

Background and Aims

Cement-retained implant-supported prostheses have become, in many cases, a restoration of choice due to easy fabrication, good aesthetics and similarity to the teeth-born restorations. It is advised to locate margin of the restoration 1–2 mm apically from the adjacent tooth's cement enamel junction (Belser, Buser et al). In that case the problem of cement excess removal occurs. Deep subgingivally placed margins may lead to the insufficient cement removal after cementation, therefore cement remnants might provoke cement related peri-implantitis.

The aim of this study was 1) to evaluate the amount of the cement left after cementation and cleaning in implant supported restorations with various locations of the margins. 2) Additional aim was to compare two different methods of evaluation of the cement excess left.



Fig 1. Model with casted abutment



Fig 2. Abutments with different location of the shoulder

Methods and Materials

Twenty-five laboratory implants (4.8 mm diameter) Straumann (ITI) Dental implant System (Institut Straumann AG, Basel, Switzerland) in the casts (Fig 1) with contoured soft tissue imitation using additional vulcanizing silicone for flexible gingiva masks Gum Quick Plus (Dreve Dentamid GmbH, Unna, Germany). The same amount of individually casted golden abutments with various positions of the shoulder were fabricated (Fig 2). Twenty-five restorations with occlusal openings (which were temporarily closed with a light cured composite material during cementation) were cemented using reinforced glass ionomer luting cement Fuji Plus (GC, Tokyo, Japan).

Specimens were divided into five groups: 1 group (control) - bevel 1 mm above the gingival margin, 2 at gingival level, 3–1 mm below, 4–2 mm below and 5– 3 mm subgingivally. Cement excess has been removed after cementation (Fig 3). After cleaning temporary material was removed from the occlusal opening to unscrew the abutment together with the suprastructure.



Fig 3. Specimen before cement excess removal

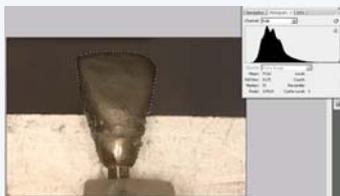


Fig 4. Cement remnants evaluation using Potoshop

Two techniques were selected to evaluate the cement remnants left. All quadrants of the specimens were photographed, using a special device with standardized distance and analyzed using Adobe Potoshop (Fig 4). Total area of the specimen and the area of cement remnants were measured in each quadrant. Cement remnants were removed and weightened using analytical balances Vibra (Shinko Denshi, Tokyo, Japan) with a readability of 0.0001 g.

Statistical analysis was carried out using SPSS v.15. Independent-samples T test performed to analyze the relation between cement remnants and depth of the bevel, bivariate correlation done to compare two methods.

Results

Data consisted of 1) cement remnants' weight; and 2) a relation between cement remnants' area and total area of the specimen (Table 1). Results correlated using both evaluation techniques ($r = 0.764$; $P = .00$). The difference between all groups (except 4 and 5) was statistically significant ($p \leq .05$) (Fig.5).

Gr.	Cement's weight (SD)	Relation
1	0.0003 (0.0001) g	0.0111
2	0.0008 (0.0003) g	0.0165
3	0.0013 (0.0005) g	0.0572
4	0.0051 (0.0013) g	0.1158
5	0.0063 (0.0021) g	0.1171

Table 1. Cement's weight and relation between not removed cement area and all surface

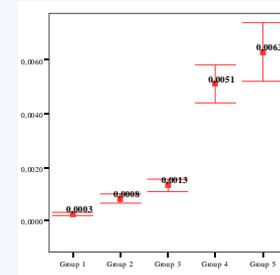


Fig. 6. Remnants' weight in each group

Discussion

Despite all efforts of the prosthodontist the removal of all cement remnants was not successful. The results of our study correlate with the findings of Agar et al, who stated that cementation of the prostheses with subgingivally placed margins may lead to the insufficient cement removal and potential problems concerning it. The main finding of the study was that the deeper position of the shoulder determined that more cement remnants were left undetected. Furthermore, no more studies about subgingivally located margins influence on cement removal could be found in the literature.

Casted abutments were chosen to reflect clinical situation and to control the position of the shoulder. The positions of the shoulders were selected according to the recommendations to locate margin several millimeters subgingivally. This is done for aesthetic reasons (Belser, Buser et al). Location 1 mm supragingival served as a control group because the margin was visible.

Conclusions

With the limitations of the study it could be concluded that it is complicated or impossible to remove all cement excess after cementation if the margins are located subgingivally. The deeper the position of the margin is, the greater amount of undetected cement is left after cleaning. All cement remnants are removed only when the margin is visible. The greatest amount of the cement remnants was left when the crown margin was 2 or 3 mm below the gingival level. It could be advised to avoid using the cement-retained implant restorations in latter cases.

Further studies are required to determine if in vitro experiment correlates with the clinical situations.

References

1. Aesthetic implant restorations in partially edentulous patients – a critical appraisal. Belser UC, Buser D. Perio 2000, 1998
2. Cement Removal from Restorations Luted to Titanium Abutments with Simulated Subgingival Margins. Agar JR et al. J Prosthet Dent 1997
3. Complications Associated with Excess Cement Around Crowns on Osseointegrated Implants: A Clinical Report. Pauletto N, Walton JN. Int J Oral Maxillofac Implants 1999