



Subjective Differences between Dentists and Patients about Relative Quality of Metal Ceramic Restorations placed in the Esthetic Zone

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ABSTRACT

Introduction: Esthetic perceptions could differ between the dentist and his patients among various regions and cultures.

Aim: The aims of this study were to evaluate the subjective differences between the dentist and the patient in terms of esthetics of metal-ceramic crowns (MCcs). The study also aims to compare the mesiodistal (MD) and buccolingual (BL) dimensions of the cemented crown with its respective natural antimeric tooth.

Materials and methods: A total of 85 patients seeking treatment for a single crown (MC) were treated by the undergraduate students under supervision of respective academic staff. After cementation of the crowns, a 9-point questionnaire was given to patient and different dentists. A treatment cast for every single crown was poured. Then, the MD and BL dimensions of the crowns were compared against their respective antimeric tooth.

Results: The dentists and the patients agreed in the range of 50.5 to 90.5%. Least subjective differences were found for the length and width of the cemented crowns. The highest differences were noted for symmetry between the cemented crown and its antimeric natural tooth. A total of 31 to 38% of the patients differed from the dentist's evaluation for shade of the crown, color of the crown at the margin, contour of the crown, and the relationship of the crowns with the surrounding gingiva. The highest MD and BL dimensions were in the cemented crown of canines, while the lowest MD and BL diameters were for the cemented crowns of the lateral incisor crowns.

Conclusion: Dentist and patient mostly agreed in terms of length (90%), width (81%) and relation of crown with free gingiva (74%). However, they differed mostly on the symmetry of the

cemented crowns. The highest MD dimensions and BL diameter were in the cemented MCcs of canine, while the lowest were with lateral incisors.

Clinical significance: While fabricating a dental prosthesis, the dentist must know about patients' perception of esthetics; otherwise both clinical and laboratory efforts would not be enough to satisfy the esthetic needs of the patient even if the restoration is technically correct. Perceptions related to symmetry differ mostly between dentist and patient.

Keywords: Antimeric tooth, Dental porcelain, Dental symmetry, Teeth proportions.

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INTRODUCTION

Among various concerns of dental patients seeking prosthetic treatment, the concern for esthetics duly satisfied by dentist augments patient's acceptance of dental prosthesis. Besides scientific, technical, and psychological factors, there are also differences in the perception of a beautiful smile between various cultures.¹ Conceptual differences in the demands between the patients and their dentists about esthetics do exist, and could be a leading cause of patient's dissatisfaction with the treatment. For a dentist, the primary goal is re-establishing esthetics and functions, so as to feel confident about smiling without the patient hiding his teeth.^{2,3} Discrepancy between dentist and patients' perception of esthetic has resulted in esthetic appearances that are lower than patient expectation.^{4,5} Subtle differences between the patient and their

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dentists that may have an outcome on the expectations of the patients need to be identified during the diagnostic phase.⁶

The differences in opinions between the dentist and the patient are primarily based on the level of knowledge, differences of skills, and understanding between the two. While the dentist has to establish esthetics conforming to the basic principles,⁷ the patient, on the other hand, is mainly driven by the presence of antimeric teeth in the oral cavity, which may or may not fall in line with ideal esthetic principles. Antimeric teeth are those teeth that are symmetrical in mesiodistal (MD) width and buccolingual (BL) diameter.⁸⁻¹² Existing antimeric teeth not only provide clue to the dentist or the technician, but they also are valuable to the patient to judge the correctness of treatment done.

From academic point of view, subjective differences between the dentist and the patient in front of a student could add to his confusion and be an embarrassment to an academician. Like in most dental institutes, students at college of dentistry (Jazan University, Jazan, Kingdom of Saudi Arabia) are required to do a clinical case of a single metal-ceramic crown (MCc) for maxillary teeth as part of their graduation requirement. Investigating the outcome of teaching enhances curriculum development, ongoing quality audit, and student competency.¹³

The aim of this cross-sectional study is, therefore, to evaluate the esthetic requirements (shape, color, contour, size, shade matching at margins, and gingival relation) of patient and dentist at individual level and then compare the percentage of agreements/differences between them. The study would also provide comparative dimensions of cemented MCcs and their respective antimeric maxillary natural teeth which would allow the researchers to evaluate whether students under training are able to prepare the natural teeth appropriately in MD and BL dimensions.

MATERIALS AND METHODS

This study was conducted in the undergraduate clinic of the Department of Prosthetic Dental Sciences at College of Dentistry, Jazan University, Jazan, Kingdom of Saudi Arabia, duly approved by the research and ethical committee of the college and the university. The study was undertaken by selecting 85 patients being treated by the dental undergraduates for a single maxillary crown (porcelain fused to metal). Inclusion criteria were based on patients having good oral hygiene, seeking a single crown restoration in the maxillary arch (between left second premolar to right second premolar only), while having their antimeric natural tooth present without any malposition, supraeruption, wear, restoration, or decay. An antimeric natural tooth was operationally

defined as the bilateral natural tooth on the other half of the same arch of the prepared tooth.^{14,15} For evaluation of the esthetic outcome of cemented MCc by the patient and the dentist, a questionnaire containing nine questions (closed type with answering options of either yes or no) (Table 1) pertaining only to measure esthetics was first formulated. This self-evaluation questionnaire consisted of simple, clear questions without any direct or indirect overlapping and was chosen by a panel of experienced dentists (prosthodontists and restorative dentist). For ease of understanding, the questionnaire was translated from English to Arabic and back translated from Arabic to English for consistency. All patients were treated by dental students under the supervision of staff having a minimum experience of 5 years in the field of prosthodontics.

Patient Dentist Evaluation of the Quality of Esthetic of Cemented Crown

Patient Evaluation

Patients were allowed to evaluate their cemented crowns in an isolated environment with the patient sitting on a dental chair. The patient was provided with a circular large face mirror (20 cm in diameter) and was asked to evaluate the cemented crown according to the questionnaire prepared for the study.

Dentist's Evaluation

Experts that evaluated the esthetic outcome of the patients treated with MCc were in no way related to the patient's treatment nor were they revealed the treatment was done

Table 1: Questionnaire to evaluate the quality of the cemented crown

Sl. no.	Question	Response
1	Are you satisfied with the color or shade of the cemented crowns	Yes/no
2	Are you satisfied with the length of the cemented crowns	Yes/no
3	Are you satisfied with the width of the cemented crowns	Yes/no
4	Are you satisfied with the contour or bulkiness of the cemented crowns	Yes/no
5	Are you satisfied with the translucency of the cemented crowns (mesial, distal, and incisal)	Yes/no
6	Are you satisfied with the symmetrical between the cemented crown and natural one	Yes/no
7	Are you satisfied with the color or shade of the cemented crown at the margins	Yes/no
8	Are you satisfied with the relationship of the cemented crown with the free gingiva	Yes/no
9	Did you think the cemented crown looks natural	Yes/no

by their colleagues or the students. The team evaluated the outcome using the same questionnaire as described in a study by Alshiddi et al.¹⁶ Finally, assessment was based on sum of clinical, radiographic, and evaluation of mounted dental casts on a semiadjustable articulator. Inter- and intraexaminer reliability was analyzed using chi-squared analysis. Kappa statistics test was used to calculate and measure agreements/differences between the answer of patients and dentist for each question. The p-value of 0.001 was used to detect any statistically significant differences.

Evaluation of MD and BL of Antimeric Natural Teeth and Cemented MCcs

After cementation of MCc for each individual patient, an alginate impression was made from which a post-treatment cast was made for gathering relevant data. All respective antimeric teeth were measured for MD (the greatest distance between the proximal surfaces of the tooth) and bucco-palatal diameter (the distance between the labial/buccal surface and the lingual/palatal surface of the tooth at the maximum bulk or its height of contour which, in turn, was marked on a dental cast surveyor). Measurements were registered with a sliding digital vernier caliper, which was held at right angles to the MD and bucco-palatal surfaces of both the cemented crowns and their respective antimeric teeth.^{14,17} Calibrations for zero were checked after each reading for the instrument. The same investigators recorded the measurements of the antimeric natural teeth and the MCcs. The obtained BL and MD dimensions for both the cemented MCcs, and their antimeric teeth were compared to detect any significant differences.

Data obtained were segregated into four groups respectively (central, lateral, canine, and premolars) and later subjected to statistical analysis by unpaired t-test using Statistical Package for the Social Sciences program for windows (version 21.0 statistical software) to notice if there is any statistically significant difference ($p < 0.01$).

RESULTS

From 85 patients selected for the study, about 85% of the responses were conclusive, whereas the remaining 15% were not included in final analysis. The results of the subjective agreements/differences between the dentists and the patients are shown in Table 2. For nine different questions related to esthetics of cemented MCcs, the dentists and the patients agreed in the range of 50.5 to 90.5%. Subjective differences (overall) ranged from 9.5 to 49.5%. Least subjective differences were found for the length (9.5%) and the width (18.9%) of the cemented crowns. The highest differences between the patient and the dentist were noted for symmetry between the cemented crown and its antimeric natural tooth. A range of 31 to 38% of the patients differed from the dentist’s evaluation for color or shade of the crown, color of the crown at the margin, contour of the crown, and the relationship of the crowns with the surrounding gingiva. For all the related questions, the subjective differences or agreements were statistically significant ($p > 0.001$) (Table 2).

Table 3 represents the mean and their standard deviation of comparative width of both MD and BL measurements between the antimeric teeth (A) and cemented MCc for each tooth involved in the study.

Table 2: Agreements between patients and dentist for the questionnaire

Question #	Patient		Dentist		Dentist – Patient agreement (%)	Subjective differences (%)	Kappa test	p-value
	Yes	No	Yes	No				
1	77	8	46	39	63.5	36.5	0.22	0.001*
2	71	14	63	22	90.5	9.5	0.72	0.000*
3	68	17	52	33	81.1	18.9	0.57	0.000*
4	50	35	23	62	68.2	31.8	0.41	0.000*
5	68	17	33	52	58.8	41.2	0.27	0.000*
6	71	14	29	56	50.5	49.5	0.19	0.003*
7	59	26	26	59	61.1	38.9	0.33	0.000*
8	68	17	38	47	64.7	35.3	0.34	0.000*
9	77	8	55	30	74.1	25.9	0.32	0.000*

Table 3: Mesiodistal dimension and BP width of antimeric natural teeth and cemented crowns

Tooth	MDA/SD	MD MCc/SD	p-value	BLA/SD	BL MCc/SD	p-value
Central	7.52/(0.92)	7.97/(0.84)	0.004*	6.78 (0.87)	7.53 (0.82)	0.000*
Lateral	6.7/(0.72)	7.02/(0.72)	0.016*	6.32 (0.92)	6.98 (0.98)	0.000*
Canine	7.33/(0.72)	8.30/(0.56)	0.000*	8.02 (0.53)	9.10 (0.6)	0.000*
Premolar	6.40/(0.57)	6.99/(0.62)	0.0000*	9.13 (0.83)	9.73 (0.79)	0.0000*

*Significant value



As can be observed, the highest MD dimensions were in the cemented MCc of canines, followed by the MD of MCc of the premolar teeth, while the lowest MD diameters were for the MCc of the lateral incisor. The highest BL dimensions were in the cemented MCc canine, followed by the BL of MCc of the central, while the lowest BL diameters were for the MCc of the lateral tooth. These results showed statistically significant difference in MD dimensions, BL diameters of central, lateral, canine, and premolars of the maxillary teeth at $p > 0.001$.

DISCUSSION

This cross-sectional study evaluated the subjective differences/agreements between the patient and the dentist about the esthetic outcome of a single MCc placed by the undergraduate dental students under academic supervision of experienced prosthodontists. The study also evaluated the physical differences in two dimensions (MD and BL) between the cemented MCc and their respective natural antimeric tooth.

Patient Dentist Evaluation of the Quality of Esthetic of Cemented Crown

As the dental esthetic zone is relatively concerned with the maxillary anterior teeth, therefore, for this study, cases were selected who required restoration in the form of a single MCc between maxillary right second premolar on either side. In general, this study demonstrates a high percentage of dentist – patient agreement (50.5–90.5%) and less percentage of differences (9.5–38.9%). The study demonstrates an overall satisfaction of 42% compared with 68.8% for the involved subjects in the study which are somewhat similar to the one obtained by Alshiddi et al.¹⁶ The least subjective differences between the dentist and the patient in this study were related to length, width, and relation with free gingiva of the MCc (9.5, 18.9, and 25.9 respectively). This study, however, shows higher agreement between the dentist and the patient in terms of the color (63.5 vs 45%), contour (68.2 vs 53%), and naturalistic appearance (74.1 vs 43%) of the cemented crowns as compared to Alshiddi et al.¹⁶ Less subjective differences between the two studies in the above-mentioned esthetic categories could be attributed to multiple clinical and laboratory factors.

The highest subjective difference or least agreement (50.5%) between the dentist and the patient was observed for bilateral symmetry of the restored crown with its natural antimeric tooth. While 71 patients were satisfied with the symmetry, only 29 out of 85 MCcs were verified to be correct in symmetry by the experts. Similarly, for color or shade of the crown at the margins, 59 of the total patients were satisfied with the results although only 26 of

the cases were verified to be correct by the experts. These results are in accordance with the study by Musskopf et al¹⁸ who concluded that patients and prosthodontists have different perceptions related to symmetry and esthetics around gingival margins of cemented crowns.¹⁹ Moreover, patient's ability to detect symmetry cannot be relied when the evaluation is miniscule. Since this study used 3D Master shade guide in both clinics and production laboratory, this could explain the good results in shade in this study, which is in agreement with Nakhaei et al,¹⁹ who concluded that shade guide has an effect on shadematching results.

MD and BL Dimensions of Antimeric Natural Teeth and Cemented MCcs

In this study, 85 patients were treated by undergraduate students for a single MCc. In academics, it is expected that students learn better first in the preclinical laboratory followed by exposure in the dental clinics. While preparing a natural tooth, the student does not always have the privilege of pre and postmeasurement values of the teeth, and, hence, it is believed that a clinician may overestimate tooth reduction.²⁰ Therefore, it is mandatory that visual and tactile perceptions are enhanced among students. If students are not allowed to improve such skills, then the dental curriculum meant for them needs to accommodate such drawbacks. Many investigators have evaluated the areas of weaknesses and strengths of the curriculum, as perceived by graduating dentists.^{21,22} This study, besides analyzing subjective differences between the dentist and the patient, also allowed the researchers to analyze the performance of the students who prepared the teeth under supervision of regular experienced staff. This was achieved by comparing the MD and BL dimensions of the cemented crowns with their corresponding natural antimeric tooth. As can be observed from Table 3, the analyzed dimension performed by the students was well within the normal range and was statistically valid too. Among various prepared teeth, both dimensions for MCcs in relation to maxillary canines were higher than the rest (almost a difference of up to 1 mm than the rest). Average preparations were, however, closer to the normal range. There was a significant difference between the contours of all examined teeth, which is in accordance with the findings by Yu et al,²³ who also found a significant difference in contours of all tested teeth. The results for the canines being overcontoured coincides with the study by Syed et al,¹⁷ whose study had higher BL values for maxillary canines. Overcontoured restorations BL are detrimental to periodontal health irrespective of the margin placement.²⁴ However, in a study conducted by Alhourri,¹⁴ it was observed that BL reduction of maxillary teeth was more than the normal limit, which is in contrast

to our findings. This could be explained by the fact that maxillary canines are difficult to prepare due to different morphology and line angles.

In a review conducted by Abduo,²⁵ he concluded that axial contour alteration is inevitable after restorative treatment. The alterations were mainly in the form of increasing the contour, which appears to be associated with negative biological consequences. Furthermore, he said that slight contour alteration could be considered as part of the treatment although it might be beneficial to keep it minimal, without plaque retentive features and violation of the biologic width.

CONCLUSION

Within the limitation of this retrospective cross-sectional study, it can be concluded that:

- Subjective differences between the dentist and the patient regarding esthetics of MCc do exist.
- Dentist and patient mostly agreed in terms of length (90%), width (81%) and relation of crown with free gingiva (74%), while they differ mostly on the symmetry of the cemented crowns.
- When compared with the natural antimeric tooth, the highest MD dimensions and BL diameter were in the cemented MCcs of canine, while the lowest were with lateral cemented MCcs.
- The teaching strategy was good in imparting the principle of teeth preparation. To assess the teaching strategy, one should evaluate the graduated dentists regularly.
- Further studies with higher number of subjects are recommended to evaluate the reasons of subjective differences between the dentist and the patient.

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