A randomized, clinical study of all-ceramic crowns retained on zirconia abutments or metal-ceramic crowns retained on titanium abutments

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Introduction

In recent years there has, for esthetical reasons, been an increasing request for ceramic in dentistry. Dental ceramics are biocompatible and the optical properties are very similar to those of the tooth. However, limitations in materials strength to tensile stress have led to development of oxide ceramics with improved resistance against crack propagation, especially those based on zirconium dioxide (zirconia). In implant dentistry it has been suggested that all-ceramic crowns and abutment may lead to reduced greyish discoloration of gingival margin and superior esthetical result. Some clinical studies have showed promising survival rates of zirconia abutments. However, randomized controlled clinical studies that can confirm these results are needed.

Objective

The purpose of this clinical trial was to compare the short-time esthetical outcome of all-ceramic crowns on zirconia abutments (AC-group, test) with metal-ceramic crowns on titanium abutments (MC-group, control) in patients with tooth agenesis treated with Astra Tech implants.

Material and Methods

Fourteen patients with 27 implant-supported single crowns replacing one or more premolars were included. The patients were 20-49 years old and had agenesis of three to nine teeth. The crowns and abutments were placed randomly. Thus, the first abutment and crown was selected by drawing lots. Thereafter, the abutments and crowns were inserted alternately.

One to two months after cementation of the crowns all patients were clinically examined. Variables describing the esthetic outcome were assessed using the “Copenhagen Index Score” (CIS) including assessment of i) harmony/symmetry, ii) crown morphology, iii) crown color match, iv) mucosal discoloration, v) papilla fill mesially and vi) papilla fill distally.

The Wilcoxon rank sum test were used to determine statistically significance of differences in CIS between test and control group.

Copenhagen Index Score (CIS):

Harmony/symmetry: According to facial midline, the tooth axis, and the smile line was categorized to:
- score 1: Optimal symmetry
- score 2: Almost symmetry
- score 3: Asymmetric

Crown morphology: Based on “Ideal shape” with regards to prominans, surface and dimensions of crowns compare to contrateral natural tooth there was giving:
- score 1: Optimal
- score 2: Almost optimal
- score 3: Suboptimal
- score 4: Unacceptable

Crown color match: Comparison of hue, value, chroma and translucency to natural dentition. Following scores was given:
- score 1: Optimal
- score 2: Almost optimal
- score 3: Suboptimal
- score 4: Unacceptable

Mucosal discoloration: Degree of greyish discoloration of marginal mucosa, range between:
- score 1: No discoloration
- score 2: Light greyish
- score 3: Distinct greyish
- score 4: Visible metal

Papilla fill: The score of height of papilla, varies was following:
- score 1: Papilla filled the entire proximal space
- score 2: at least ½ the height of papilla was present
- score 3: less than ½ the height of papilla
- score 4: no papilla.

Results

CIS was calculated for every single crown by addition of registered values of the six different esthetic scores. Since these scores ranged between one for the best and four for the most inferior esthetical outcome, CIS varied from minimum of 6 (optimal) to 24 (unacceptable). The mean (± SD) CIS for AC-group was 10.8 ± 2.4 (n = 13) and for MC-group 12.1 ± 1.9 (n = 14). The difference in CIS between the test and control group was not statistical significant.

Conclusions

The short-time esthetical outcome of all-ceramic crowns on zirconia abutments was slightly better than metal-ceramic crowns on titanium abutments. However, the difference was not significant, which may be explained by the limited number of patients and crowns included in the present study.