

Light in the Darkness

Light has enormous power. We can easily experience this when, in springtime, we carelessly expose our pale winter skins to the sun for too long. In medicine, we use light therapeutically, light therapy being one of the scientifically proven methods for treating various illnesses. It is used, for example, in the treatment of depression and the sleep disturbance commonly associated with it. Also, phototherapy uses light to treat serious skin conditions such as neurodermatitis and psoriasis. In the complete absence of sunlight, people become ill.

Hans Sellmann

/// DYNAMIC

The above processes are known as light therapy or phototherapy. But there is another type of extended treatment – photodynamic therapy, which refers to the treatment of tumours and other tissue changes in human organs. For this, we use light plus a light-sensitizing substance, and oxygen. The principle is quite simple – the patient is treated with a sensitizer which passes selectively into the tumour. After a given period, the tumour and the healthy tissue are irradiated with light of a suitable wavelength, and toxic substances are generated by photophysical processes. Because the neoplasm has been selectively sensitized, other tissue is unaffected.

/// WELL PROVEN

Photodynamic therapy has been used as a standard process in ophthalmology for some time. In dermatology, too, photodynamic therapy is quite useful in the treatment of various forms of skin cancer and its precursors. The disadvantage of photodynamic therapy is that it principally can penetrate only a few millimetres. However, this is not a problem in dentistry, because here we deal only with thin structures.



Fig 1: The battery-powered LED FotoSan equipment is small but impressive!

/// PERIODONTAL TREATMENT

Periodontal treatment is, when performed in the conservative way known for decades, widely unpopular with our patients. This is very understandable.

No patient finds gum surgery and scaling and root planning enjoyable. Don't laugh! Gingivectomy and SRP (accepting the loss of large sections of viable bone mass), were once commonplace.

Nowadays, we see it completely differently, with calls for 'gentle' periodontal treatment – sometimes too gentle, in my opinion! Also, at a time when periodontal disease is no longer (only) a hygiene problem (no plaque =/ no gum disease!), biofilm, which arises 'under the gum' in the sulcus and causes inflammation, must still be dealt with and removed. And that is now not only to be carried out systemically (with oral antibiotics). Again, LDDs, Local Delivery Devices, applied in the pocket, are of only temporary assistance. But how do we get rid of inflammation? With lasers?

/// THE LASER ALONE BRINGS NOTHING

Increasingly, research is showing the powerful antiseptic effects of dental lasers. But precisely as the above mentioned oral and systemic disinfection methods you see limited long term effect – re-infection of the pocket takes place easily. In terms of the technology behind a laser, its price is certainly reasonable, but that is not the case in terms of its applicability.

Whether talking about treatment of hard or soft tissue, you can find equally effective methods and means to obtain the same effect in a less expensive way. However, I see great potential in one area: bacterial reduction.

/// TOO EXPENSIVE

But even when a method in dentistry promises high therapeutic efficiency, it must offer payback for us in the practice with all our cost constraints, especially at the moment. Again, we turn to bacterial reduction (the terms 'sterilisation' or 'disinfection' are not sufficiently accurate) in endodontic treatment or in periodontology, and here the laser is safe and effective. Bacterial reduction in periodontal treatment used together with photodynamic disinfection offers well documented effect and there is an alternative to the laser!



Fig 2: The photosensitizer solution is available in three different viscosities

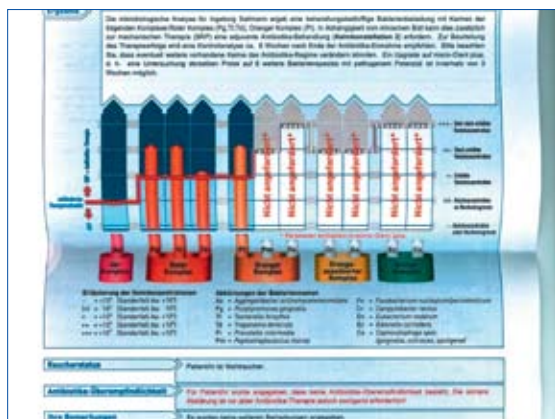


Fig 3: Partial results of the periodontal marker bacteria test (see book, Sellmann: 'Risikountersuchungen in der Zahnarztpraxis', Spitta Verlag1)

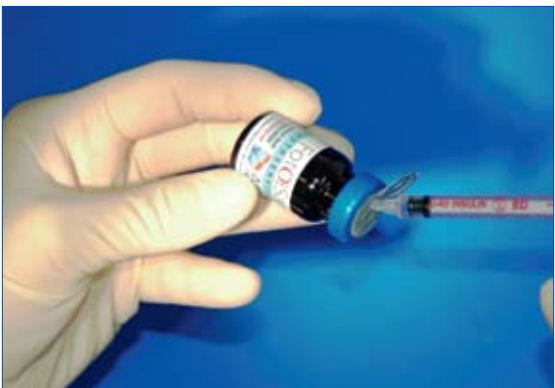


Fig 4: Using a standard insulin syringe, we dose the photosensitizer very sparingly..

/// IF ONLY THE LASER WASN'T NEEDED

I have heard from many colleagues that the problem is the high cost of the laser. However, it is also possible without a laser! Again, back to basics: in 2001, Dörtbudak showed a significant reduction of acinomyces actinomycetemcomitans, porphyromonas gingivalis and prevotella intermedia after PDA treatment (TBO+690nm LED).

- Haas showed in 2000 on 17 patients with periimplantitis that inflammation was suppressed by PAD.
- Kömerik et al (2003), Sigusch et al (2005) and Shibli et al (2003), to name but a few names and studies, also illustrate the positive effect of PAD.

1 Risikountersuchungen in der Zahnarztpraxis – Kariologie, Parodontologie, Tumordiagnostik und andere Hans H. Sellmann brochure, 250 sider, 150 bilder, pris 42,80 €, Spitta Verlag GmbH & Co. KG, Ammonitenstraße 1, D-72336 Balingen, tf.: +49 (0)7433/952-0 Fax: +49 (0)7433/952-111

/// PAD? YOU DON'T NEED A LASER!

For more than ten years one has successfully carried out photodynamic or light-activated disinfection, or as I would prefer to put it, bacterial reduction. A laser is therefore unnecessary. For some time a much cheaper but just as effective light source, the LED, has been available for this treatment. The abbreviation LED stands for light-emitting diode, which is an electronic semiconductor component. When an electric current passes through the diode in the correct direction, light is emitted, ranging from infra-red through to ultra-violet with a wavelength depending on the semiconductor material.

/// ENDODONTIC, PERIODONTAL, IMPLANT, CARRIES ETC

PAD treatment is suitable for many dental problems. It is certainly not a universal panacea, but overall, where we struggle against inflammation in the oral environment, we have used FotoSan equipment successfully. This is how we do it:

- **Root canal treatment:** The root canal is prepared and rinsed in the usual way. It is then filled with FotoSan Agent, the liquid included in the introkit, and illuminated for 30 seconds per canal with the single-use endo tip attached to the lamp. Afterwards, the root canal is dried and filled in the usual way.
- **Periodontal treatment:** First of all, subgingival scaling and root-planning (SRP) is carried out. Then photosensitizer of the required consistency (thin, medium, or thick liquid – all three consistencies are included in the introkit) is injected into the pocket. Now the long tip is inserted in the pocket and the pocket is exposed to light for 10 seconds from the inside. Change to blunt tip and irradiate 10 seconds from the gingival side – both tips are included in the kit. The blunt tip must be pressed firmly against the gingiva.
- **Periimplantitis treatment:** Proceed as with periodontal treatment.
- **Gingivitis and Pericoronitis treatment:** The photosensitizer is introduced supragingivally, and then exposed to light for 10 seconds using the blunt tip, which is firmly pressed against the gingiva.
- **Caries treatment:** The use of FotoSan is especially suitable for adjuvant treatment of caries. After removal of as much as possible of the decayed dentine, the photosensitizer is applied and exposed to light for 10 seconds. The cavity is then filled in the usual way.

/// VIRUSES, FUNGUS, PROTOZOA

According to the manufacturer, and based on corresponding studies, light-activated bacterial reduction (disinfection) is effective not only against bacteria, but also against other micro-organisms such as fungus and protozoa. The affinity for mammal cells of the photosensitizers used is considerably less, so that it has no effect on them – in fact, the treatment is free of side-effects.

Please note:

- The photosensitizer must be in contact with the micro-organisms to be eliminated. Therefore the biofilm must be disrupted which should be done by scaling. A simple coating is not sufficient.
- The light must also reach the photosensitizer in order to activate it. So both the endo tip and blunt tip must be used.

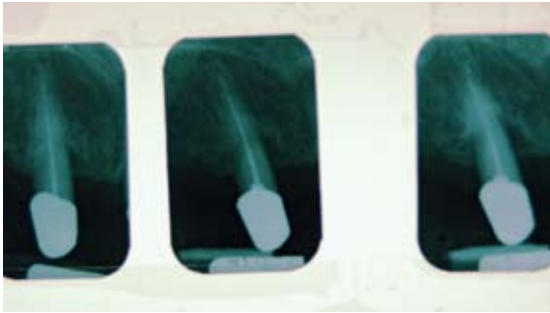
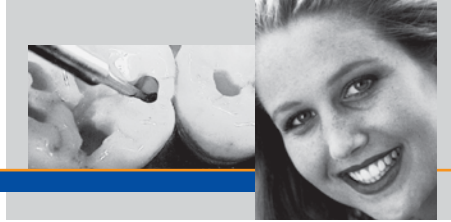


Fig 5: Another treatment case: over a period of one year, shows the bone loss around the abutment indicating an active pocket



Fig 9: ... we attach the blunt tip and place FotoSan from the gingival side ...



Fig 6: We clean it first mechanically using the Airscaler from KaVo ...



Fig 10: ... and irradiate for 30 seconds



Fig 7: ... and then with the curette 'that is not blunt' (American Eagle)



Fig 11: The long tip is then inserted into the sulcus and irradiated for 30 seconds



Fig 8: Then we apply the photosensitiser (old photo, today we use a different syringe) ...



Fig 12: Today, we as well use an Endo-flush cannula in addition to an insulin syringe. It has a lateral exit so that the sulcus is not damaged.

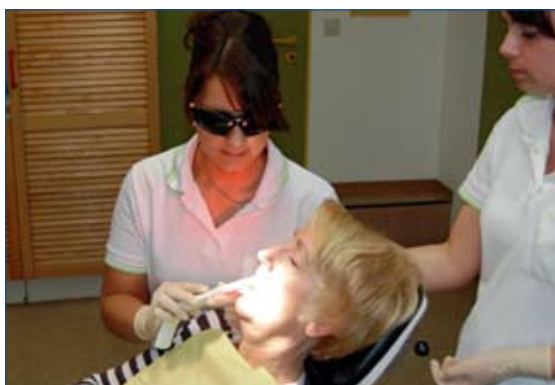


Fig 13: During PAD treatment, the operator wears protective glasses, while the patient closes his eyes.



Fig 15: ... as in endodontic therapy.



Fig 14: In caries therapy, the FotoSan treatment is used just as successfully ...



Fig 16: In root canal disinfection, we insert the long endo tip of the FotoSan equipment.

/// OUR OWN TRIALS

In order to test the effectiveness of the FotoSan, we carried out a trial of our own.

- Tooth 34 exhibited non-specific inflammation despite otherwise good oral hygiene.
 - We carried out a test for existing periodontopathogenic micro-organisms.
 - Independently of the results, we cleaned and rinsed out the pocket.
 - Then we applied the photosensitizer directly into the pocket using a blunt cannula.
 - Immediately afterwards, we irradiated the pocket from the inside for 10 seconds using the long single-use tip.
- Afterwards from the gingival side using the blunt tip. Both tips can be seen in the photographs.

Over the next few days, reduction of the inflammation could easily be determined visibly (change in colour from dark red to a paler pink).

We then repeated the earlier test for periodontopathogenic bacteria, and found that the bacteria count was significantly reduced.

Further operations on other patients in our practice showed the same positive results.

/// SUMMARY

Light-activated disinfection is very new in terms of its application to dentistry, but is in fact already well-known as an effective method in scientific studies. Instead of using an expensive laser, it can also be carried out with equal efficiency and significantly more economically using a LED lamp and the application of the FotoSan treatment.

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