issn 2193-4665

Vol. 8 • Issue 1/2016

laser

international magazine of laser dentistry

1 2016

research
Fluorescence-guided caries excavation of decayed teeth

special
Probing for alternatives

events
Laser education at its best



Master of Science (M.Sc.) in Lasers in Dentistry

Next Start: **26th September 2016**
Aachen, Germany
4 semesters

Become part of the International Dental Elite

- Create new economic potential for your practice
- Two year career-accompanying postgraduate programme at the University of Excellence RWTH Aachen
- Combination of lectures, skill training sessions, live ops, tutorials, and practical workshops
- Internationally accepted and accredited by the German Governent, the European Union, the Washington Accord and the Bologna Process
- Science-based and practice-orientated on highest national and international level
- Increased patient satisfaction: minimal contact reduced vibration and pain

ASIIN e.V.
accredited degree program

RWTH INTERNATIONAL ACADEMY AACHEN UNIVERSITY

RWTH International Academy
Kackertstraße 10 I 52072 Aachen I Germany
phone +49 241 80 23543 I fax +49 241 80 92525
info@academy.rwth-aachen.de
www.academy rwth-aachen.de

PROFESSIONAL EDUCATION PROGRAMMES

AALZ
Aachen Dental Laser Center

AALZ GmbH
Pauwelsstraße 17 I 52074 Aachen I Germany
phone +49 241 47 57 13 10 I fax +49 241 47 57 13 29
info@aalz.de
www.aalz.de

Kenji Yoshida

Light to brighten the future

Dear readers of *laser* international magazine of laser dentistry,

We sincerely welcome all of you to Nagoya, Japan, on the occasion of the 15th Congress of the World Federation for Laser Dentistry from July 17 to 19 2016 in Nagoya, Japan.

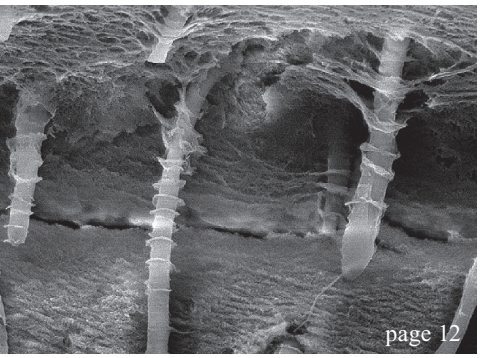
The WFLD is held every two years, and this is the third World Congress held in Japan, following the first congress in 1988 in Tokyo under the presidency of Professor Hajime Yamamoto, and the second congress in 2002 in Yokohama, hosted by Professor Isao Ishikawa.

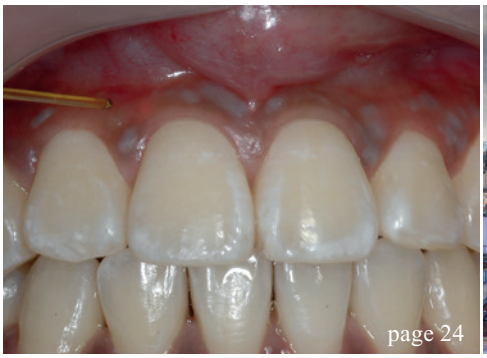
Themed "Light to Brighten the Future", the congress aims at moving forward from existing laser dentistry and dental care as well as seeking the new developments through extensively incorporating light into diagnosis and treatment of patients. The congress features a varied programme, including lectures, a symposium, workshops, oral and poster sessions, exhibitions and seminars. Each programme will bring light to the future laser specialists in engineering and various medical fields, including dentistry. Presenters from all around the world will deliver their latest findings and scientific knowledge. It is our deepest aspiration that the congress will also be an opportunity for further advancement of academic research activities and clinical improvement, as well as herald the beginning of a new development of medical devices and expansion of the industry in Japan.

Apart from the scientific programme, opportunities for social activities, including a welcome-drink reception, Japan night and banquet during the congress. We hope the congress will be a place to acquire the latest information and knowledge and to extend your scientific networks for your future careers and research.

We are sincerely looking forward to seeing all of you at the WFLD2016 in Japan.

Kenji Yoshida
Chairperson, WFLD2016


page 12


page 24


page 40

editorial

03 Light to brighten the future
Kenji Yoshida

research

06 Fluorescence-guided caries excavation of decayed teeth
ZA Martin Augenstein & Prof. Dr Matthias Frentzen

12 Evaluation of a self-adhesive composite in dentin surfaces
Dr. Ana Catarina Nogueira da Silva *et al.*

18 Smear layer removal with laser in drilled implant holes
Dr Alireza Mirzaee

case report

24 Non-ablative melanin depigmentation of gingiva
Dr Kenneth Luk

industry

28 Histological effects of NightLase® in the soft palate of rats
Aslıhan Üsümez *et al.*

32 Introducing LASOTRONIX—lasers for generations

special

34 Probing for alternatives
Dr Anton Kasenbacher

35 Nachgebohrt – Zahnarztangst
Dr. Anton Kasenbacher

practice management

36 Eleven tips for success in your dental clinic
Dr Anna Maria Yiannikos

events

40 Laser education at its best
Dr Dimitris Strakas

news

42 manufacturer news international

44 news international

DGL

47 Mit Laser die Zukunft ausleuchten
Kenji Yoshida

48 news germany

about the publisher

50 imprint

Cover image courtesy of LASOTRONIX
www.lasotronix.com

Fotona
choose perfection

The universe at your fingertips.

TwinLight® Peri-implantitis Treatment

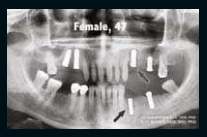
A simple and effective procedure that offers the power to treat peri-implantitis – an increasing threat to oral health.

- Minimally-invasive technique
- Fast regeneration/healing
- Reduced inflammatory response
- Highly effective treatment
- No antibiotics needed

LightWalker®

www.lightwalkerlaser.com

Peri-implantitis treatment video



www.fotona.com

96014 CE ENG/1

Fluorescence-guided caries excavation of decayed teeth

An *ex vivo* study

Authors: ZA Martin Augenstein & Prof. Dr Matthias Frentzen, Germany

Introduction

The goal of caries excavation is the elimination of bacterially infected dentin to give the maximal conservation of healthy dental hard tissue as well as to maintain the vitality of the dental pulp.[1] Dentin layers near the pulp which can be remineralised—affected dentin—should be preserved in terms of an atraumatic therapy.[2,3] There are several techniques to determine the endpoint of the excavation clinically. One of these techniques is the examination of the hardness of the cavity floor using a dental probe. For this type of test, the dental probe must not infiltrate the material further; the "Crie dentaire" must be audible. However, this test is not objectifiable and does not correlate with bacterially infected dentin.[2] Additionally, Fusayama et al. observed that dentin areas close to the pulp show a significantly lower hardness than dentin of a chronical carious lesion.[2]

Fig. 1: SIROInspect® with filter glasses, accessory parts and charging station (Sirona Homepage, 2014).

Fig. 1

Studies with dye solutions, which are supposed to mark infected dentin, do not show unambiguous results either, since hypomineralised dentin areas and porosities are stained as well.[4] This often results in an overexcavation under clinical conditions, since even non-infected hypomineralised areas such as the dentino-enamel junction or healthy areas near the pulp are stained.[5,6]

A fluorescence-based optical method may be considered an alternative.[7] Optical phenomena in the tooth structure damaged by caries or the spectroscopic detection of metabolic products of a microbial infection of the dentin are used.[8,9] Examples for this procedure are the DIAGNOdent®-system,[10] intraoral camera systems with blue light excitation[11] as well as feedback controlled Er:YAG laser systems.[12] The previously-mentioned systems are difficult to implement in practice. The technology is very complex.

Devices which stimulate the dentin with a blue-light diode (405 nm) present an alternative; the examiner gives an evaluation with the help of filter glasses, making the fluorescence visible during the treatment of caries excavation. This treatment technique is called the FACE® method (Fluorescence Aided Caries Excavation).[7] The present study attempts to examine histologically under *ex vivo* conditions whether

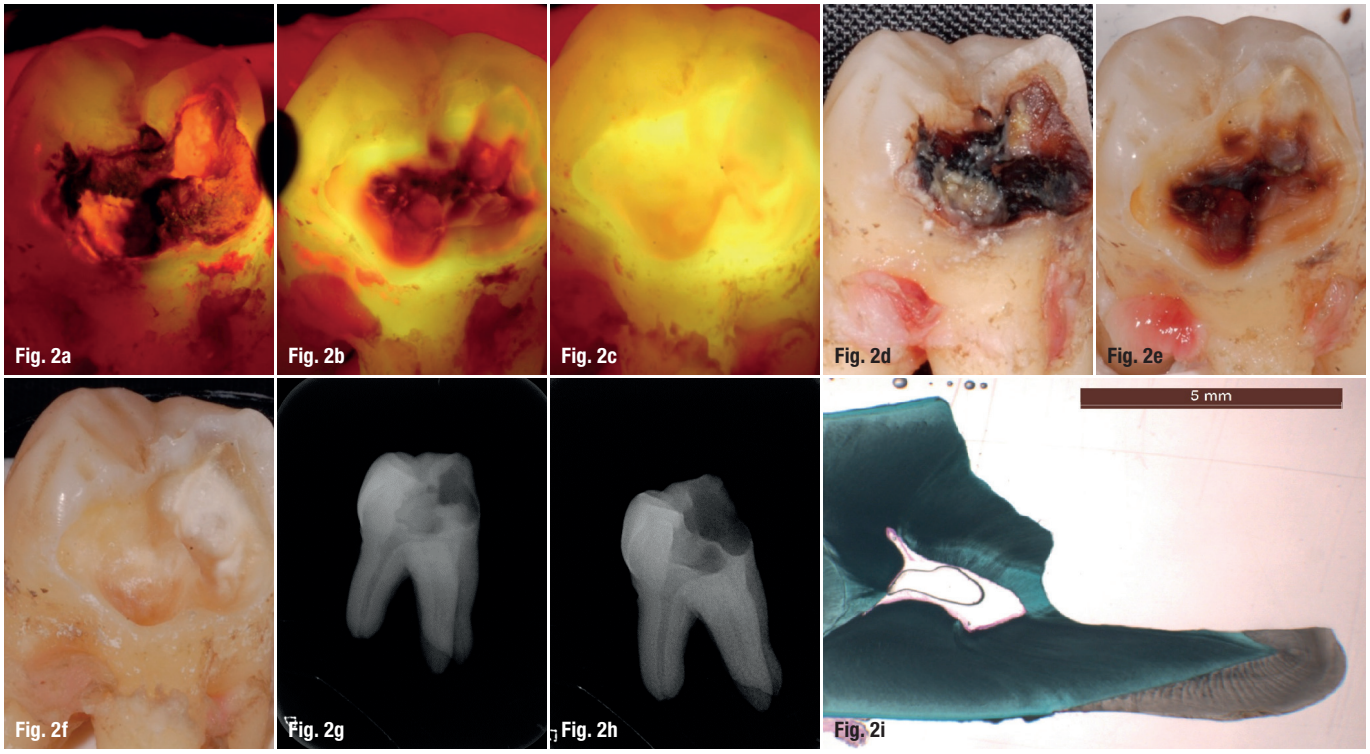


Fig. 2 a–i: Case example I—Documentation of a tooth sample in process of the examination; before excavation a daylight shot and a fluorescene shot (through a high-pass filter > 500 nm) of the cavitated decayed lesion were taken; intermediate steps **(b)**, **(e)** as well as the complete excavation **(c)**, **(f)** using the SIROInspect® were documented; additionally X-rays were taken after extraction and after the complete treatment **(g)**, **(h)**; the histological examination of the thin sections was evaluated microscopically **(i)**.

an atraumatic, complete excavation of bacterially infected dentin is possible.

Material and methods

In this study, 31 human teeth with carious lesions were examined. The indication for the extraction of the teeth was made independently from this trial. Patients gave their informed consent for the scientific use of the samples. All in all, 27 teeth were treated with the FACE®-System (SIROInspect®, Sirona, Bensheim, Germany) directly within two hours after extraction (Fig. 1); four untreated teeth served as reference for the histological evaluation.

The initial state was recorded by a photo as well as X-ray. After that, the teeth were fixed in a stage. Then the cavity was illuminated using the SIROInspect®-light probe (405 nm, 60–250 mW)

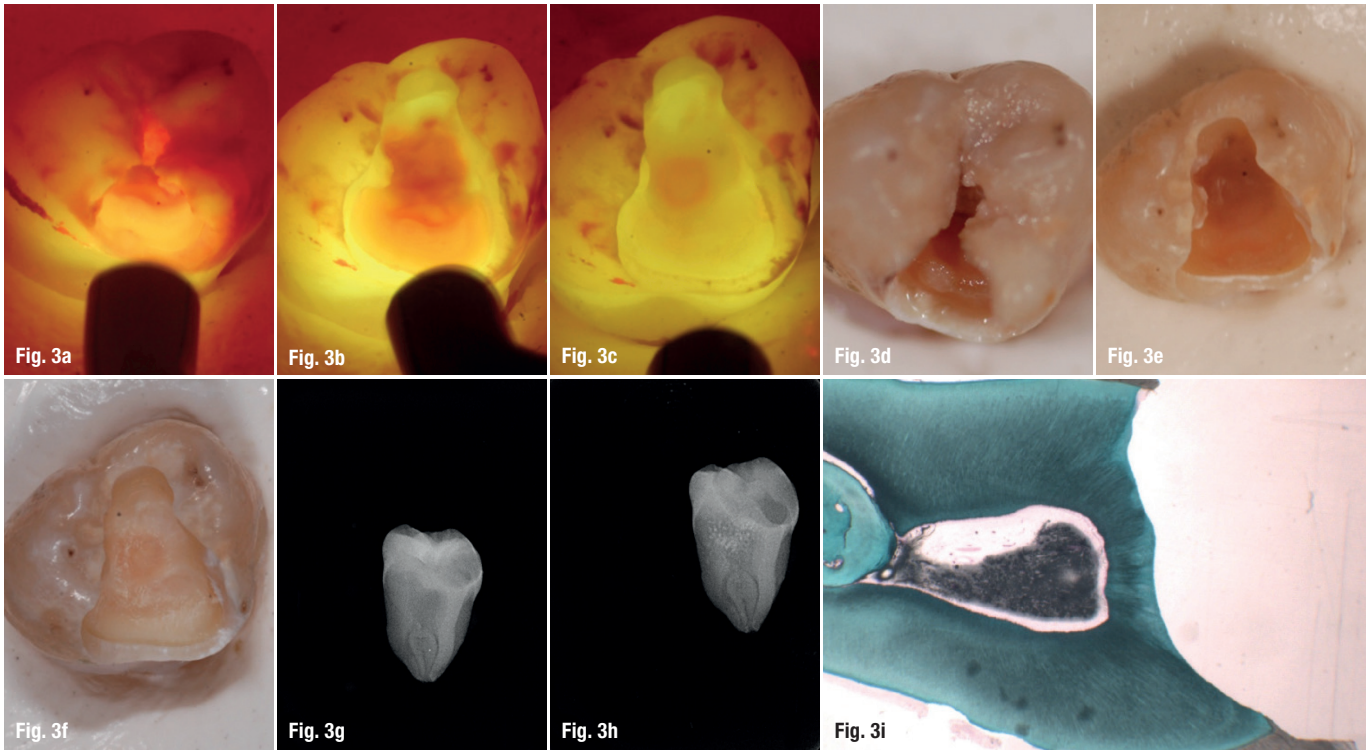


Fig. 3 a–i: Case example II— Documentation of a tooth sample in process of the examination; before excavation a daylight shot and a fluorescene shot (through a high-pass filter > 500 nm) of the cavitated decayed lesion were taken; intermediate steps **(b)**, **(e)** as well as the complete excavation **(c)**, **(f)** using the SIROInspect® were documented; additionally X-rays were taken after extraction and after the complete treatment **(g)**, **(h)**; the histological examination of the thin sections was evaluated microscopically **(i)**.

and was photographed through a high-pass filter which had the same properties as the filter glasses of the goggles (Figs. 2a, d, g and 3a, d, g). This filter system only lets waves with a wavelength larger than 500 nm pass. Subsequently, an access cavity was prepared with a diamond bur and the carious changed tissues were excavated with a carbide bur with 1,600 rpm using the laser system according to the manufacturer information until no more red fluorescent dentin was visible. The examiner used magnifying glasses to control the treatment. An X-ray and photographic documentation as well as a fluorescence image of the tooth were made according to the initial photographs (Figs. 2c, f, h and 3). The teeth were stored in isotonic saline solution during all steps of the examination. Before histological thin-section preparations were made, the teeth were stored in formalin solution (4 %) and stained with rhodamine fuchsine fast green. Overview pictures were made of all dental probes with a magnification of six times (Figs. 2i and 3i). The identification of histological caries zones (Fig. 4), until which an excavation was performed under the control of the laser system, was carried out at a magnification of 12 times and 18 times respectively. Untreated teeth with cavitated decayed lesions served as histological reference.

Results

In 93 % of the teeth with cavitated caries lesions, red fluorescence were detected in the area of the lesion. Two samples did not show red fluorescent features, but only fluoresced in the brownish spectral range. These two teeth were also excavated until there was no more brownish fluorescence. The sections of these teeth did not show any abnormalities of structure in the periphery of the carious lesions.

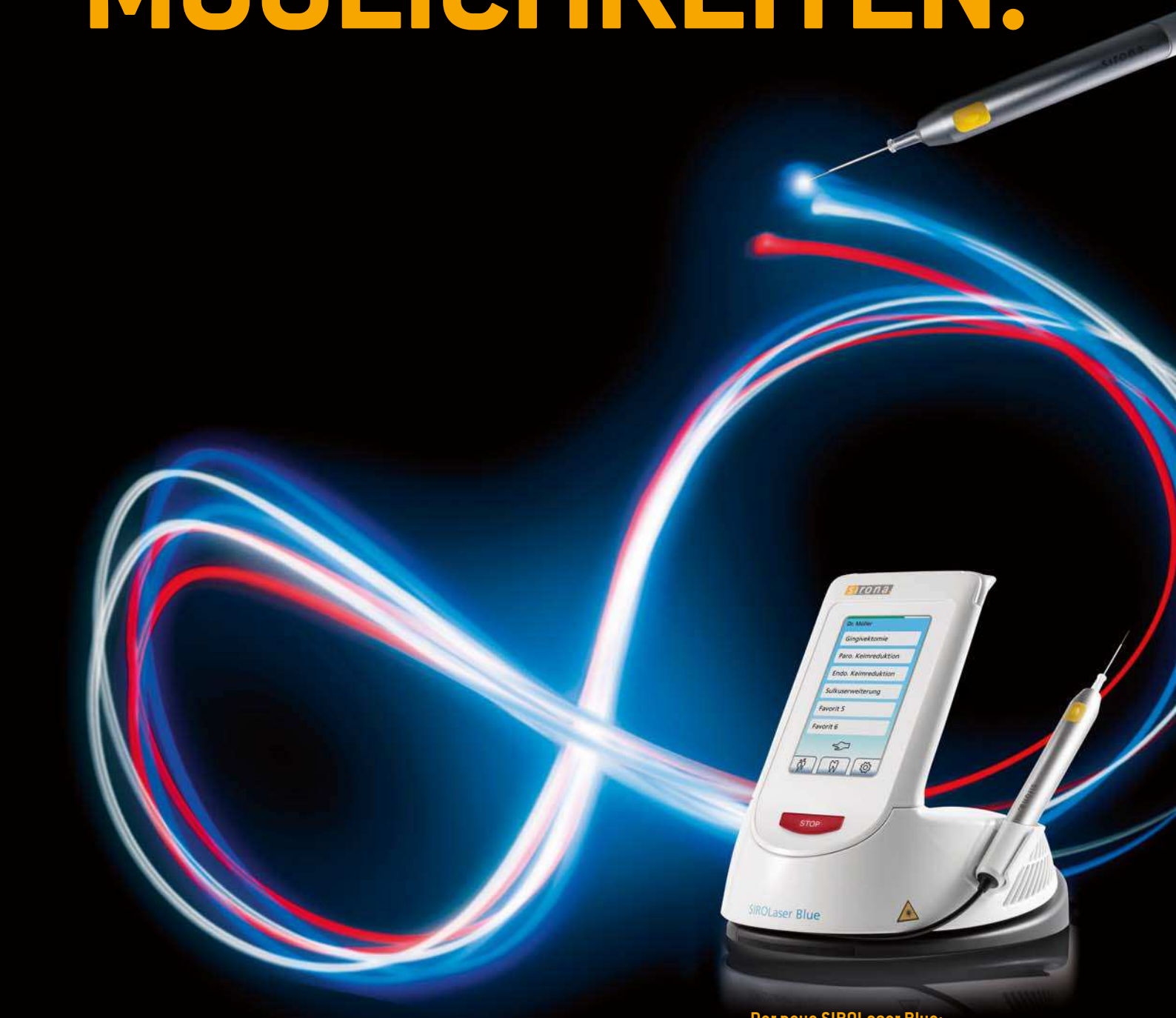
The X-rays revealed a complete excavation for all teeth. 96 % of the teeth were identified histologically free from bacteria (Figs. 2 and 3). In 37 % of the samples, parts of sclerotic dentin were preserved. After the excavation using the laser system, carious dentin (microbiological contamination) was identified histologically only in one sample.

Discussion

In 2002, Lennon et al. already examined whether red fluorescence corresponds to bacterially infected dental hard tissue.[7] In his study, the FACE® method was compared to other methods of excavation. DNA labeling of the samples was assessed by means of CLSM (Confocal Laser Scanning Microscopy) as objective evidence. The study showed a sensitivity of 94 % and a specificity of 83 % for the FACE® method. The results of a conventional excavation method were distinctly below those values and the excavation method using carious detector dye were rated the worst with 65 % for sensitivity and a were only 17 % for specificity.[7] Another significant finding is that if there was a

SIROLaser Blue

UNENDLICHE MÖGLICHKEITEN.



Der neue SIROLaser Blue:
Maximale Schneidleistung trifft
auf höchste Behandlungsvielfalt.
3 Dioden. Mehr als 20 Indikationen.
Unendliche Einsatzmöglichkeiten.

SIRONA.DE/LASER

The Dental Company

sirona.