

Ozonated Liquids in Dental Practice – A Review.

Author: Dr Julian Holmes, Lime Technologies Holdings Ltd, Clinical Director.

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Part 1:	Introduction to Ozone
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Part 7: Periodontal & Implant Care.

Abstract: In Part 7 of Ozonated Liquids in Dental Practice, the uses of ozone are examined in the role of Periodontal and Implant Care, both in the dental practice environment, and in the at-home setting. There is an increasing body of research and evidence to support the use of ozone in both gas form and dissolved in water or plant extracts to control and eliminate infection, to control wound management, and maintain healthy supporting structures of bone and soft tissue.

Introduction.

Fig 07.01 shows an integrated implant: peri-implantitis – periodontal disease around an implant – has lead to bone loss on the mesial surface of the implant - bone interface.

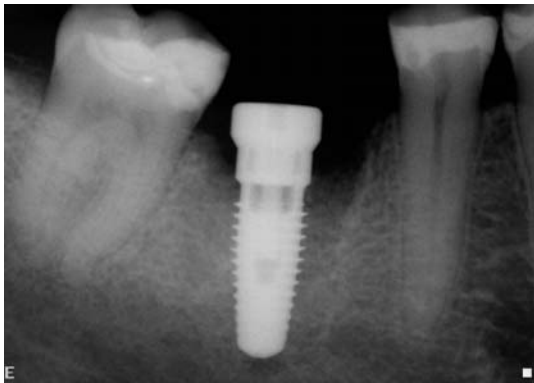


Fig 07.01

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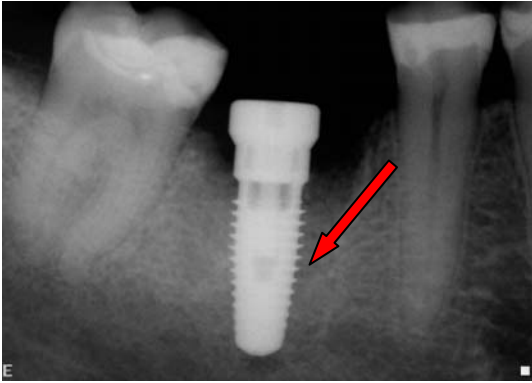


Fig 07.02

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The arrow in **Fig 07.02** points to the deepest part of the pocket.

As implant surfaces become more complex to enhance bone integration, infection and bone tissue loss is more complex to treat and achieve tissue re-integration and health. Traditional teaching suggests that the pocket cannot be treated to allow new bone tissue formation and re-attachment of bone to the implant surface.

In this scenario, the soft tissue is reflected, the complex coating on the implant is removed, and the surface polished. The result is, in essence, a long polished healing collar, and a more complex area for the patient to maintain. Also a large amount of heat is created in this process with titanium powder and metal particles. The heat may cause bone necrosis and implant loss. The metal particles will cause unsightly soft tissue tattoos.

The use of ozone and ozonated liquids allows a simple sterilisation of the failing implant surface. Once access to the area of dehiscence is obtained and gross infected tissue has been removed, ozone can be used to sterilise the implant surface. Then bone grafting can be applied, and after healing, ozone used to maintain an infection-free area.

The use of ozone around implants is supported by published research showing that ozone not only effectively sterilises the surfaces of both the implant and bone, but also switches on the reparative mechanisms allowing tissue regeneration around implant surfaces (*Low et al 2006*).

Use the CMU3 to 'irrigate' the peri-implant pocket area with ozone as the treatment plan is implemented stage by stage. Set the CMU3 unit to the '10-Minute' setting.

Attach an Ultradent tip to the CMU3 Clinical Tip, and introduce this into the soft tissue pocket. 'Irrigate' each pocket for up to 2 minutes. This will reduce pain and soft tissue bleeding, if present, and allow supporting bone tissue regeneration.

Use the LT-Ozonated Oil range. Irrigate around the implant head and under the bar, and soft tissues with the appropriate ozonated oils.

Use the Lime Technologies Water Sanitiser Unit to make ozonated water to maintain oral hygiene. The Patient can use the Lime Technologies Water Sanitiser at home to continue the treatment and oral hygiene control. Set the Water Sanitiser Unit to the '10-Minute' setting to make ozonated water at home and in your practice.

Use the CMU3 to 'irrigate the treatment area with ozone as the treatment plan is implemented stage by stage. Set the CMU3 unit to the '60-Second' setting for treatment on teeth, and to the '10-Minute' setting when irrigating periodontal tissue pockets.

Figs 07.03 & Fig 07.04, show a full mouth rehabilitation with implant-supported crown & bridge units.

The full arch reconstruction is split into a number of 3- and 2-unit crown & bridge components.



Fig 07.03
Lower Molar
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The upper arch implants are shown in **Fig 07.03** with all the prosthetic attachments in place, and access sealed with light-cured composite. **Fig 07.04** shows the upper technical work in place.



Fig 07.04
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Oral hygiene was going to become an issue for this elderly lady. Within the treatment time, she began to suffer from arthritis, limiting her ability to clean around the implant heads and embrasures. The patient was instructed to use ozonated fluids on micro brushes around all teeth.

The embrasures were left wide enough to allow the brushes access into the interproximal areas. By exerting a small pressure on the gingival tissue, the interdental papillae were recreated, and later contoured with electro-surgery. This also created areas that were more difficult for the patient to maintain.

Ozone and ozonated fluids were used to control and manage the healing phase of all surgery procedures, and in routine hygiene maintenance.

Use the CMU3 to 'irrigate' the peri-implant pocket area with ozone as the treatment plan is implemented stage by stage. Set the CMU3 unit to the '10-Minute' setting.

Attach an Ultradent tip to the CMU3 Clinical Tip, and introduce this into the soft tissue pocket. 'Irrigate' each pocket for up to 2 minutes. This will reduce pain and soft tissue bleeding, if present, and allow supporting bone tissue regeneration.

Use the LT-Ozonated Oil range. Irrigate around the implant head and under the bar, and soft tissues with the appropriate ozonated oils.

Use the Lime Technologies Water Sanitiser Unit to make ozonated water to maintain oral hygiene. The Patient can use the Lime Technologies Water Sanitiser at home to continue the treatment and oral hygiene control. Set the Water Sanitiser Unit to the '10-Minute' setting to make ozonated water at home and in your practice.

Implants present a special scenario to the patient's oral environment and a special challenge to maintain healthy alveolar tissue to support and retain the implant and its prosthetic restoration.

It cannot be stressed too much or often enough, that it is the dental practitioner's responsibility to assess the level of oral care training and maintenance a patient requires, and the suitability of the patient for implants.



Fig 07.05

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Fig 07.05 showing debris and tissue infection around an implant-retained bar. The patient is reported to have said that as cost was not a problem, if the treatment failed, he would just have it repeated.



Fig 07.06

Lower Molar
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Fig 07.06 shows a similar case in a 19-year old female patient. Despite numerous repeated attempts to encourage oral hygiene, she failed to comply, and the implants were subsequently lost.

Sadly, this not only shows the failure of the practitioner to assess and select suitable patients, but also illustrates the lack of understanding concerning implants.

Use the LT-Ozonated Oil range. Irrigate around the implant head and under the bar, and soft tissues with the appropriate ozonated oils.

Use the Lime Technologies Home Water Sanitiser Unit (LT-HWU3) to make ozonated water to maintain oral hygiene. Set the LT-HWU3 to the '10-Minute' setting to make ozonated water in your practice. Ozonated water can be used to rinse and wash the injured tissue, as well as maintain oral health. Patients can use the LT-HWU3 unit at home to make ozonated water to brush with, sterilise their tooth brushes and use ozonated water as part of their hygiene cycle.

Without the supporting tissues, which will be lost by the developing periodontal disease around these two implants, the implants will be lost, and it will not be possible to replace the implants in this location.



Fig 07.07

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Fig 07.07 shows a patient with missing central teeth. The upper acrylic denture has led to labio-palatal width for implant placement. Upper laterals are to be veneered due to failing composite restorations. All other upper teeth are unrestored.



Fig 07.08

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Ozonated water was used to irrigate the surgery site during tooth removal and implant site preparation. **Fig 07.08** shows the case with the upper left implant in place, before the upper right central is removed.

In this last case (**Fig 07.09**), an upper right 1st molar is to be extracted. The patient has a long history of episodic pain associated with this tooth, and it is non-vital.



Fig 07.09

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Ozone is used in gas form to sterilise the socket once the molar is removed, and as ozonated water, once the bone cavity is surgically cleaned of all debris and granulation tissue (**Fig 07.10**).



Fig 07.10

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Ozonated water is used during the implant site preparation surgery, and to sterilise the implant before insertion.



Fig 07.11

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Once the implant has been placed, the wound sutured and post-operative instructions given, the patient was instructed to use ozonated fluids around the healing site. Either ozonated oils or water can be used.

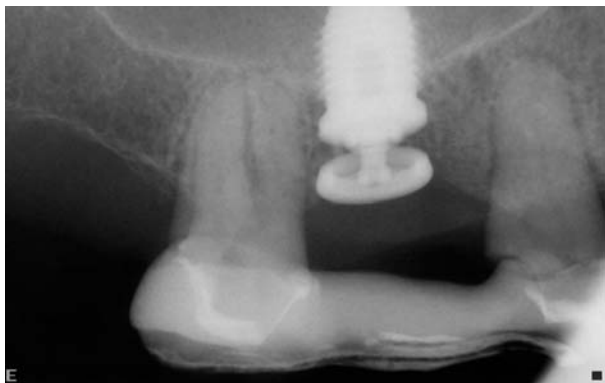


Fig 07.12

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The patient presented about 5 months later complaining of a slight swelling under the transitional bridge.

The PA x-ray (**Fig 07.12**) shows the cover screw has loosen and unscrewed – despite being covered with gingival tissue.



Fig 07.13

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Fig 07.13 shows the stage before the upper second premolar was removed and an implant placed in this site. The definitive technical work has been placed on #17 and

#16.

Oral Hygiene and Implant Retained Dentures.



Fig 07.14

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Fig 07.14 shows two implant heads with ball prosthetic attachments to secure a lower denture. These may present potential problem areas where debris collects, and is difficult for the patient to remove..

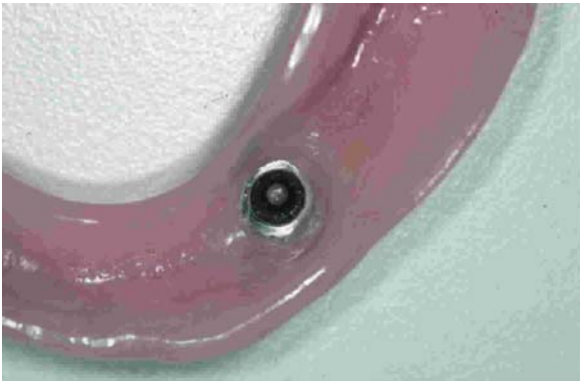


Fig 07.15

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Fig 07.15 shows the lower denture with ball attachment clasps. Debris will collect in the soft tissue and ridge areas on the fitting surface of the lower (and upper where fitted) denture.

Fig 07.16 shows the same patient with the ball attachments changed for a splinting bar attachment. Both implants are now held rigidly, and the denture is more stable in the patient's mouth. However, this also means that cleaning under the bridge is more difficult. Additional skills have to be learned by the patient to maintain oral health, and prevent supporting bone loss around the implants.

Ozonated fluids can be used to lubricate the attachments, and around the implant head. This will help to ease placement and removal where the patient has poor muscle strength, reduce tissue infection and swelling around the implant abutment, and maintain tissue health.



Fig 07.16

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As the number of implants increases, and the denture becomes more complex, the bars used to support a denture become more complex.

In **Fig 07.17**, a bar with Rine attachments is shown. **Fig 07.18** shows the fitting surface of the denture with the female part of these attachments.



Fig 07.17

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Fig 07.18

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Ozonated fluids can be used to lubricate the attachments, and around the implant head. This will help to ease placement and removal where the patient has poor muscle strength, reduce tissue infection and swelling around the implant abutment, and maintain tissue health.

In summary, ozone has an important role to play in oral hygiene, both its maintenance and control.

For routine oral care for patients with implants.

Use the LT-Ozonated Oil range. Irrigate around the implant head and under the bar, and soft tissues with the appropriate ozonated oils. The oils can be used at home in the after-care treatment phase by the patient on a regular basis. There are no studies that have ever shown the development of microbial resistance.

Ozonated Oils and Oil-Gels General Points and Information.

Storage. Please refrigerate or keep in a cool, dark place. Do not freeze. Replace the container lid when not in use.

Spillage: Clean up oil spills and dispose of carefully. The oils are non-toxic.

Container Disposal. Dispose of the containers with care and consideration to your environment. Use a recycling centre if possible.

Inflammability. This product is not inflammable under normal conditions and use. Do not expose to heat sources.

Directions for use. These products should not be swallowed in large quantities and are not intended for internal use unless specified below. However, they are not toxic, and if swallowed, there are no special precautions that should be taken. If in doubt, consult your usual doctor.

Treatment Duration. For areas of periodontal infections, the treatment time is from 2-3 weeks or longer as determined by the practitioner. There are no reported cases of microbial resistance to these products. Healing time is dependant on the age of the patient, the medical status of the patient, and patient compliance. If in any doubt, contact Dr Julian Holmes at julian@limetechnologies.net or your own medical practitioner who you normally consult with. Further information is available from the Internet and World Wide Web on www.limetechnologies.net.

Presentation. Ozonated oils are pure plant extracts, through which pure oxygen and ozone are passed. The plant extracts undergo a chemical reaction to form a thick, viscous oil, or in some cases, a petroleum jelly like product. The final products contain ozonides. These ozonoids have a pharmaceutical activity similar to ozone gas, but at a reduced activity level. They are bactericidal, fungicidal, and veridical. The oils are chosen for their innate healing properties, and the ozonides enhance this effect.

Storage. Please refrigerate or keep in a cool, dark place. Do not freeze. Replace the container lid when not in use.

Spillage. Clean up oil spills and dispose of carefully. The oils are non-toxic.

Container Disposal. Dispose of the containers with care and consideration to your environment. Use a recycling centre if possible.

Inflammability. This product is not inflammable under normal conditions and use. Do not expose to heat sources.

Directions for use. These products are not designed to be swallowed. The encapsulated range of products are intended for internal use. They are not toxic, and if swallowed, there are no special precautions that should be taken. If in doubt, consult your usual doctor or Dr Julian Holmes on julian@limetechnologies.net or contact Lime Technologies at www.limetechnologies.net.

Gum Tissue Infections:

1. Bacterial: Clean the affected area with cooled boiled or sterile water or hydrogen peroxide mouth rinse. Apply a thin layer of the ozonated oil over the affected skin surface. Seek dental help if necessary. The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface. There is no need to cover with a dressing.

Dry Socket: Dry socket is a superficial bone and soft tissue infection, usually following the removal of a tooth or teeth (especially 8's) but this can occur in any site in the mouth after surgery. It is painful, and can take a long period of time to settle and heal with routine antibiotics. To treat with ozone oils, clean the affected area with cooled boiled or sterile water or hydrogen peroxide mouth rinse.

A small syringe with a blunt end, for example the Ultradent 1.2ml syringe with a fine acid etchant delivery tip, is filled with ozonated oil. The syringe tip is introduced into the dry socket to its full depth if possible, and the oil is expelled into the socket as the syringe tip is withdrawn. The patient should be sent home with a supply of the oil, syringes, delivery tips, and instructions, and instructed in oral hygiene care, and the case reassessed at regular time intervals.

Periapical Sinus: After the nerve tissue is irreparably damaged by trauma or caries, it will die. If this goes undetected, an area of infection at the tip of the root will develop. The drainage pathway is towards the buccal plates and sulcus. Treatment should be combined with RCT (Root Canal Therapy). During RCT, the sinus can be irrigated with ozonated oils. A small syringe with a blunt end, for example the Ultradent 1.2ml syringe with a fine acid etchant delivery tip, is filled with ozonated oil. The syringe tip is introduced into the sinus to its full depth, and the oil is expelled into the sinus as the syringe tip is withdrawn. The case should be reassessed at regular time intervals.

2. Fungal: eg Denture Sore Mouth: Clean the affected gum tissue surface with cooled boiled or sterile water or hydrogen peroxide mouth rinse. Clean the denture with soap and water, rinse, and dry. Apply a thin layer of the ozonated oil over the fitting surface (the surface that touches the gum tissue) of the denture and replace. The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface.

3. Viral: eg Lip Herpes:
Clean the affected skin surface with cooled boiled or sterile water or hydrogen peroxide. Apply a thin layer of the ozonated oil over the affected lip surface. The patient should be instructed to re-apply every 3-4 hours after re-cleaning the affected surface.

Periodontal Pockets: These oils should be used in conjunction with thorough scale and debris prophylaxis. They are **NOT** an alternative to routine professional oral hygiene care.

All periodontal pockets should be charted and measurements noted. Points of bleeding and pocket depth should be recorded. After professional prophylaxis, a small syringe with a blunt end, for example the Ultradent 1.2ml syringe with a fine acid etchant delivery tip, is filled with ozonated oil. The syringe tip is introduced into the periodontal pocket to its full depth, and the oil is expelled into the pocket as the syringe tip is withdrawn. At no time should the oil be injected into the soft tissue. The aim is to fill the pocket with the ozone oil or gel as an adjunct to debris removal.

The patient should be instructed in oral hygiene care, and the case reassessed at regular time intervals. Ozonated oil can be re-applied at 1 week intervals in all cases, or in severe cases, more frequently.

Surgery Sites / Surgical Suture Lines: Clean the suture line with cooled boiled or sterile water, or hydrogen peroxide solution. Apply a thin layer of the ozonated oil over the affected skin surface with a suitable instrument, such as a 'Micro-Brush'. The patient should be instructed to

re-apply every 3-4 hours after re-cleaning the affected surface. There is no need to cover, such as with a perio-pack, unless protection from further trauma is required.

Recent Published Ozone Research to Support the Use of Ozone in Solution.

Dental researchers have started to examine the effects of ozonated fluids in periodontal disease. Huth *et al* in two papers in 2006 and 2007 (Huth *et al* 2006, Huth *et al* 2007) examined the effect of ozone on periodontal tissues. The 2007 paper compared traditional periodontal anti-microbial products with the use of ozonated water. Both papers concluded that ozonated water has an excellent anti-microbial effect.

Huth *et al* (Huth *et al* 2007) in their later paper examined the effect of ozone on the influence on the host immune response. These researchers chose the NF-kappaB system, a paradigm for inflammation-associated signaling/transcription. Their results showed that that NF-kappaB activity in oral cells in periodontal ligament tissue from root surfaces of periodontally damaged teeth, was inhibited following incubation with ozonized medium. The Huth 2007 study establishes a condition under which aqueous ozone exerts inhibitory effects on the NF-kappaB system, suggesting that it has an anti-inflammatory capacity (Huth *et al* 2007). The use of ozonated water in dental ultrasonic systems, such as scalers, sonic preparation systems (KaVo Sonic-Sys, KaVo GmbH, Germany) and air abrasion systems would seem to be supported by Huth *et al* 2006 and Huth *et al* 2007.

The use of ozone around implants is supported by published research showing that ozone not only effectively sterilises the surfaces of both the implant and bone, but also switches on the reparative mechanisms allowing tissue regeneration around implant surfaces (Low *et al* 2006).

There are many benefits to control oral hygiene and as a source of sterile water. However, patients should also be informed that there is an interaction of aqueous ozone with anti-microbials. This research has been published, illustrating the importance of potential interactions of dissolved ozone and prescribed anti-microbials. Patients who are taking a course of antibiotics may need to be informed that the use of ozonated water inactivates antibacterial agents (Dodd *et al* 2006) and in particular amoxicillin (Andreozzi *et al* 2005), progesterone (Barron *et al* 2006) and tetracycline (Dalmázio *et al* 2007). For concern to dentists is that ozone may inactivate the anti-microbial effects of triclosan (Suarez *et al* 2007).

A current topic of debate in dental material science and long term potential effects, are endocrine disruptors found in resin-based dental restorative materials. Deborde *et al* (Deborde *et al* 2005) showed endocrine disruptors were destroyed by ozonated water. This paper potentially points towards a pathway to remove these chemicals from the body system after placement of 'modern' tooth-coloured or 'white' fillings.

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Figures 07.01 to 07.18 © Dr Julian Holmes, 2008.

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