

Active oxygen treatment

Ronald Muts looks at solutions for peri-implantitis and periodontitis

Oxygen has been used to promote the healing of wounds in medicine for over a hundred years. Since the '60s, hyperbaric oxygen therapy has been used successfully in the Netherlands, after heart surgery and in other cases of life-threatening infection with anaerobic organisms.

Experiments have also been conducted with topical oral oxygen therapy in dentistry, primarily in larger maxillary reconstructions using iliac crest bone (fig 1). In such cases, bone loss regularly occurs as a result of dehiscence and necrosis of any exposed bone. In an attempt to prevent bone loss, and with the good results from hyperbaric oxygen therapy in mind, active oxygen was applied locally by means of a stabilised, active oxygen producing gel (fig 2). According to the dental surgeons conducting these experiments, it was a notable clinical experience that fewer complications occurred, and that the healing process progressed faster and better.

Based on these findings we wondered whether these beneficial experiences would also lead to similarly positive results in our dental practice.

Case 1

A 39-year-old man presented as a new patient in 2011. During the intraoral examination, peri-implantitis was noticed around the implant of tooth 36 with a circular bone defect and a pocket of 9mm (fig 3). After extensive oral hygiene instruction we curetted the



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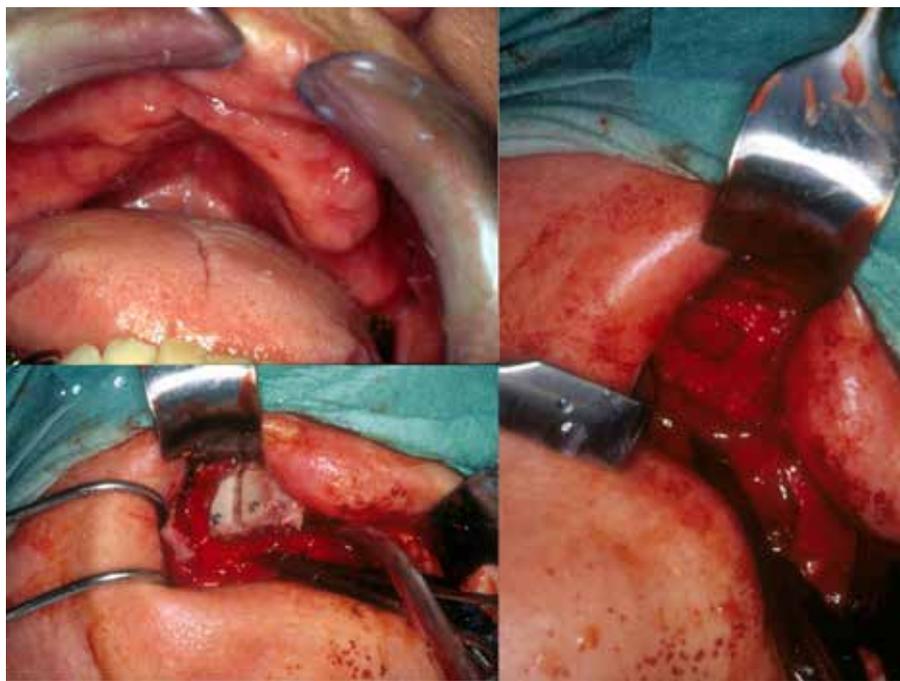


Fig 1: Maxillary reconstruction using iliac crest bone.



Fig 2: Application of active oxygen producing gel.



Fig 3: Case 1 – Defect and pocket of 9mm.



Fig 4: Case 1 – At 1 year pocket reduced to 4mm.

mucous membrane around the implant of tooth 36 in a closed situation under anaesthetic. This was done in order to create a fresh wound bed. We did not clean the implant surface in this context. Immediately after this, we applied the active oxygen based Oral Gel (Bluem) in accordance with TOOTH guidelines.

After one year, new horizontal and vertical bone growth around the implant is clearly visible (fig 4). The pocket depth had reduced from 9 to 4mm. The redness and the swelling of the peri-implant tissue had disappeared, the mucous membrane was tight around the implant again, and there was no longer any bleeding after probing.

Another year later the bone ingrowth had been maintained (fig 5). There even appears to be a slight improvement, and the pocket depth had reduced further to 3mm. ☺



Fig 5: Case 1 – At 2 years pocket depth of 3mm.



Fig 6: Case 2 – Radiograph.



Fig 7: Case 2 – Peri-implantitis, pocket depth of 12mm.

Case 2

In a 62-year-old female patient, we encountered peri-implantitis in 2011. This is clearly visible radiographically



Fig 8: Case 2 – At 2 years pocket depth of 4mm.

(figs 6 and 7). The maximum pocket depth was measured at 12mm. In this case, we raised a flap and encountered cement residue around the implant. We cleaned the implant surface with curettes and 35 per cent phosphoric acid. Bluem Oral Gel was then applied to the implant surface, and to the flap after suturing. We instructed the patient to apply the oxygen gel three times daily around the implant, and to rinse three times daily with the Bluem mouth rinse. After two years, a check-up X-ray (fig 8) was taken. This X-ray agrees with the clinical finding: the pocket depth has been reduced to 4mm.

Discussion

In order to increase the action of active oxygen locally, both low concentrations of sodium perborate and of the enzyme glucose oxidase (GOx) can be applied. In contact with water, sodium perborate is converted

into sodium borate and H_2O_2 . The GOx ensures a gradual conversion of glucose into gluconic acid and H_2O_2 . GOx, which is normally dormant, but becomes active under the influence of moisture, for example from a wound. Small quantities of gluconic acid and hydrogen peroxide are released very gradually.

In low concentrations of 0.003-0.015 per cent, hydrogen peroxide has a disinfectant action, and occurs, together with the antibacterial ROS (reactive oxygen species) during the respiratory burst of neutrophils in normal wound fluid. It has a chemotactic effect on leucocytes. The concentration of hydrogen peroxide in the Bluem products used here is not comparable to the high concentrations (1.5-3 per cent) of hydrogen peroxide used in medicine as a disinfectant. It is known that the production of free radicals with high concentrations of hydrogen peroxide causes tissue damage. Research has however shown that the continuous presence of a low concentration of hydrogen peroxide kills pathogenic bacteria much more effectively than a one-off high concentration and that fibroblasts are not damaged by this.

Conclusion

Although the local use of a low dose H_2O_2 has a proven positive effect on wound healing, the exact mechanism of stabilised oxygen preparations on wound healing in general and on tissue regeneration in dentistry in particular is not yet fully understood. The TOOTH advice for application of active oxygen gel is only a treatment guideline, but has shown great patient benefits in our practice. Reference is made emphatically to the fact that the active oxygen therapy is based on the use of physiologically low-dose hydrogen peroxide and should not be compared to the 1.5-3 per cent concentration usual for disinfectants used in dentistry since these can actually cause tissue damage.

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References available on request.

TOOTH advice

- 1) Record radiographically. Measure pocket depth, recession and bleeding.
- 2) Make an acute wound bed using curettage around the implant, and root planing around teeth.
- 3) Put a small amount of Bluem Oral Gel in a disposable 2.5ml syringe (Terumo) with a black minitip (Ultra-dent). Apply the gel in the pocket around the element.
- 4) Give the patient instructions according to the regime below:
 - i) 2x daily brush with Bluem toothpaste.
 - ii) 2x daily rinse for one minute with Bluem mouthwash.
 - iii) 2x daily interdental cleaning with Bluem Oral Gel at the implant site, or if the patient is able, apply the gel in the pocket before going to bed, using the 2.5ml syringe (Terumo) and black minitip (Ultradent).
- 5) Evaluate after two weeks.
- 6) Check up after four and eight weeks. If the situation remains stable, subsequent check-ups every four months. Measure pocket depth, recession and bleeding at each visit.
- 7) After one year, take control X-ray. Check pocket depth, recession and bleeding.