareness of the dental practitioners regarding zirconia implants.
Objective: To assess knowledge and awareness of the dental practitioners regarding zirconia implants.
Background: Dental ceramics is one of the most preferred materials in modern fixed prosthodontics. As a material in dental medicine, zirconia was introduced in the 1970s when different types of coverage for dental implants were investigated. The first use of zirconia oxide was with small amounts of aluminium oxide, in glass- infiltration ceramics. This was further led to the development of CAD/CAM technology.
Reason for study: This review is to help increase the awareness of the possible advantages and uses of zirconia in prosthodontics and to help increase advancements in the field to help improve the quality and functioning for patient satisfaction.
Materials and methods: A questionnaire consisting of 14 questions, to evaluate knowledge and awareness of the dental practitioners regarding zirconia implants was prepared. This was circulated to the 90 practitioners and the responses were collected.
Results: The responses for the 14 questions are represented as 14 pie charts, which were prepared using applications like survey plant and excel. The overall result showed that dentists were well aware of zirconia implants in dentistry.
Conclusion: from this study we could conclude that practitioners have good awareness of zirconia and its uses in prosthodontics. To improve the awareness of the population that isn't aware of this more camps, seminars and educational programmes can be organised.

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INTRODUCTION

The rehabilitation of completely and partially edentulous patients with dental implants Is a widely accepted and documented procedure (Gahlert, 2007). Currently, titanium and titanium alloys are the materials most often used in implant manufacturing and have become a gold standard for tooth replacement in dental implantology. These materials have attained mainstream use because of their excellent biocompatibility, favourable mechanical properties, and well documented beneficial results (Depprich, 2008 and Steinemann, 1998). When exposed to air, titanium immediately develops a stable oxide layer, which forms the basis of its biocompatibility. The properties of the oxide layer are of great importance for the biological outcome of the osseointegration of titanium implants (Sykaras, 2000).

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The principal disadvantage of titanium is its dark greyish colour, which often is visible through the peri-implant mucosa, therefore is less aesthetic in the presence of a thin mucosa. Recession of the gingiva may lead to compromised aesthetics. This is of main concern with respect to maxillary central incisors (Heydecke, 1999). Because of these disadvantages, novel implant technologies that produce ceramic implants are being developed (Kohal, 2004). Dental ceramics represent one of the major structural materials in modern fixed dentistry. As a material indental medicine, zirconium-dioxide was introduced in the1970s when different types of coverage for dental implants were investigated (Cranin, 1975). The first use of zirconium-dioxide in fixed prosthodontics was when small amounts of aluminiumoxide (Al2O3), in glass-infiltrated ceramic) were replaced by zirconium-dioxide crystals (ZrO2). Later on, the development of zirconium-dioxide was followed by the development and improvement of CAD/CAM technology, as the only commercial way for making

restorations in fixed prosthodontics from this material. To understand the values of zirconium-oxide ceramics and its excellent mechanical properties, the development of dental ceramics in general must be considered. Most dental ceramics consist of an amorphous part and crystals. The amount and size of crystals determine the mechanical properties. The amorphous part predominantly consists of SiO2 (glass), which gives ceramics an aesthetically pleasant and natural looking appearance (translucency), and insures chemical bond with resin cements. Demands for better aesthetics and natural looking appearance led to development of new ceramics with increased amount of crystals that could withstand greater forces and can be used as a single material without metal framework. These were glass-infiltrated ceramics, that are crystalline-based systems (mostly alumina, Al2O3) with added glass, and glass-ceramics, that are glass-based systems with added crystals. But, due to its limited mechanical properties, they could only be used in up to three-unit bridges in premolar region. Because of this, new polycrystalline ceramics, such as aluminium-oxide and zirconium-oxide ceramics were introduced. These ceramics consist only of crystals and do not have an amorphous part. However, ceramics are known to be sensitive to shear and tensile loading, and surface flaws may lead to early failure. These realities imply a high risk for fracture (Andreiotelli, 2009). In recent years, are considered to be inert in the body and exhibit minimal ion release compared with metallic implants. Material composition and surface topography of a biomaterial play a fundamental role in osseointegration. According to Albrektsson *et al*, the quality of the implant surface is one major factor that influences wound healing at the implantation site and subsequently affects osseointegration (Albrektsson, 1981). Therefore, various chemical and physical surface modifications have been developed to improve osseous healing. To improve surface properties, 2 main approaches may be used, such as optimising the micro-roughness (sandblasting, acid-etching) or applying bioactive coatings such as calcium phosphate, bisphosphonate, collagen (Langhoff, 2008). Due to the new innovations and possible future of ceramic implants it is important for the practitioners to be aware about the field and possible uses to help improve the patient satisfaction. Hence this study is aimed to assess the knowledge and aptitude of the practitioners regarding zirconia implants.

MATERIALS AND METHODS

The study was performed with the help of a questionnaire that was circulated to 90 dental practitioners. There was no restriction on the age of the practitioner or the field of dentistry the practitioner belonged to. The questionnaire consists of 14 questions that are useful in assessing the s knowledge and awareness of the practitioners regarding zirconia implants.

The questionnaire

Do you know indications for zirconia implants?*

- Yes
- No

What is the success rate of implant surgery?*

- 90%
- 80%
- 70%
- 60%

Can a patient with lack of healthy bone be a good candidate ?*

- Yes
- No

How long does an implant take to bond to bone in lower jaw?*

- 3-4months
- 4-5months
- 7-8months
- 9-10months

How long does implant take to bond to bone in upper jaw?*

- 5-6months
- 7-8months
- 9-10months
- 11-12months

Which implant is easier to clean and maintain?*

- Zirconia Implant
- Titanium Implant

Do zirconia implants have a tendency to fracture?*

- Yes
- No

Which has greater incidences of bleeding and inflammation?*

- Zirconia implant
- Titanium implant

Which has a higher rate of failure?*

- Titanium implant
- Zirconia implant

In case of failure of implant which is easier to remove?*

- Zirconia implant
- Titanium implant

Which has greater marginal bone loss?*

- Zirconia implant
- Titanium implant

Which type of thread has higher success rate?*

- V thread
- Square
- Reverse buttress
- Buttress

What radio graphic aids are used for treatment planning ?*

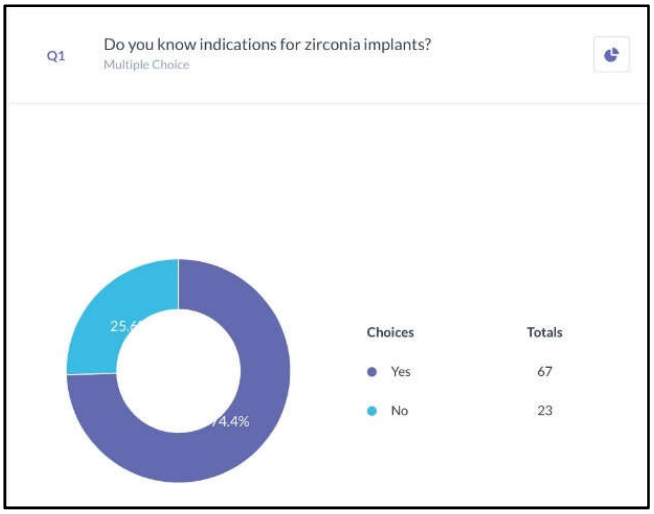
- CBCT
- OPG
- IOPA

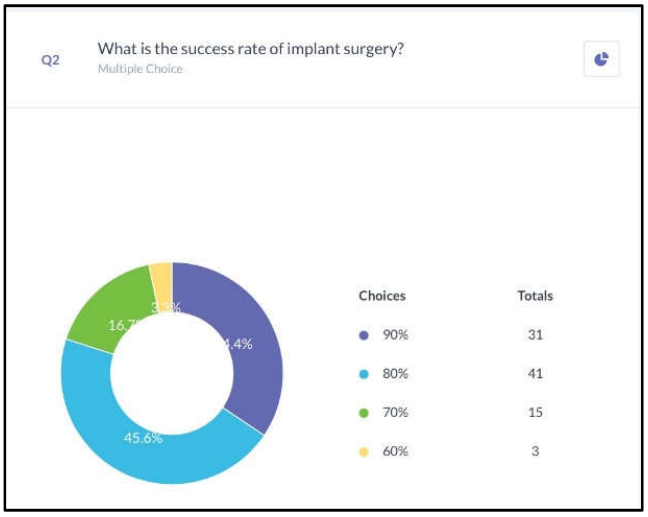
Which type of prosthesis is preferred for a zirconia implant?*

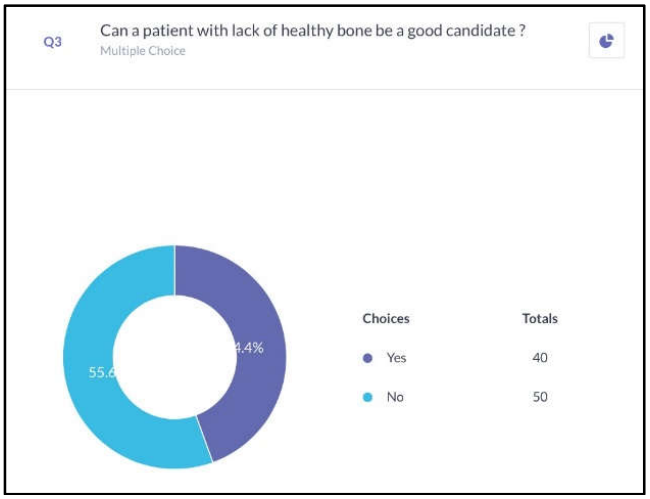
- Cement retained
- Screw retained

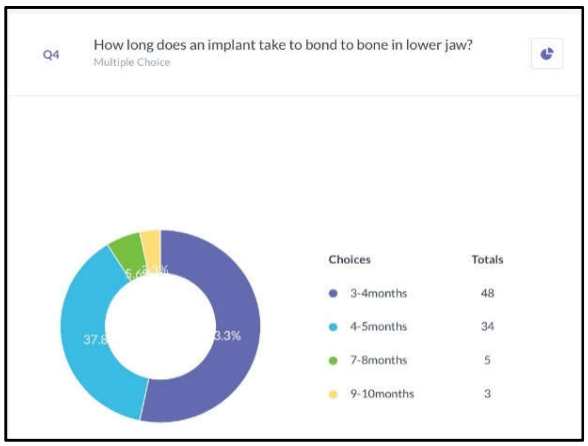
RESULTS

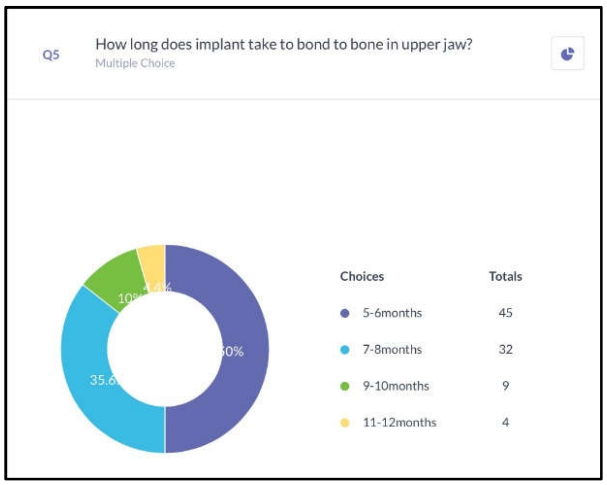
In this study a total of 90 practitioners participated. Out of the total 65 were male practitioners and 25 were female practitioners. 55 of the total participants were specialist such as prosthodontists and implantologists while the remaining 35 were general dentists. The outcome of the study varied from other studies with regard to the sample size and participants chosen. The graphical representation of the responses of the 14 questions of the questionnaire are depicted below:

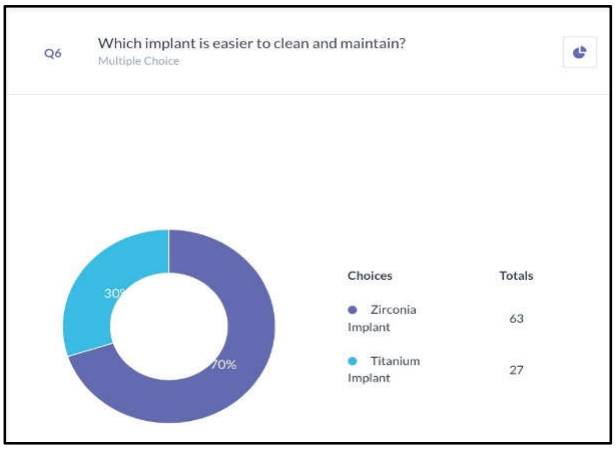


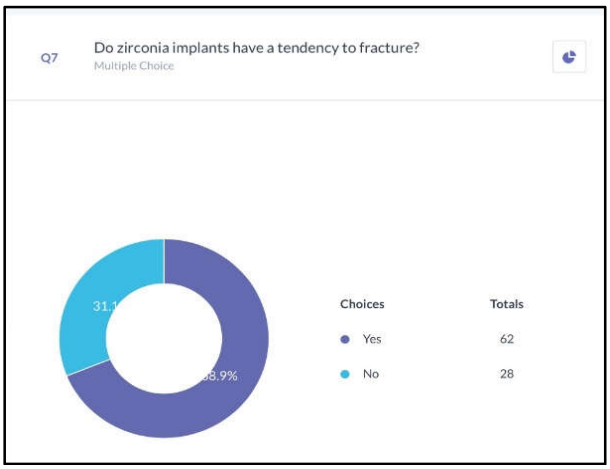


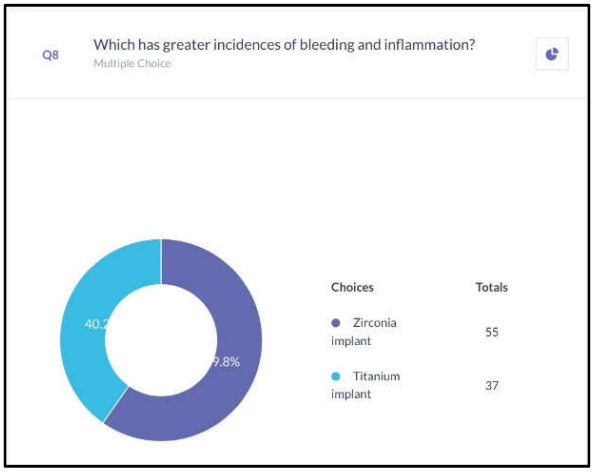


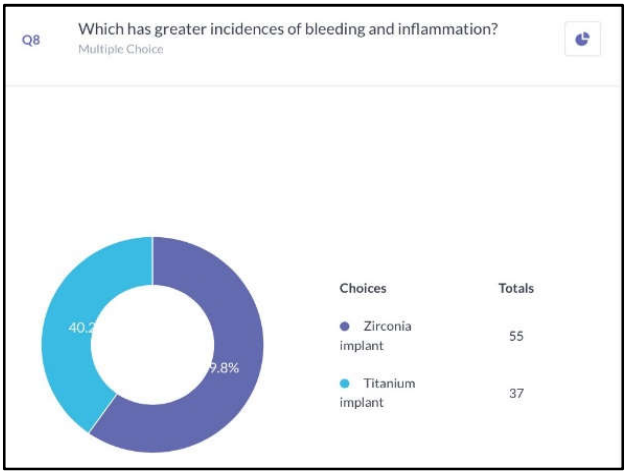


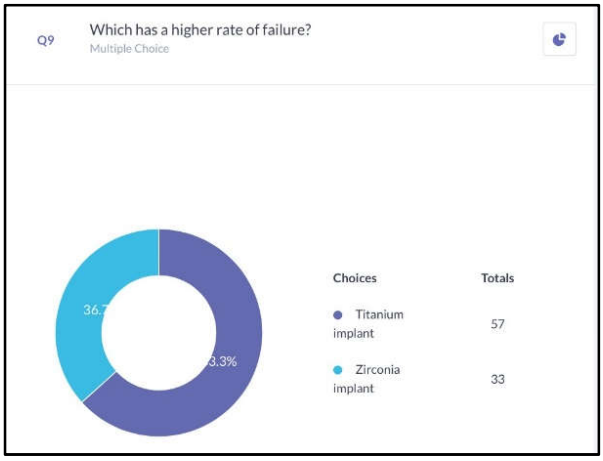


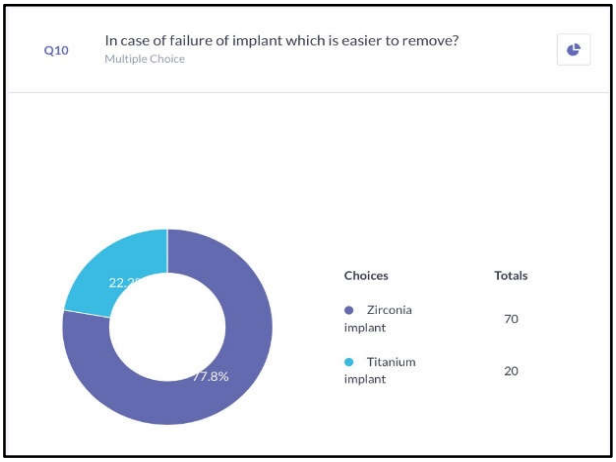


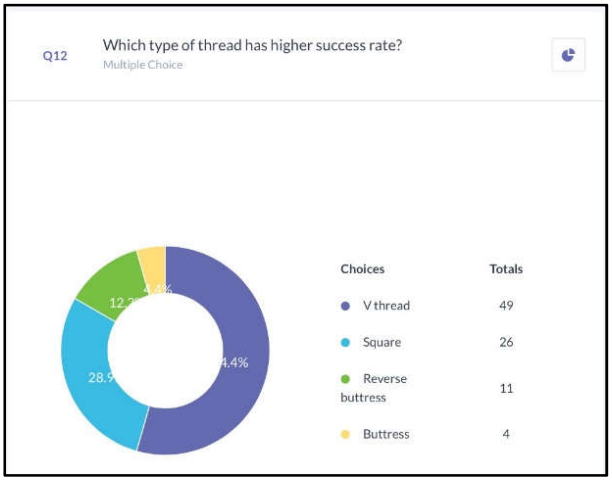


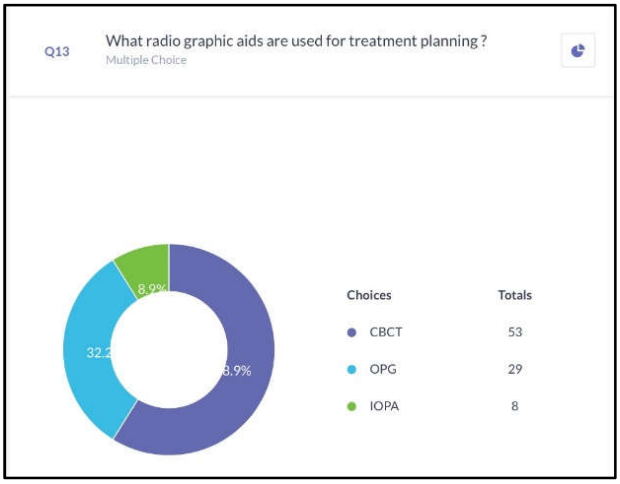

Q8
Which has greater incidences of bleeding and inflammation?
Multiple Choice
Choices
Totals
Zirconia implant
55
Titanium implant
37

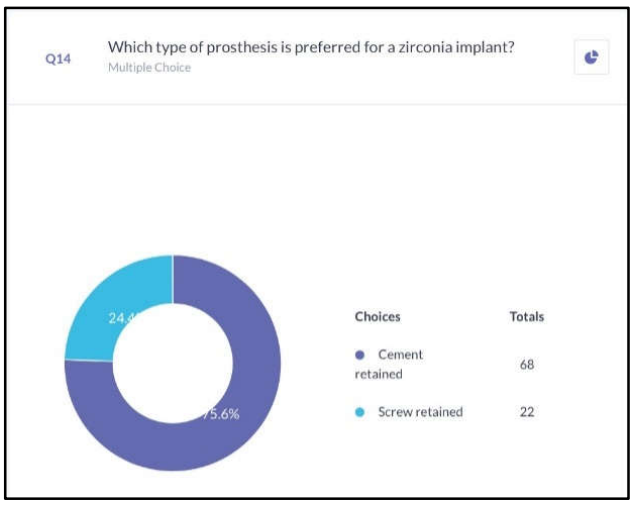

Q8
Which has greater incidences of bleeding and inflammation?
Multiple Choice
Choices
Totals
Zirconia implant
55
Titanium implant
37


Q9
Which has a higher rate of failure?
Multiple Choice
Choices
Totals
Titanium implant
57
Zirconia implant
33


Q10
In case of failure of implant which is easier to remove?
Multiple Choice
Choices
Totals
Zirconia implant
70
Titanium implant
20


Q12
Which type of thread has higher success rate?
Multiple Choice
Choices
Totals
V thread
49
Square
26
Reverse buttress
11
Buttress
4


Q13
What radio graphic aids are used for treatment planning ?
Multiple Choice
Choices
Totals
CBCT
53
OPG
29
IOPA
8


Q14
Which type of prosthesis is preferred for a zirconia implant?
Multiple Choice
Choices
Totals
Cement retained
68
Screw retained
22

The 14 graphs above depict the percentage of responses of 90 practitioners for each of the 14 questions of the given questionnaire. On comparison of the responses with the key it showed that more than 60% of the participants scored a percentage of 50% or above.

DISCUSSION

The first question suggest that 74.4% of the practitioners know about zirconia implants while the remaining 25.6% do not. The success rate of implant surgery is 95-99% for the first 5 year and the decreases to 90% subsequently in after years, only 34.4% of the candidates picked the correct response which is 90%. (Nothdurft, 2011). Any good candidate for an implant must be one with sufficient residual ridge and alveolar bone of desirable thickness in order to support the implant and prevent failure of fracture (Guess, 2012). In questions 4 and 5 respectively the osseointegration of the implant in the mandible and maxilla are 3-4 and 5-6 months respectively ,as the maxilla being cancellous bone takes a longer time to integrate with implant when compared to the mandible which is thicker and cortical in nature.[13] 68.9% of the practitioners believe that zirconia implants have a tendency to fracture as they are ceramics and can hence take less amount of tensional load hen compared to titanium implants (Nothdurft, 201 and Gupta , 2011). In question number 8 around 59.8% of the people believe that zirconia has a greater tendency to cause bleeding and inflammation as opposed to the remaining 40.2% that say titanium will have a greater chance. This shows that the practitioners are unaware of the fact that zirconia as a ceramic is more biocompatible and due to the less invasive screw as compared to the titanium implant which is highly invasive tends to cause far less bleeding and post-operative inflammation (Gupta, 2016).

Zirconia dental implants have a greater rate of failure when compared to titanium implants due to their poor flexural strength, but only 36.75 of the practitioners believed this was true. In case of failure of implant zirconia implants are more difficult to remove, as during removal the tend to fracture and break into smaller fragments thus requiring more probing into the tissue. Titanium implants can be screwed out place with far less effort (Gomes, 2011). Only 22.2% of practitioners said that titanium implants could be removed easily in case of failure. 48.9% and 51.9% of the practitioner said that zirconia and titanium implants have greater marginal bone loss respectively. Titanium implants due to the reason of drilling into the bone and groove engagement of the screw into the bone can cause resorption and lead to greater marginal bone loss than zirconia implants (Rubén Agustín-Panadero, 2014). V thread has been noticed to have a greater success rate over square, buttress and reverse buttress as answered by 54.4% of the practitioners. CBCT was considered the best radiographic aid in treatment planning for implants by 58.9% of the practitioners which is due to the 3D representation of the jaw and also as it shows the bone density which helps in deciding whether the candidate is suitable for an implant (Manicone, 2007). 75.6% of the practitioners preferred cement retained prosthesis over the screw retained. This is because of the Independent orientation and enhanced aesthetics of cement retained prosthesis as compared poor aesthetics and dependent angulation if the screw retained prosthesis (Wilson, 2009). The lack of awareness could be due to the lack of specialisation of the dental practitioners who took part in the study. The participants who had either completed their masters in any field or had done a fellowship in implantology had a much greater awareness about zirconia implants andits uses in comparison to the general dental practitioners

Conclusion

The awareness of the dental practitioners about zirconia implants can be increased by increasing the no.of camps, symposia. Zirconia as dental ceramic has a very important use in dentistry and is also considered to be the future of its field. It is important that the practitioners be aware of its uses, advantages and disadvantages in order to help them improve the efficiency of health care in dentistry and to improve patient satisfaction and comfort.

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