

REVIEW

From

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ABOUT

PHD thesis of Dr. Sabina Plamenova Keremedchieva - assistant professor at the Department of Periodontology and Dental Implantology, Faculty of Dentistry, Medical University of Varna, entitled "Investigation of the role of marginal adaptation of indirect restorations as a placentative factor and its influence on the level of attachment", submitted for the degree of Doctor of Education and Science with scientific supervisors Prof. Dr. Stefan Vassilev Peev and Assoc. Prof. Dr. Angela Zdravkova Gusijska, and according to the order of the Rector of MU-Varna R 109-30/30.01.2024.

Biographical data

Dr. Sabina Plamenova Keremedchieva was born in 1992 in Varna. In 2011 she graduated from the First Language High School, Varna, with a gold medal. She graduated from the Faculty of Dental Medicine at the Medical University "Prof. Dr. Paraskev Stoyanov" – Varna as a Master of Dental Medicine in 2018. She started working the same year as an assistant professor at the Department of Periodontology and Dental Implantology at the Faculty of Dental Medicine, Medical University of Varna. She taught Bulgarian and English speaking students.

Relevance of the topic

There are many problems in the restoration of dental crown defects related to the selection of the correct technique, methodology and materials for restoration. Appropriate clinical decisions are of utmost importance for treatment success. Each step of the treatment, the technique to be performed, the choice of cementing agent, must be well considered and tailored to the situation in order for the patient to obtain a long-lasting, functional and aesthetic result. The ultimate goal is a restoration with as good a marginal adaptation as possible that does not represent a retention factor. The variety of materials and techniques for restoring dental crown defects is proof that there are no perfect ones, but we must look for to obtain the best possible result. Examining and researching these problems would improve the restoration quality, durability, aesthetics.

Structure

The PHD thesis contains 209 pages. It is illustrated with 99 tables, 118 figures and 9 applications. 283 references are cited.

The introduction directs us to the idea of the study. The literature review discusses current data on types of dental crown defects, direct and indirect restorations, marginal adaptation and microprossuction, periodontitis, and retention factors. The summary of the review analyzes the unresolved issues that may impair the quality of treatment.

The aim is formulated in detail as the 3 objectives follow the idea, allowing the implementation of the study.

In the first task, 40 sections of extracted permanent premolars and molars of individuals over 18 years of age divided into 8 groups were the subject of the experimental studies. The teeth met certain requirements to exclude factors affecting the quality of the obturations. They were stored in 4% buffered aqueous formaldehyde solution. A class II cavity was made on each tooth for fabrication of a ceramic inlay. In some groups, a hybrid technique was applied by lifting the gingival base with bulk fill composite. The cavity was directly scanned. After fabrication and cementation of the ceramic inlay, the specimens were subjected to thermocycling, inclusion in epoxy resin, and sectioning. The thickness of the cement layer in the gingival base area was observed using a Leica DM1000 LED light microscope and x40 magnification.

The results of this first task showed that no statistically significant differences in the thickness of the cement layer in the gingival base area were observed. When comparing the type of technique, classical or hybrid (with lifting of the gingival base with composite prior to direct scanning of the cavity), no statistically significant differences were reported either.

Statistical analysis of cement type, either resin-reinforced cement (Fuji Plus, GC) or composite cement (EsteCem II, Tokuyama Dental), demonstrated no statistically significant differences in cement layer thickness in ceramic inlays.

Conversely, in the second task, a comparison of the microprobe on the parameter "cement type" reported statistically significant differences between the two cement types, in favor of composite cement. It demonstrates significantly better sealing and smaller volume of microleaching.

When comparing material type, hybrid ceramic (Vita Enamic) or lithium disilicate (IPS e.max CAD), no statistically significant differences were reported in terms of marginal adaptation of ceramic inlays, although hybrid ceramic demonstrated slightly better marginal adaptation compared to lithium disilicate.

For the second task, 40 sections of extracted permanent premolars and molars of individuals over 18 years of age were examined. The teeth were selected and prepared similarly to the first task. The microleakage of the staining agent, fuchsin, into the gingival base area was observed. Measurements were taken on a Leica DM1000 LED light microscope and magnification x40. Eight groups were formed.

When comparing the microseal between groups, statistically significant differences were found. In group 7 and group 8, a hybrid technique with gingival base lifting with composite and composite cement was applied to cement the ceramic inlays. Although no microleakage was reported at the composite-cement interface, fuchsin penetration was reported at the composite-tooth interface, where the original position of the gingival base was before lifting. The author questions the positive effect of the hybrid technique over time.

The lowest percentage of microleakage of the other 6 groups involved in the statistical analysis was demonstrated by group #3 - inlays made by classical technique, cemented with composite cement, of hybrid ceramics. Statistically significant differences in microleaching with a large effect size were reported between groups #3 and #2 - inlays made by classical technique, cemented with GJC, from lithium disilicate (in favor of group #3); Group No 4 - classical technique inlays cemented with composite cement, lithium disilicate and Group No 2 (in favour of Group No 4) and between Group No 3 and Group No 6 - hybrid technique inlays cemented with GJC, lithium disilicate (in favour of Group No 3).

No statistically significant differences in microleaching were reported for the groups studied with respect to technique type and material type. Regarding cement type, a statistically significant difference with a large effect size was found in favour of composite cement over GJC, for cementing ceramic inlays. The results of the PhD student showed that the composite cement exhibited a significantly lower volume of microleakage in the gingival base area. Dr. Keremedchieva concluded that composite cements can be successfully applied to cement ceramic inlays, whereas resin-reinforced GJCs have limited application.

Dr. Keremedchieva suggests that the better sealing of composite cement may be explained by its lower solubility. She explains the greater micro-permeability of GJC compared to composite cement because of porous defects that form during the mixing of the GJC components. Dr. Keremedchieva concludes that composite cement is a better material for cementing ceramic inlays.

For Clinical Task #3, 50 vital teeth, premolars and molars with Class II defects and a gingival base positioned subgingivally, were the subjects of the clinical study. Completed cases within 6 months-a very short period for such a study-were followed.

Drilling depth, level of margo gingivalis, and level of clinical attachment were examined.

In each participant of the clinical study of the third task, bitewing radiography was performed 3 times with a dose of 30 mGy/sm² and an exposure time of 9.9 sec-perhaps the doctoral student had milli-seconds in mind.

In 10 cases, direct obturations were made with Estelite Asteria composite (Tokuyama Dental) as the control group. In the remaining 40 cases, cavity preparation of the teeth for ceramic inlay was performed according to preset criteria. The impression method used was direct scanning of the cavity with a 3Shape Trios intraoral scanner; the cementing agent was Estecem II composite cement (Tokuyama Dental).

The results found that there was a statistically significant difference in probing depth before and 6 months after placement of the direct or indirect restoration. The mean probing depth decreased from 4.12 mm before to 3.53 mm after. The value of the clinical attachment level indicator also decreased from 3.89 mm before to 3.59 mm after, that is, there was a gain in clinical attachment level in the area of the subgingival-located gingival base. The studies showed a statistically significant difference, with a small effect size. There was a statistically significant difference at the level of the margo gingivalis, again with a small effect size. The trend is towards a slight recession forming, from 0.23 mm before to -0.06 after.

Dr. Keremedchieva found that the greatest gain at the clinical attachment level was in group 1, classically fabricated inlays, of hybrid ceramic, followed by group 2, classically fabricated inlays, of lithium disilicate. Control group 0, direct obturations, ranked 3rd. In group 3 and group 4, inlays made by hybrid technique, from hybrid ceramic and lithium disilicate, respectively, the gain in clinical attachment level was of very small effect size.

Dr. Keremedchieva confirms that the effects of elevating the gingival base with composite prior to fabrication of partial indirect restorations are not entirely favorable. She finds that further research, with long-term follow-up of cases, is needed to draw a more definitive conclusion about the effect of the technique on periodontal tissues and the survival of the restoration.

In terms of technique, a statistically significant difference in terms of gain per clinical level of attachment was reported for the classic indirect restoration technique. It demonstrated slightly better clinical results compared to the direct composite obturation fabrication technique. She explains this by the possible polymerization shrinkage of composite materials, which is reduced to only the thin layer of composite cement in ceramic inlays.

In terms of choice of material, Dr. Keremedchieva reported statistically significant differences in terms of clinical attachment level. She found statistically significant differences with a greater effect of reducing probing depth in ceramic materials compared to the direct obturation composite, where the effect size was medium.

In conclusion, Dr. Keremedchieva found that when choosing a method for restoring a Class II defect of a dental crown with a subgingival base, a number of parameters must be considered, such as the technique to be used, the material to be used to fabricate the restoration, the cementing agent, the impression technique, the aesthetic and functional qualities, and the time and money the patient is willing to invest in the treatment. It is of utmost importance for periodontal health to make a restoration that is not retentional.

In terms of marginal adaptation, the study reported no statistically significant differences between hybrid ceramic and lithium disilicate machining inlays. The results show slightly better marginal adaptation of restorations made from hybrid ceramics.

Regarding the clinical level of attachment, indirect restorations made by classical technique followed by direct obturation with composite demonstrated the best result in the studies. This finding may confirm the advantages of indirect restorations over direct restorations in the presence of Class II defects with a subgingival gingival base. Dr. Keremedchieva concluded that the hybrid technique with elevation of the gingival base does not have an entirely positive effect.

The short follow-up period is insufficient to gain clarity on the effect on periodontal tissues and survival of the investigated techniques and materials for the restoration of Class II dental crown defects with a subperiosteally positioned gingival base.

Dr. Keremedchieva formulated 9 conclusions, and I cannot accept the first of them. The dissertator formulated two contributions of an original nature, one original contribution to the country and three contributions of a confirmatory nature.

The abstract consists of 55 pages and presents in abbreviated form the main issues addressed in the submitted dissertation.

Results of the study are reported in a list of 3 publications, all three in English in the journal Scripta Scientifica Medicinae Dentalis. The PhD student is the lead author in all three articles, which shows her leading role in the implementation of the research.

Conclusion

Dr. Sabina Plamenova Keremedchieva has presented a complete dissertation that meets the requirements. I will give my affirmative vote.

Varna

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