International Poster Journal IPJ of Dentistry and Oral Medicine

Int Poster J Dent Oral Med 2000, Vol 2 No 2, Poster 39

Histologically detectable caries extension in comparison to laser fluorescence measurements

Language: English

Authors: Andreas Braun, Matthias Frentzen, Rolf Nolden
Department of Restaurative Dentistry and Periodontology, University Bonn

Date/Event/Venue:
23.09.99-25.09.99
35. Annual Meeting of the IADR Continental European Division
Montpellier / France

Objective

The results measured with the Diagnodent®-system for caries detection should be compared to the caries extension in enamel (using light microscopic analysis).

Material and Methods

40 filling-free human extracted teeth stored in physiological saline solution were examined. After cleaning the tooth, the surface was examined with the Diagnodent®-system (fig. 1) at three points (mesial, central and distal) using probe A (fig. 2 and 3). After 1.5 hours the measurements were repeated to test reproducibility. Then the teeth were fixed in formaline, embedded in a light-activated PMMA medium. Sections of 50 mm were cut. After staining the sections with Toluidine Blue and Rhodamin B the caries extension of the areas measured with the laser fluorescence system could be examined by light microscopic analysis (stereo-microscope, Wild Heerbrugg AG, CH-Heerbrugg). The results were analysed concerning correlations between the laser-fluorescence values and caries extensions (distances from the tooth surface to the deepest histologically detectable caries). Also a 2x2-table and a chi-square-test were used, analysing the values of the regression line.

Fig. 1: Diagnodent®-measurement device

Fig. 2: Probe A of the Diagnodent®-system

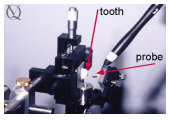


Fig. 3: Experimental setup (tooth fixed on mechanical stage) to test reproducibility

Results

Before embedding the teeth for histological analysis all laser-fluorescence-values were reproducible after storage in physiological saline solution for 1.5 hours. With increasing extension of caries in enamel higher and more varying laser fluorescence values were measured (correlation coefficient: 0.85, fig. 4). Regarding two groups (caries extension <0.3 mm, caries extension >0.3 mm) with two possible results (value >10 [u], value <10 [u]) this relation was statistically significant (chi-square=49.42, table 1)

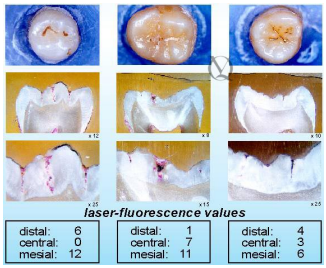


Fig. 4: Tooth crowns and histologically examined sections (sections stained with Toluidine Blue and Rhodamin B)

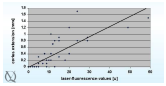


Fig. 5: Correlation laser-fluorescence values / caries extension (correlation coefficient: 0.85)

Chi^2 49.42	caries < 0.3 mm	caries > 0.3 mm	Σ
value < 10 [u]	56	1	57
value > 10 [u]	4	14	18
Σ	60	15	75

Table 1: 2x2 table for the relationship laser-fluorescence values / caries extension (chi-square=49.42)

Bibliography

- Braun A., Frentzen M., Nolden R.: Beeinflussung der Laser-Fluoreszenz-Messung durch Zahnreinigungsmaßnahmen. Dtsch Zahnärztl Z, 1999, 54, S. 195-197.
- Lussi A.: Comparison of different methods for the diagnosis of fissure caries without cavitation. Caries Res, 1993, 27, S. 409-416.
- Ricketts D., Kidd E., Weerheijm K., de Soet H.: Hidden caries: what is it? Does it exist? Does it matter? Int Dent J, 1997, 47, S. 259-265.
- Weerheijm, K.L., de Soet, J.J., van Amerongen, W.E., de Graaff, J.: Sealing of occlusal hidden caries lesions: an alternative for curative treatment? J Dent Child, 1992, 59, S. 263-268.

This Poster was submitted on 28.04.00 by Dr. Andreas Braun.

Correspondence address:
Dr. Andreas Braun
Univ-Poliklinik für Zahnerhaltung und Parodontologie Bonn
Welschnonnenstr. 17
D - 53111 Bonn

Poster Faksimile:

153 Histologically detectable caries extension in comparison to laser fluorescence measurements

A. Braun
M. Frentzen
R. Nolden

AIM OF THE STUDY

The results measured with the Diagnodent®-system for caries detection should be compared to the caries extension in enamel (using light microscopic analysis).

METHODS

40 filling-free human extracted teeth stored in physiological saline solution were examined. After cleaning the tooth, the surface was examined with the Diagnodent®-system (fig. 1) at three points (mesial, central and distal) using probe A (fig. 2 and 3). After 1.5 hours the measurements were repeated to test reproducibility. Then the teeth were fixed in formaline, embedded in a light-activated PMMA medium. Sections of 50 µm were cut. After staining the sections with Toluidine Blue and Rhodamin B the caries extension of the areas measured with the laser fluorescence system could be examined by light microscopic analysis (stereo-microscope, Wild Heerbrugg AG, CH-Heerbrugg).
The results were analysed concerning correlations between the laser-fluorescence values and caries extensions (distances from the tooth surface to the deepest histologically detectable caries). Also a 2x2-table and a chi-square-test were used, analysing the values of the regression line.

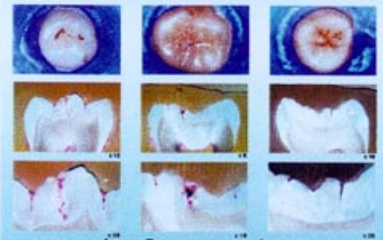
Fig. 1: Diagnodent®-measurement device

Fig. 2: Probe A of the Diagnodent®-system

Fig. 3: Experimental setup (tooth fixed on mechanical stage) to test reproducibility

RESULTS

Before embedding the teeth for histological analysis all laser-fluorescence-values were reproducible after storage in physiological saline solution for 1.5 hours. With increasing extension of caries in enamel higher and more varying laser fluorescence values were measured (correlation coefficient: 0.85, fig. 4). Regarding two groups (caries extension <0.3 mm, caries extension >0.3 mm) with two possible results (value >10 [u], value <10 [u]) this relation was statistically significant (chi-square=49.42, table 1)



laser-fluorescence values

distal: 6 central: 0 mesial: 12	distal: 1 central: 7 mesial: 11	distal: 4 central: 3 mesial: 6

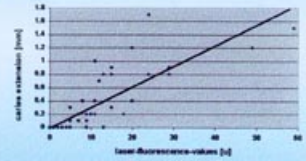


Fig. 5: Correlation laser-fluorescence values / caries extension (correlation coefficient: 0,85)

Chi^2 49.42	caries < 0.3 mm	caries > 0.3 mm	Σ
value < 10 [u]	56	1	57
value > 10 [u]	4	14	18
Σ	60	15	75

Table 1: 2x2 table for the relationship laser-fluorescence values / caries extension (chi-square=49.42)

CONCLUSION

The present study confirms a relationsphip between laser-fluorescence values and caries extension. Up to a measured value of 10 [u] a caries in enamel of up to 0.3 mm depth can be expected. However, at the moment a classification of caries in enamel is not possible due to the strongly varying measured values.

Department for Operative Dentistry
and Periodontology
University Dental Clinic Bonn, Germany
Tel.: (+49) 228-2872428
Fax: (+49) 228-2872444
e-mail: a.braun@uni-bonn.de