Fit of crowns and clinical evaluation by dentists and technicians

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Introduction

An important criterion for the clinical success of a crown is its fit. An inferior marginal crown gap can cause plaque retention, marginal inflammation and secondary caries [1]. The statements to a desirable size of the marginal gap ranging in accordance with the used cement from 30 µµm up to 100 µµm [2]. On the other hand gap sizes of 300 µµm up to 500 µµm have been described in clinical practice [3]. Under the conditions of the dental lab the technician can control the exactness of the marginal fit by light microscopy. But in routine this procedure is rarely used. However, in the patient's mouth fit can only be evaluated without exact measurements. The estimation of the crown fit in the patient's mouth depends on the subjective assessment by the practitioner. Normally the clinical control is performed by visual examination supported by the use of a dental explorer.

Objectives

The aim of the study was to evaluate correlations between the exact width of the marginal gap of full cast crowns and the subjective assessment of the fit by dentists and dental technicians.

Material and Methods

25 extracted human teeth were randomly divided into 5 groups and prepared with a circular shoulder. For each of the 5 groups cast crowns were made from different metals (AuAgCu, AuPdPt, PdAgAu, CoCrMo, Ti). The metals were processed according to the manufacturers' instructions using the appropriate investment material and casting devices. The crowns were fitted onto the prepared teeth and cemented with provisional cement (Fig 1). 20 experienced professionals (10 dentists and 10 technicians) were asked to evaluate the fit of the crowns with an unused standardized dental probe (EXS3A6, Hu-Friedy, USA). The examiners were unaware of the alloys. The data were collected with a standardized questionnaire. The professionals had to answer two questions with yes or no: "Is the marginal fit acceptable under clinical conditions?" and "Would you cement this crown in the patients' mouth?". After this the crowns were removed and cemented with ZnO-Phosphate cement under standardized conditions (3 kg pressure for 3 minutes). The excess of the cement was removed with a dental explorer The marginal gaps (cement width) of the crowns were circularly investigated using a light microscope (VMZM40 with 1.6 x TV-tubus, 2.0 x objective and 4.0 x screen-level, Metrona-software, 4H JENA engineering, Jena, Germany) (Fig 1-5). To achieve powerful averages 50 measurements were performed on every cast crown [4]. Means of the gaps were calculated for each alloy and statistically compared using H-Test and U-Tests. Correlations between objective measurements and subjective evaluation were calculated by Spearman-Test.
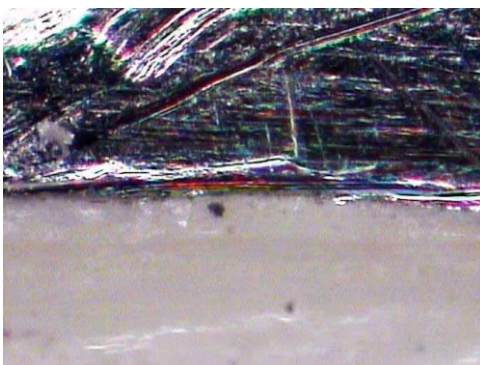

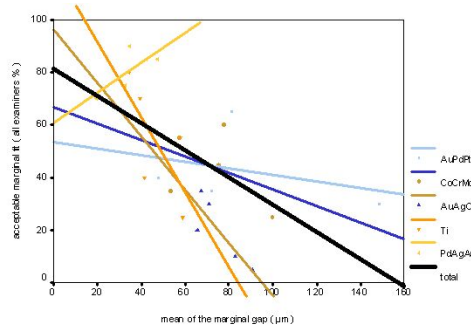Fig 1 Marginal gap of a group 1 crown

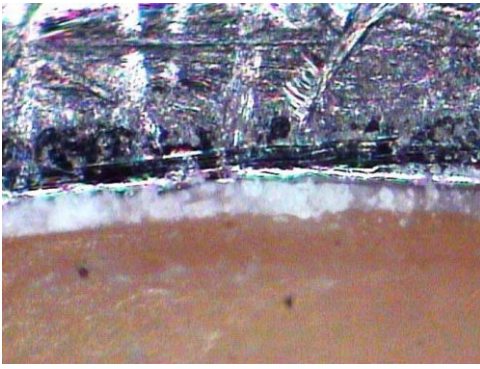Fig 7 Correlation of the evaluation of the marginal fit
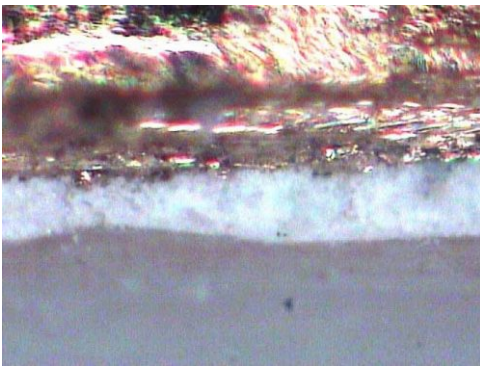
Fig 2 Marginal gap of a group 2 crown

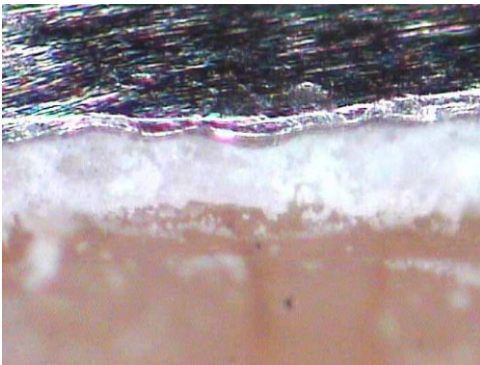Fig 3 Marginal gap of a group 3 crown

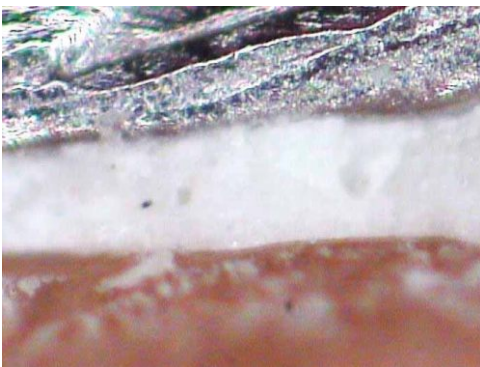Fig 4 Marginal gap of a group 4 crown

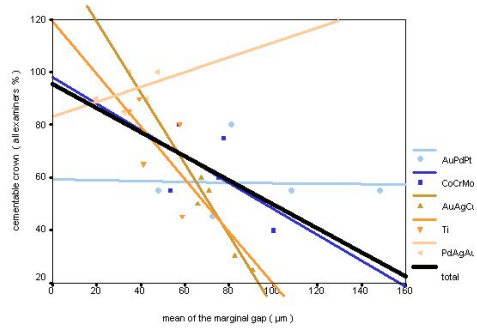Fig 5 Marginal gap of a group 5 crown

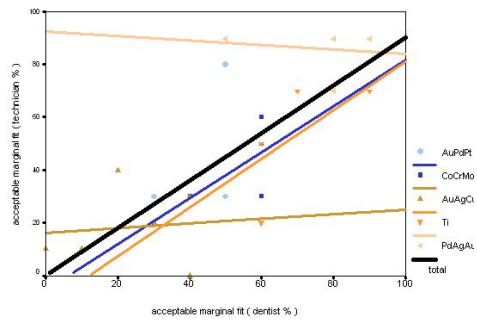Fig 8 Correlation of the evaluation of the clinical useability

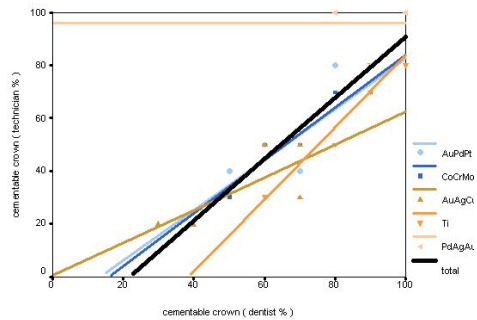Fig 9 Correlation of the evaluation of the marginal fit between dentists and technicians

Fig 10 Correlation of the evaluation of the clinical useability between dentists and technicians

Results

The different alloys showed significantly different marginal fits. The smallest average gap sizes (35 µµm) and the smallest maximum gap sizes (104 µµm) were found in the crowns of group 1 (Fig 6). The biggest average gap size (92 µµm) and the biggest maximum gap size (237 µµm) were found in the crowns of group 5 (Fig 6). The differences of the findings between the alloys were in 20 % (average gap size) and in 10 % (maximum gap size) significant (p<0.01). In total there was an indirect correlation between the exact crown gap of all crowns, the evaluation of the marginal fit (Fig 7) and the decision for the cementation in patients' mouth among all examiners (Fig 8). There was no strong correlation between the subjective findings of the dentists and the findings of the technicians especially within the evaluation of the crowns of the group 1 and 5 (Fig 9 and 10).
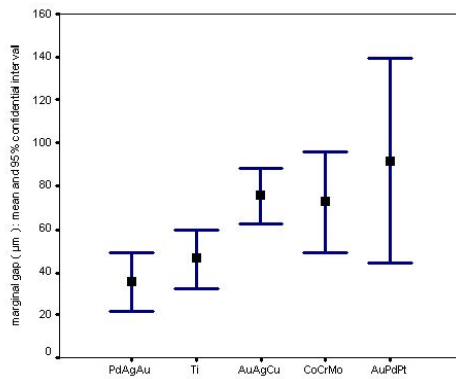

Fig 6 Arithmetical Mean and confidential intervall of the tested crowns

Conclusions

The crowns of the group 1 had the significantly smallest cement width. The biggest marginal gap was found within the crowns of the group 5. The number of crowns with a satisfactory estimated marginal gap was decreasing with an increasing exact marginal gap. In spite of this fact 22 % of the dentists and 13.6 % of the technicians would clinically cement crowns which they have estimated with an inferior marginal fit. It is suggested that within crowns with a small (< 40 µm) or a big average marginal width (> 90 µm) clinicians use other criteria rather than marginal gaps to evaluate the fit of crowns. In this case over- or under contouring of crowns has possibly more importance in the clinical decision.

Literature

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2. Marxkors R, Eichner K, Voß R: The crown margin. Dtsch Zahnärztl. Z 26 (1971) 742-748
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4. Groten M, Axmann D, Pröbster L, Weber H: Determination of the minimum number of marginal measurements required for practical in vitro testing. J Prosthet Dent 83 (2000) 40-49

This Poster was submitted by Dr. Arne F. Boeckler.

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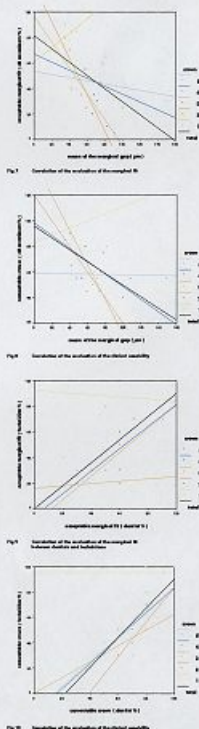## BOECKLER A*[1], RINKE J[2], RÖSEL M[1], SETZ J[1]

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OBJECTIVES

An important criterion for the clinical success of a crown is its fit. An inferior marginal crown gap can cause plaque retention, marginal inflammation and secondary caries[1]. The statements to a desirable size of the marginal gap ranging in accordance with the used cement from 30 µm up to 100 µm[1]. On the other hand gap sizes of 300 µm up to 500 µm have been described in clinical practice[1]. Under the conditions of the dental lab the technician can control the exactness of the marginal fit by light microscopy. But in routine this procedure is rarely used. However, in the patient's mouth fit can only be evaluated without exact measurements. The estimation of the crown fit in the patient's mouth depends on the subjective assessment by the practitioner. Normally the clinical control is performed by visual examination supported by the use of a dental explorer. The aim of the study was to evaluate correlations between the exact marginal gap of cast crowns and their subjective assessment by dentists and dental technicians.
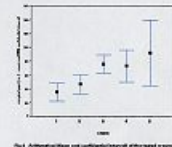
MATERIALS AND METHODS

25 extracted human teeth were randomly divided into 5 groups and prepared with a circular shoulder. For each of the 5 groups cast crowns were made from different metals (AuAgCu, AuPdPt, PdAgAu, CoCrMo, Ti). The metals were processed according to the manufacturers' instructions using the appropriate investment material and casting devices. The crowns were fitted onto the prepared teeth and cemented with provisional cement (Fig 1). 20 experienced professionals (10 dentists and 10 technicians) were asked to evaluate the fit of the crowns with an unused standardized dental probe (EXS3A6, Hu-Friedy, USA). The examiners were unaware of the alloys. The data were collected with a standardized questionnaire. The professionals had to answer two questions with yes or no: "Is the marginal fit acceptable under clinical conditions?" and "Would you cement this crown in the patients' mouth?". After this the crowns were removed and cemented with ZnO-Phosphate cement under standardized conditions (3 kg pressure for 3 minutes). The excess of the cement was removed with a dental explorer. The marginal gaps (cement width) of the crowns were circularly investigated using a light microscope (VMZM40 with 1.6 x TV-tubus, 2.0 x objective and 4.0 x screen-level, Metrona-software, 4H JENA engineering, Jena, Germany) (Fig 1–5). To achieve powerful averages 50 measurements were performed on every cast crown[1]. Means of the gaps were calculated for each alloy and statistically compared using H-test and U-tests. Correlations between objective measurements and subjective evaluation were calculated by Spearman-tests.

Fig 1 Marginal gap of a group 1 crown
Fig 3 Marginal gap of a group 2 crown
Fig 5 Marginal gap of a group 5 crown

Fig 7 Correlation of the evaluation of the marginal fit
Fig 8 Correlation of the evaluation of the clinical useability
Fig 9 Correlation of the evaluation of the marginal fit between dentists and technicians
Fig 10 Correlation of the evaluation of the clinical useability between dentists and technicians

RESULTS

The different alloys showed significantly different marginal fits. The smallest average gap sizes (35 µm) and the smallest maximum gap sizes (104 µm) were found in the crowns of group 1 (Fig 6). The biggest average gap size (92 µm) and the biggest maximum gap size (237 µm) were found in the crowns of group 5 (Fig 6). The differences of the findings between the alloys were in 20 % (average gap size) and in 10 % (maximum gap size) significant ($p<0.01$). In total there was an indirect correlation between the exact crown gap of all crowns, the evaluation of the marginal fit (Fig 7) and the decision for the cementation in patients' mouth among all examiners (Fig 8). There was no strong correlation between the subjective findings of the dentists and the findings of the technicians especially within the evaluation of the crowns of the group 1 and 5 (Fig 9 and 10).

Fig 6 Arithmetical Mean and confidential interval of the exact crowns

CONCLUSIONS

The crowns of the group 1 had the significantly smallest cement width. The biggest marginal gap was found within the crowns of the group 5. The number of crowns with a satisfactory estimated marginal gap was decreasing with an increasing exact marginal gap. In spite of this fact 22 % of the dentists and 13.6 % of the technicians would clinically cement crowns which they have estimated with an inferior marginal fit. It is suggested that within crowns with a small (< 40 µm) or a big average marginal width (> 90 µm) clinicians use other criteria rather than marginal gaps to evaluate the fit of crowns. In this case over- or under contouring of crowns has possibly more importance in the

REFERENCES

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