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ORIGINAL ARTICLE

The comparative preference between zirconia and e-max among dentists in Saudi Arabia

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ABSTRACT

Background: For years, porcelain fused to metal restoration was the first demanded restoration, but nowadays the demand of metal-free restoration such as zirconia and e-max has increased due to its high esthetic appearance that matches the natural teeth appearance. This study aimed to declare the comparative preference between Zirconia and e-max among dentists in Saudi Arabia.

Methodology: A survey was prepared consisting of 11 questions with multi-choice answers to investigate the preference between Zirconia and e-max among dentists in Saudi Arabia. During December 2018 and January 2019, this survey was sent via email to (1,100) dentists in Saudi Arabia.

Results: The answers of 1,000 dentists were received. The dentists varied in gender, age, location type, region, and their practical experience. The highest percentage of dentists was owners of a private clinics and associates/employers of a private clinics. The highest percentage of the dentists preferred lithium dislocate (e.g., e-max) more than zirconia and layered zirconia for both anterior and posterior teeth. Statistically, there was an obvious relationship between the dentist's experience, location type, and their preference between either e-max or zirconia.

Conclusion: By studying these results, e-max is preferred among dentists more than layered zirconia and all-zirconia. Few studies have focused on the comparative preference between e-max and zirconia in oral cavity among dentists in Saudi Arabia and most of them were trials.

Keywords: Zirconia, e-max, dentists preference, all-zirconia, layered zirconia.

Introduction

Dental restoration is very important for preservation of tooth integrity and regaining esthetic appearance of the teeth [1]. There are many factors related to the properties of the dental restoration material affecting the success of the dental restoration like its mechanical properties, surface texture of the restoration, its color shades and degree of translucency, and finally its anatomical form [2]. For several years, porcelain fused to metal crown was considered the most commonly used esthetic crown due to its esthetic appearance, excellent mechanical properties, and in-costive restoration in comparison with many other esthetic restorative materials [3]. With time, the demand of metal free ceramic restoration has increased to avoid the disadvantages of unaesthetic metal appearance specially in anterior teeth [4,5]. The most common metal free aesthetic restoration recommended nowadays that apply required mechanical and esthetic properties are zirconia and e-max lithium disilicate crowns [6]. E-max crown is a type of all ceramic restorations made from lithium disilicate ceramic block. The main difference between e-max and zirconia crowns is that e-max crown is more translucent than zirconia [7]. So, e-max is recommended in teeth without stains, while in dark teeth with existing stains, zirconium crowns are recommended which prevent

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stain appearance under it [8]. Zirconia restoration has two types [9]: layered zirconia and all-zirconia. Layered zirconia (e.g., Lava) is a type of zirconia restorations that obtain high esthetic appearance, considerable strength, and flexibility needed for both anterior and posterior teeth. Many laboratory tests have shown that fracture toughness and flexural strength of zirconia (1,200 MPa) is higher than other all ceramic materials. These types of restorations are cemented using resin cement which also can be easily adjusted in the clinic using diamond bur or greenstone [10]. On the other hand, all zirconia (e.g., Bruxzir) are the type of restorations that require minimal reduction of the tooth, it is designed and milled using CAD/CAM technology. It is recommended for posterior teeth more than anterior teeth due to decreased esthetic appearance compared with layered zirconia, also it has more strength. This type of restorations should be glazed and polished well to avoid wearing or chipping of the opposing teeth [11].

Subjects and Methods

An online survey was prepared during December 2018 and January 2019 consisting of 11 questions for investigating the comparative preference between zirconia and e-max among dentists in Saudi Arabia (Table 1). The survey was sent via email to 1,100 dentists in Saudi Arabia. They were asked to participate in the survey by answering the 11 questions from their points of view.

Results

The answers from 1,000 dentists were received. The dentists showed high difference and variety in their answers. The answers were counted for the first nine questions and are shown in Table 2, the percentage of each answer was also calculated separately. Then, the results of last two questions (10,11) were counted and presented in Table 3, both questions were about a special case at low risk for dental decay with minimal wear and supposed to make crown on two different teeth. The statistical analysis using statistical package for the social sciences software version 16 was done to study the correlations between the dentists regarding results of question no. 10 (Table 4), and Table 5 for studying the correlations between the dentists regarding results of question no. 11.

The dentists who participated in the survey had a mean of age (36.9 ± 4.8). The male and female dentists who participated in the survey were exactly equal in number. Dentists who had graduated since less than 5 years were the highest with percentage (64%) and the dentists who graduated since (5–15) years ranked second with percentage (24%), while dentists who graduated since more than 15 years were the least with percentage (12%). The highest percentage of dentists were owners of a private practice (29.9%) and next were associates/employers of a private practice (20%), while public health practitioners ranked third with percentage (15%). Dentists from east ranked first with percentage (34%),

***Table 1**. Survey containing (11) questions with multi-choice answers.*

Age
Sex: • Male • Female
Years since graduation • <5 • 5-15 • >15
Practice type • Owner of a private practice • Associate/employer of a private practice • Health Partners Dental Group • Associates Dental Group • Other managed care • Public health practice • Federal facility • Academic institution
Region • West • East • North • South • Middle
Practice busyness • Too busy to treat all cases • Provided care to all cases , but overburdened • Provided care to all, not overburdened • Not busy enough
Insurance coverage of patients • <40% • 40%–79% • >80%
Hours work/week • ≥32 hours • <32 hours
Location type • Urban • Suburban • Rural
Assume that "your patient is a 40-year male who attends his annual recall visits on a dependable basis, has no relevant medical history, is at low risk for dental decay, has satisfactory occlusion with minimal wear, and is financially able to pay for a crown out-of-pocket." Suppose you are doing a routine single-unit crown on tooth #19. What material would you most likely recommend? • All-zirconia (e.g., Bruxzir) • Layered zirconia (e.g., Lava) • Lithium disilicate (e.g., e-max) • explain your choice in short sentence: Suppose you are doing a routine single-unit crown on tooth #8. What material would you most likely recommend? • All-zirconia (e.g., Bruxzir) • Layered zirconia (e.g., Lava) • Lithium disilicate (e.g., e-max) explain your choice in short sentence

while dentists from west ranked second with percentage (27%), and those from the middle-east ranked third with percentage (15%). The dentists were equal in percentage for their practicing busyness status with percentage (25%)

Table 2. *Results of the first (9) questions of the survey.*

Characteristics	*N* (%)
Age (mean ± SD)	36.9 ± 4.8
Sex	
Male	500 (50%)
Female	500 (50%)
Years since graduation	
<5	640 (64%)
5–15	240 (24%)
>15	120 (12%)
Practice type	
Owner of a private practice	299 (29.9%)
Associate/employer of a private practice	200 (20%)
Health Partners Dental Group	51 (5.1%)
Associates Dental Group	110 (11%)
Other managed care	73 (7.3%)
Public health practice	150 (15%)
Federal facility	10 (1%)
Academic institution	107 (10.7%)
Region	
West	270 (27%)
East	340 (34%)
North	140 (14%)
South	100 (10%)
Middle	150 (15%)
Practice busyness	
Too busy to treat all cases	250 (25%)
Provided care to all cases , but overburdened	250 (25%)
Provided care to all, not over-burdened	250 (25%)
Not busy enough	250 (25%)
Insurance coverage of patients	
<40%	240 (24%)
40%–79%	250 (25%)
>80%	510 (51%)
Hours work/week	
≥32 hours	596 (59.6%)
<32 hours	404 (40.4%)
Location type	
Urban	700 (70%)
Suburban	200 (20%)
Rural	100 (10%)

Table 3. *Answers regarding question no. (10,11).*

Questions/answers	*N* (%)
What material would you most likely recommend on tooth #19?	
All-zirconia (e.g., Bruxzir)	260 (26%)
Layered zirconia (e.g., Lava)	240 (24%)
Lithium disilicate (e.g., e-max)	500 (50%)
What material would you most likely recommend on tooth #8 ?	
All-zirconia (e.g., Bruxzir)	270 (27%)
Layered zirconia (e.g., Lava)	280 (28%)
Lithium disilicate (e.g., e-max)	450 (45%)

for the four choices. More than half of the dentists treated patients with insurance coverage >80%, while those dentists who treated patients with insurance coverage <40% or ranging from 40%–79% were semi-similar with percentages (24%) and (25%), respectively. Dentists who worked ≥32 hours/week were (59.6%) more than those who worked less than 32 hours/week (40.4%). Urban dentists ranked first in participation with percentage (70%), suburban ranked second in participation with percentage (20%), while rural dentists ranked third in participation with percentage (10%).

It is clear from the results that lithium disilicate (e.g., e-max) ranked first by dentists for both teeth #19 and #8 with varying percentage (45%) for tooth #8 and (50%) for tooth #19. The dentists were different in selecting the other types of zirconia for both teeth. For tooth #19, all-zirconia (e.g., Bruxzir) ranked second for preference among the dentists with percentage (26%), while layered zirconia (e.g., Lava) ranked third with percentage (24%). On the other hand, for tooth #8, Layered zirconia (e.g., Lava) ranked second for selection by the dentists with percentage (28%) while all-zirconia (e.g., Bruxzir) ranked third with percentage (27%). This indicated more preference for layered zirconia in anterior teeth more than all-zirconia as the esthetic appearance of the layered zirconia is better than all-zirconia, while in posterior teeth all-zirconia is more preferred than layered zirconia as all-zirconia accommodate the occlusal forces and does not require heavy reduction of the teeth.

Dentists who recommended lithium disilicate for tooth #19 were half of the total number of participants (50%), 27% of them were females and 23% were males. On the other hand, dentists who recommended all-zirconia ranked second with percentage (26%) in which male and female percentage were equal (13%) for both, while dentists who recommended layered zirconia were (24%) of the whole dentists and the highest percentage of them were male dentists (14%) and only (10%) for female dentists. Dentists who graduated since less than 5 years ranked first in recommending the three types of restorations, while all dentists who graduated since more than 15 years recommended only lithium disilicate for tooth #19. The dentists who recommended lithium dislocate were close in their practicing busyness status, while dentists who recommended all-zirconia were mostly too busy to treat all cases (10%) and not busy enough (8.6%). On the other hand, most of dentists who recommended layered zirconia provided care to all cases, but overburdened (10%) and second were dentists who provided care to all but not overburdened (8%). Most of dentists who recommended lithium disilicate worked ≥32 hours/week (48%) and only (2%) of the dentists worked <32 hours/week. The highest percentage of dentists who recommended all-zirconia and layered zirconia worked less than 32 hours/week with percentages (24.4%) and (14%), respectively. Urban dentists ranked first in recommending the three restoration types, suburban ranked second in recommending both all-zirconia and lithium disilicate, while rural and suburban were equal in percentage for recommending layered zirconia (7%) for both of them. Rural dentists did not recommend lithium disilicate and only (3%) of recommended all-zirconia

Table 4. *Correlations regarding results of question no. 10.*

Characteristics	All-zirconia (260) *N* (%)	Layered zirconia (240) *N* (%)	Lithium disilicate (500) *N* (%)
Sex			
Male	130 (13%)	140 (14%)	230 (23%)
Female	130 (13%)	100 (10%)	270 (27%)
p-value = 0.09			
Years since graduation			
<5 (640)	200 (20%)	140 (14%)	300 (30%)
5–15 (240)	60 (6%)	100 (10%)	80 (8%)
>15 (120)	0 (0%)	0 (0%)	120 (12%)
p-value = 0.01			
Practice busyness			
Too busy to treat all cases	100 (10%)	25 (2.5%)	125 (12.5%)
Provided care to all cases, but overburdened	30 (3%)	100 (10%)	120 (12%)
Provided care to all, not overburdened	44 (4.4%)	80 (8%)	126 (12.6%)
Not busy enough	86 (8.6%)	35 (3.5%)	129 (12.9%)
p-value = 0.07			
Hours work/week			
≥32 hours (596)	16 (1.6%)	100 (10%)	480 (48%)
<32 hours (404)	244 (24.4%)	140 (14%)	20 (2%)
p-value = 0.04			
Location type			
Urban (700)	130 (13%)	100 (10%)	470 (47%)
Suburban (200)	100 (10%)	70 (7%)	30 (3%)
Rural (100)	30 (3%)	70 (7%)	0 (0%)
p-value = 0.03			

Table 5. *Correlations regarding results of question no. 11.*

Characteristics	All-zirconia (270) *N* (%)	Layered zirconia (280) *N* (%)	Lithium disilicate (450) *N* (%)
Sex			
Male (500)	100 (10%)	180 (18%)	220 (22%)
Female(500)	170 (17%)	100 (10%)	230 (23%)
p-value = 0.06			
Years since graduation			
<5 (640)	249 (24.9%)	263 (26.3%)	128 (12.8%)
5–15 (240)	20 (2%)	16 (1.6%)	204 (20.4%)
>15 (120)	1 (0.1%)	1 (0.1%)	118 (11.8%)
p-value = 0.03			
Practice busyness			
Too busy to treat all cases (250)	70 (7%)	71 (7.1%)	109 (10.9%)
Provided care to all cases, but overburdened (250)	57 (5.7%)	79 (7.9%)	114 (11.4%)
Provided care to all, not overburdened (250)	69 (6.9%)	69 (6.9%)	112 (11.2%)
Not busy enough (250)	74 (7.4%)	61 (6.1%)	115 (11.5%)
p-value = 0.4			
Hours work/week			
≥32 hours (596)	96 (9.6%)	100 (10%)	400 (40%)
<32 hours (404)	174 (17.4%)	180 (18%)	50 (5%)
p-value = 0.02			
Location type			
Urban (700)	52 (5.2%)	200 (20%)	448 (44.8%)
Suburban (200)	119 (11.9%)	80 (8%)	1 (0.1%)
Rural (100)	99 (9.9%)	0 (0%)	1 (0.1%)
p-value = 0.01			

Lithium disilicate ranked first by the dentists for tooth #8 (45%), male and female dentists were near in selecting this restoration type 23% for females and 22% for males. On the other hand, dentists who recommended layered zirconia ranked second with percentage (28%) in which male dentists were more than female dentists (18% for male and 10% for female), while dentists who recommended all-zirconia were (27%) of the whole dentists and the highest percentage of them were female dentists (17%) and only (10%) for male dentists. Dentists who graduated since less than 5 years ranked first in recommending all-zirconia and layered zirconia with percentage (24.9%) and (26.3%), respectively, while dentists who graduated since 5–15 years ranked first in recommending lithium disilicate with percentage (20.4%). The dentists who recommended lithium disilicate were close in their practicing busyness status. The highest percentage of dentists who recommended layered zirconia provided care to all cases, but overburdened (7.9%), while 7.1% of the dentists were too busy to treat all cases and (6.9%) of the dentists provided care to all, not overburdened. The highest percentage of dentists who recommended all-zirconia were not busy enough (7.4%), while (7%) of the dentists were too busy to treat all cases and (6.9%) of the dentists provided care to all and not overburdened. Most of dentists who recommended lithium disilicate worked ≥32 hours/week with percentage (40%) and only (5%) of the dentists worked <32 hours. The highest percentage of dentists who recommended all-zirconia and layered zirconia worked less than 32 hours/week with percentage (17.4%) and (18%), respectively. Urban dentists ranked first in recommending both lithium disilicate and layered zirconia, while suburban were the highest in recommending all-zirconia. Most of rural dentists recommended all-zirconia with percentage (9.9%), while only (0.1%) recommended lithium disilicate.

Discussion

Zirconia use has highly increased since a few years due to its high mechanical and biological properties, but it lacks the translucency that lithium disilicate (e.g., e-max) possess, so zirconia restorations are limited in areas where high esthetic is more recommended [12]. Also, the ability of bonding e-max to the tooth structure gives lithium disilicate more advantages over zirconia. E-max restoration is a highly esthetic restoration which matches with the patient's natural teeth appearance [13]. The risk of chipping of e-max crown is less than zirconia crown, while very thin e-max or zirconia crown may fracture during try-in step and occlusal adjustment [14]. Both full zirconia and e-max crown can be used as a single restoration for both anterior and posterior teeth, while multiple unit of e-max are not recommended for posterior teeth due to increased liability of fracture [15]. A previous study comparing the transmittance between zirconia and e-max has been done between two types of both zirconia and lithium disilicate (conventional and high translucency). Transmittance analysis was done using the electron microscope. Analysis has shown the highest transmittance of all materials studied, followed by conventional lithium disilicate, high translucency zirconia, and conventional zirconia [16].

Conclusion

The choice between e-max, all-zirconia, and layered zirconia among the dentists in Saudi Arabia is varied and different but mostly e-max is preferred over all-zirconia and layered zirconia. There is a scarcity in studies that were conducted on the comparative preference between e-max and zirconia in oral cavity among dentists in Saudi Arabia, also most of them were trials and showed unclear results. It is recommended to establish more studies which focus on understanding the preferred type of both among Saudi Arabian dentists.

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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Consent for publication

Informed consent was obtained from all participants.

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