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Confounding factors in clinical studies using QLF

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Objectives

Analysing of potential sources of errors influencing the analysis of fluorescence images by using Quantitative Light-induced Fluorescence (QLF).

Material and Methods

- Investigation of 1835 lingual/ buccal surfaces and 517 occlusal surfaces in thirty four 15-yr-old adolescents.
- Image capturing (4x) during a longitudinal study (intervals ~ 2 months) after professional tooth-cleaning (AirFlow, EMS, Nyon, Switzerland).
- Image capturing with QLF:
  - Standardised conditions
  - Dental office without any ambient light
  - CCD camera (mirror version)
- Image analysis with QLF:
- Computer program "QLF 2.00" (Inspektor Research Systems, Amsterdam, The Netherlands)
- Images were analysed by two trained examiners
- Registration of the average fluorescence loss (DF), the area (A) (mm ^{2}) and DQ (DF*A) of all lesions at a threshold of -5.

Results

1. Red fluorescent areas - Despite of professional tooth-cleaning performed before QLF recordings red fluorescent areas caused by residual plaque/bacteria (Figure 1a - 1d).

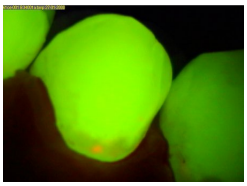


Fig. 1a

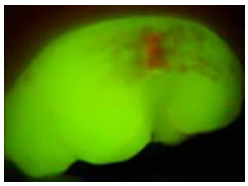


Fig. 1b

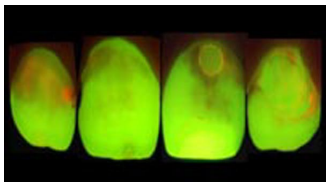


Fig. 1c

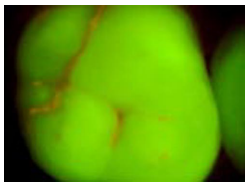


Fig. 1d

2. Different brightness of fluorescence images can pretend the remineralisation of lesions (Figure 2a - 2d).

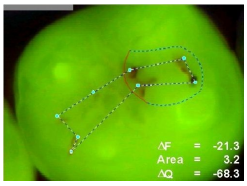


Fig. 2a

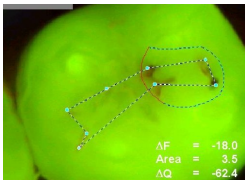


Fig. 2b

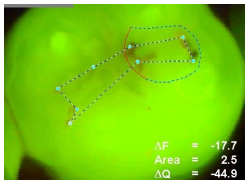


Fig. 2c

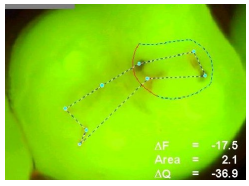


Fig. 2d

3. Different brightness of fluorescence images can pretend the remineralisation of lesions (Figure 3a - 3d).

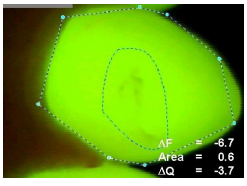


Fig. 3a

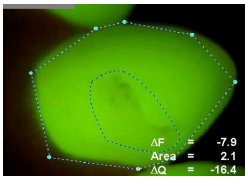


Fig. 3b

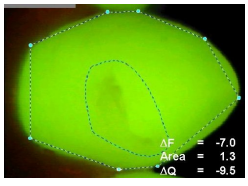


Fig. 3c

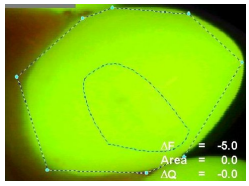
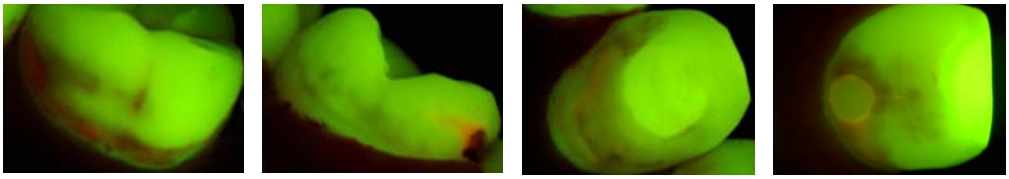


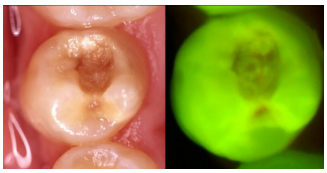
Fig. 3d

4. Lesions which are difficult to analyse - The analytical stage of the QLF method is limited if lesions extended to the gingival margin or to more than one surface.



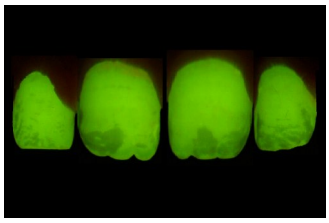
Lesion extension up to the gingival margin.

5. Hypoplasia and developmental disorders - Surfaces attacked by hypoplasia and developmental disorders have to be differentiate clinically from carious lesions before the QLF assessment.



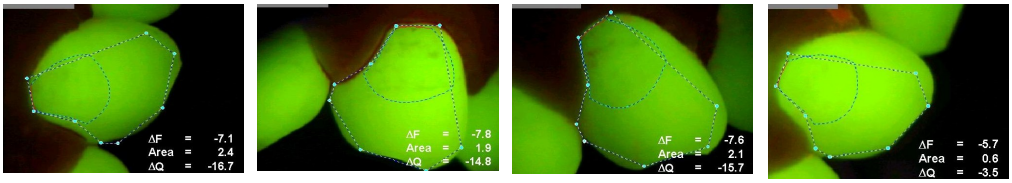
Hypoplesia caused by use frequent of antibiotics during the age from 3-5.

Enamel hypoplasia with unknown aetiology. Clinical image.



Enamel hypoplasia with unknown aetiology. QLF image.

6. Different angulations between longitudinal image - Angular errors during image capturing can not be adjusted or eliminated completely by the time-consuming analytical process (Figure 6a - 6d).



Conclusions

- The efficient control of several confounding factors is an important prerequisite in clinical studies.
- The new Video Repositioning System may be able to eliminate some sources of errors in future studies.

This Poster was submitted by Dr. Jan Kühnisch.

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Poster Faksimile:

Confounding factors in clinical studies using QLF

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AIM

Aim of this clinical study was to summarise potential sources of errors influencing the analysis of fluorescence images by using Quantitative Light-induced Fluorescence (QLF).

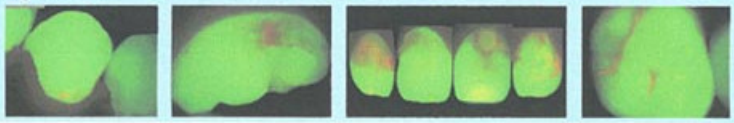
STUDY POPULATION AND METHODS

- Full mouth investigation of thirty four 15-yr-old adolescents.
- 1835 lingual/ buccal surfaces and 517 occlusal fissures were analysed.
- Image capturing for four times during a longitudinal study (intervals ~ 2 months).
- Professional tooth-cleaning (AirFlow, EMS, Nyon, Switzerland) before every investigation.

- Image capturing with QLF:
  - Standardised conditions
  - Dental office without any ambient light
  - CCD camera (mirror version)
- Image analysis with QLF:
  - Computer program "QLF 2.00" (Inspektor Research Systems, Amsterdam, The Netherlands)
  - Images were analysed by two trained examiners
  - Registration of the average fluorescence loss (ΔF), the area (A) (mm^2) and ΔQ (ΔF*A) of all lesions at a threshold of –5.

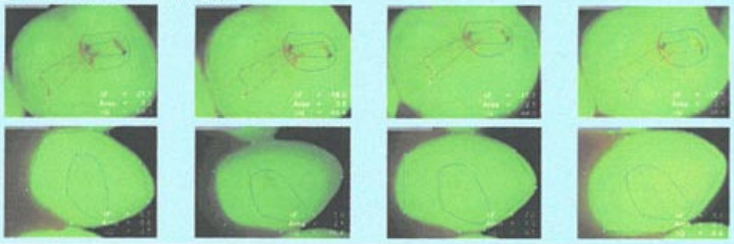
RESULTS

1. Red fluorescing areas



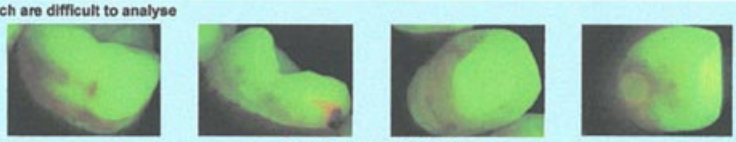
Despite of professional tooth-cleaning performed before QLF recordings red fluorescing areas caused by residual plaque/bacteria.

2. Different brightness of fluorescence images



Different brightness of fluorescence images can pretend a remineralisation of lesions.

3. Lesions which are difficult to analyse



Lesion extension up to the gingival margin.

The analytical stage of the QLF method is limited if lesions extended to the gingival margin or to more than one surface.

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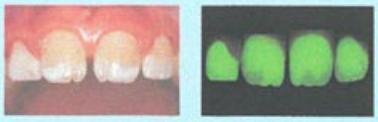
Hypoplasia caused by use frequent of antibiotics during the age from 3 – 5.



Enamel hypoplasia with unknown aetiology.

Surfaces attacked by hypoplasia and developmental disorders have to be differentiate clinically from carious lesions before the QLF assessment.

5. Different angulation between longitudinal image

Angular errors during image capturing can not be adjusted or eliminated completely by the time-consuming analytical process.

CONCLUSION

- An efficient control of all confounding factors is an important prerequisite in clinical studies.
- The new Video Repositioning System may be able to eliminate some sources of errors in future studies.