

bacteria evolve into one which produces large volumes of acids. These acids attack the tooth surface, dissolving out the minerals, leaving a hole or cavity. As this cavity now gives the bacterial colonies a degree of protection, tooth brushing cannot remove the bacteria and so the process of decay accelerates.

Yet decay is only an infection process that leads to the softening of the tooth, and the formation of a cavity, so could this infection be treated with, say, antibiotics? The bacteria that cause tooth decay are often found deep within the structure of the tooth, so their removal has to date only been by amputating the infected part of the tooth. Antibiotics and other pharmaceutical agents cannot penetrate deep enough through bacterial pellicle and tooth structure to eliminate acid niche environment. This teaching and technique is based on sound engineering principles that originate from the Victorians! Despite modern advances, there is no simple test that can be applied to a cavity to tell the dentist if they have removed all the infection! – or enough tooth material! And if areas of infection are left behind, there is a good chance that the filling placed will fail at some time in the future.

In an attempt to prevent further infection and to restore the tooth to its original shape and function, a filling is then placed. Studies over the years have shown that fillings do not last very long, any where from 6 months to several years. But once a tooth has had part of it amputated, there is no going back. For each time the filling needs to be removed and replaced, there is a little less of the original tooth left and a larger filling. A point is reached where there is no option but to opt for expensive reconstruction work with advanced dental care or have the tooth removed.

The dental professions goal is patient, how to avoid them tissue amputation and Oral care education and helped reduce the number of communities, those with institutions, as well as our aging population, decay is still prevalent. And diet advice is often lacking, so although patients may think they are doing well at home, the process of decay continues! The days of ‘Wait & Watch’ are over – the profession is not entirely sure of what it is watching unless clinicians are using advanced clinical diagnostic tools.

**The days of
‘Wait & Watch’
are over**

to help and educate the entering into this cycle of periodic filling replacement. modern toothpastes have cavities, but in poorer disabilities and in long term



Fig2: The Ozi-cure Ozone Device

Dental Ozone is a completely new way to look at decay. In the early stages of mineral loss, no use of the drill is required. The treatment is simple, inexpensive (certainly less than the cost of a filling), and requires no injection of anaesthetics. This does of course depend on the use of modern diagnostic equipment, such as the DIAGNOdent (KaVo GmbH). This laser is more accurate than x-rays, and far superior to the traditional mirror and

probe that dentists often use. The mirror and probe are tools that can find holes, not diagnose areas of first stage decay. And research has shown that x-rays are very poor to visualise decay in a tooth surface, until it is 2-3 mm inside the inner layer of the tooth.

If the area of decay is deeper, and more extensive, Ozone still has a role to play. The dental drill may need to be used to remove the cover of enamel over the decay, but this can also be carried out with air abrasion. No local anaesthetics are required, and Ozone is used to sterilise the area of decay, without the need to amputate a large volume of tooth structure. In this way, damage to the tooth is limited, and the inherent strength is preserved. Even in really deep areas of decay, Ozone can be used to preserve tooth tissue.

When Ozone is combined with traditional care, then there are a number of advantages that patients and the dental profession can make use of. Ozone can be used to sterilise a cavity before a filling is placed, so there will be virtually no sensitivity after the local anaesthetic wears away. It can be used to eliminate sensitivity after new crowns or veneers are placed. And where wear facets have produced sensitive areas at the necks of teeth, in most cases a simple 40 second application with ozone can eliminate this sensitivity. There are many more applications for Ozone in a general dental or medical practice, and the studies for some of these can be found on www.the-ozone.cc. This www site allows you to view the research papers that have been published from centres around the world.



Fig3; KaVo

There is not a single facet of a medical, dental or veterinary practice where ozone cannot be used in some form for the benefit of patients – from the general to specialist practice and health care centre, all can take advantage of this new technology.

So perhaps a Monday morning at a dental practice that has invested in modern technology is no longer the stressful, painful and anxious visit that it used to be. The waiting room in this practice are full of smiles, people chatting to the dental team members as they wait with happy anticipation at being called through for their turn in the treatment room. Mums and dads with children have no fear or anxiety, as they are reassured that modern technology has opened a door for them, that most of the older population had never believed possible. For both the patient and the dental practice, it is a technology that has a winning solution for both; the treatment is fast, it is predictable, it is painless, and also reduces the long-term cost of the treated tooth. For the dental practice, the treatment times are reduced, it is profitable, and the treatment less stressful. For the patient, modern technology has allowed them to have a 21st century treatment, rather than one that is old fashioned, and out-dated.



Case Studies;

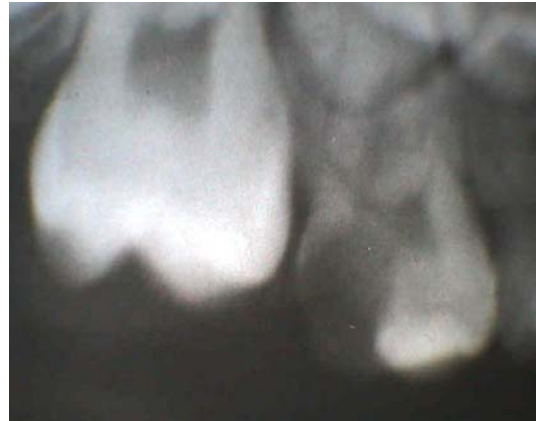
1. This case was sent to me by Dr AG from Johannesburg, South Africa

X-Ray 1: Child patient aged 4 years. Presents with rampant bottle decay on all teeth. No pain or infection present. Suggested GA with pulpotomy to try to save 55 to allow 16 to erupt into favourable position. Parents refused GA as they were going on an overseas holiday!

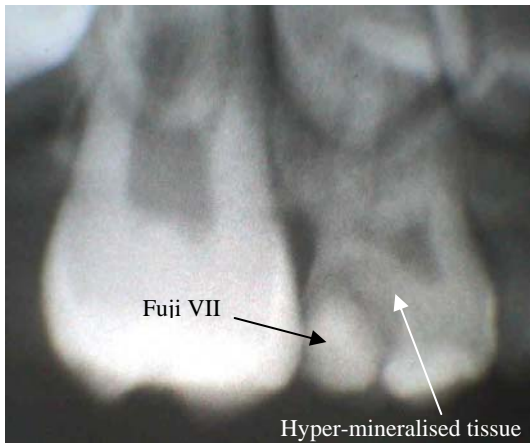


X-Ray 2: Child presents 6 months later. Again, no pain or infection. Parents do not want GA. Child uncooperative but allowed ART technique with Fuji IX.

X-Ray 3: Child returned over one year later as an emergency with toothache. ART technique had failed on 55. Child still unable to have conventional dentistry performed in the chair. Parents still unwilling to accept GA.



Ozone and Fuji VII was used.



X-Ray 4: Child came for a “check-up” just over 1 year later. Miraculous! No pain or infection. The 16 has erupted perfectly into position

The remineralisation – or hyper-mineralised secondary dentine has formed a ‘bridge’ over the pulp horn. The mode of action of ozone is as follows;

Ozone sterilises the area of infection – we know it as caries. The soft debris is removed, exposing the leathery but infected dentine below. When ozone is applied, the bacteria and their bio-molecules are oxidised to carbon dioxide, and acetate acid. The pH of the lesion changes from one that mineral loss predominates, to one where mineral uptake dominates. The addition of a mineral wash just after ozone treatment, and before the application of glass ionomer tips the balance to remineralisation.

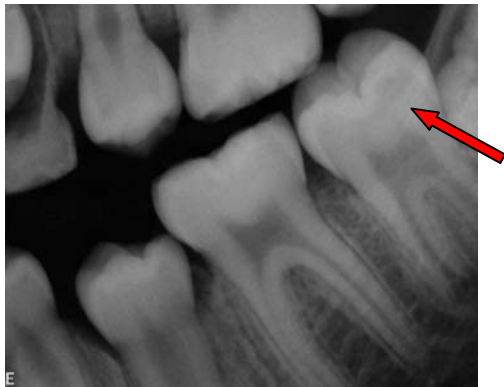
Work by Professor V Bocci has shown nerve – in this case, dental pulp – tissue can regenerate when exposed to controlled ozone exposure. Once the infection is removed, ozone stimulates the reparative mechanisms, and the pulp tissue has recovered. Secondary reparative dentine forms from the differentiated pulp cells, leading to the formation of the dentine bridge to protect the pulp tissue. Dr AG adds this comment to conclude this case presentation;

“Since I bought my ozone device in August 2005, it has literally changed how I do dentistry! The word “miraculous” never entered my vocabulary: from 2006, I use this word on a daily basis! In fact, I have taken these few days off over the Christmas period to assess the impact this device has had on the running of my practice and to reassess the way forward. It is hard for me, after over 20 years doing full-time conventional dentistry, to reassess how I should treat cases.”

“..... when Dr.Fuks, from Israel, was invited to lecture on pulpotomies, these were described as the “bread and butter” of paedodontic practice.“

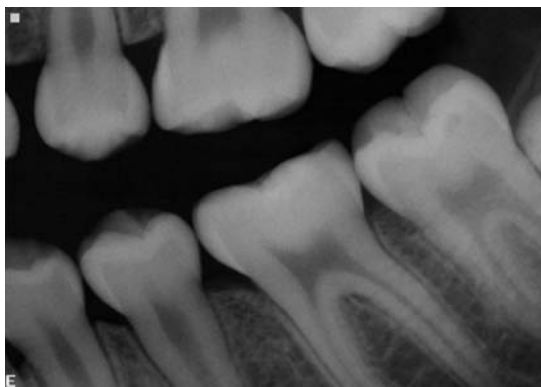
“Since I brought ozone into the practice in August 2005, I have not performed a single pulpotomy! One of my first patients to receive the ozone treatment, came for a check-up 2 weeks’ ago. She loves coming to see me and it is such a positive interaction. This would have been such a different outcome if I hadn’t used Ozone! (Her X-rays are above) She, like many of my patients, suffers from rampant / bottle decay. The need to hold the space for the un-erupted 16 was crucial. This couldn’t have been achieved without Ozone.”

Case 2. Charlotte, age 12.



Charlotte attended with caries in all molars; here I present the lower left second molar, #37. A large disto-occlusal area is visible on **X-Ray 5**.

The cavity was opened with air abrasion, the soft debris removed, and 60-seconds of ozone applied followed by a mineral wash. FujiVII was then used to protect the cavity and to control mineral release into the surrounding dental tissue.



X-Ray 6: The follow-up x-ray taken 4 months later shows the area remineralised and ready for the long-term restoration. In this case Ultradent Mycerium HFO composite was used.

Case 3. Alexandria.

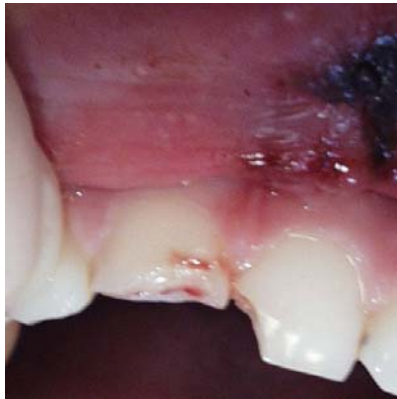


Fig 3.1 Soft tissue injury & fractured central teeth to pulp tissue

Alexandria had been involved in a road traffic accident. After a time in Accident & Emergency at a local hospital, she was discharged. She attended as an emergency 2 days after the injury. The upper central teeth were fractured, with painful exposed pulp tissue. Conventional teaching says the nerve tissue has to be removed due to oral bacterial infection.



Fig 3.2 Pulp tissue visible & extensive crown fractures

The entire surface was ozone treated for 3 x 60-second ozone sessions, a mineral wash applied, and the whole area acid etched and washed. The area was again ozone treated for 40 seconds to remove any potential water-borne infection.

X-Rays confirmed that the trauma was confined to the crown only, and no root fractures present that are visible. Previous research has shown that acid etchants cause an inflammatory response to pulpal tissue, but do not cause tissue necrosis. Necrosis is usually associated with infective processes. This area of research has been extensively researched and published by John Kanka II and Ray Bertolotti. The use of dycal-type products is no longer considered to be necessary for pulp-capping and has been shown to cause pulpal necrosis. The concepts of total etch, direct bonding and resin capping are to be found in these two researchers publications. In this case, total etch and direct resin capping was decided as the best possible treatment, after ozone application to sterilise the nerve tissue. The patient was warned that possible pulp death may result from the delayed treatment.



Fig 3.3 X-Ray showing no root fractures present that are visible.



Fig 3.4 HFO composite cores placed and shaped.

The fractured area was sealed with dentine sealants, and then a resin cap placed over the exposed pulp tissues. Care was taken to limit thermal damage to the tissues by increased heat generation during the curing cycle.

Direct resin bonding with HFO composites over these caps allowed 'new' dentine cores to be built up in 1mm incremental layers. This technique, called 'stratification' is advocated by Prof Vannini, Milan University.



Fig 3.5 HFO composite repairs finished and polished.

Figures 3.6 and 3.7 show the review x-ray and clinical photograph. The soft tissue in the aesthetic zone has healed, resulting in an integrated repair that is difficult to distinguish from the remaining tooth tissue. X-rays showed no peri-apical pathology. The pulp has regenerated, and a new secondary dentine layer has formed below the resin sealant. Initial and review x-rays are shown above.



Initial Presentation



Review Presentation



Review Presentation

The final build-up, characterisation and enamel layers are shown in Fig 3.5. The stratification technique allows life-like composite repairs to be produced relatively quickly, and with minimal existing tissue loss.

Courses on this technique can be sourced through Professor Vannini or American Dental Supplies. Based in Italy, the courses are held at Lake Como, one of the most beautiful Italian lakes.

This case illustrates how ozone can be integrated into routine dental care, as it would not have been possible to preserve the pulp tissue and tooth vitality without the use of ozone in this case. Traditional dental care would have resulted in the pulp being removed, root treatments and probably laboratory work to repair the weakened tooth structure. Whilst new porcelains can mimic tooth tissue in texture and colour, tissue preservation and maintaining pulpal vitality is still the superior outcome.

Case 4. Periodontal Bone Regeneration



Fig 4.1 Initial Presentation



Fig 4.2 3-Month Results

This case illustrates the use of ozone gas introduced into a periodontal pocket via a cannula. Fig 4.1 shows the pre-treatment x-ray of the upper left canine, #33. Extensive bone support loss can be seen around this root treated tooth. The treatment included removing the failed endodontic filling, ozone sterilisation of the canal and apical delta area, and then direct ozone treatment into the peri-apical and periodontal pocket area.

Fig 4.2 shows the regenerated bone tissue infilling the bone defects after 3-months. This was a 60 second ozone treatment cycle for the canal sterilisation, and bony defects.

Case 5; Eddie; Skin Tissue Regeneration

Ozone has been used for many years in Europe, Russia and Cuba for medical and dermatological conditions. In this last case, Eddie, a retired dental surgeon, developed bed sores on his heels after suffering a CVA. After 4 months of conventional treatment with various creams, ozone and ozonated extracts were used as a trial. Within 3 months, the wound on the left heel had closed, and the right heel was infilling with new granulation tissue. The tissue regeneration process is the same as when ozone is used on any tissue, be it mucosal, bone, or skin.



Fig 5.1 Pre-Treatment

Fig 5.2 3/12 Treatment

In a lead article published in 2003 I wrote;

‘In the vast majority of dental practices - not just in the United Kingdom and Europe, but throughout the world - the primary method to reverse the effects of decay remains 'drill and fill'. The entry of a patient into the cycle of drill and fill is irreversible. Once a hole is drilled into a tooth, the patient always will have it; and no matter how good a clinician each dentist perceives themselves to be, any restorative material will fail at some time.’

The dental profession has not kept up with their medical counterparts in finding a holistic treatment method for what is a prevalent infection – caries. The Victorian principles of amputation to establish a sound foundation for restorative care no longer are valid in the light of new published research and clinical experience.

Ozone at last offers the dental profession this new approach instead of the out-dated and Victorian amputational model.

"The Second International Ozone Meeting will be in Antigua in 8th/9th July 2007 lead by Professor Lynch, and Dr Hayes, and leading dental ozone researchers & practitioners. Please contact Dr Hayes at keith@healthy32.freeseve.co.uk or Dr Holmes at julian@oznesd.com "

Further information on the Ozi-cure Ozone unit, prices and availability, delivery and training options can be obtained from Colin Davidson, at colin@oznesd.com

For clinical questions regarding ozone in dental, medical and veterinary care, please contact Dr Julian Holmes at julian@oznesd.com

Dr Julian Holmes, 2007.



Dr Holmes contributed to the text book "Ozone, The Revolution in Dentistry" (Ed. Professor Lynch 2003), has published over 25 papers and articles of his research in ozone technologies and dental care. He was awarded the IADR First Prize for Junior Researcher at the Hawaii IADR Meeting in March 2004 for his paper on treating buccal caries with ozone.

He has lectured throughout the world on ozone applications in health care. He was appointed Visiting Professor to Florence University in 2005 & appointed Specialist Consultant to DSC, South Africa in 2006.

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Announcing the Ozi-cure™ from DSC



The Ozi-cure™ is a self-contained device to generate ozone gas from air for the use in Dental, Medical or Veterinary Practice for surface application.

The Ozi-cure™ Dental Unit manufactured by O3 and distributed in Germany by American Dental GmbH. The Ozi-cure™ achieved CE and Medical Directive Certificates in November 2006.

The treatment times used in dental ozone treatment are short from 10 to 60 seconds (Baysan and Lynch, 2001).

The use of ozone in dental practice takes dental care into the 21st Century. It sets the standard of a modern pharmaceutical method to treat dental and medical patients;

Studies from Europe (Abu-Salem *et al*, 2003; Baysan and Lynch 2001; Holmes, 2003; Holmes and Lynch, 2003) have shown conclusively that the use of ozone in dental care is effective as a non-destructive method to manage decay and its destructive effects. The use of ozone has been shown to be the ideal way to manage anxiety of patients – young and old - and their carers (Dahnhardt *et al*, 2003; Domingo *et al*, 2004).

The effects of ozone reduce tooth destruction in routine preparation (Clifford, 2004; Holmes, 2004; Holmes and Lynch, 2004) and ozone reduces the time and the cost of dental care (Domingo and Holmes, 2004; Johnson *et al*, 2003) and raises the practice income. In Endodontics, ozone is effective against *Enterococcus faecalis* (Chang *et al*, 2003).

Professor Velio Bocci from Milan University (1994) has emphasised that the potential toxicity of O₃ should not preclude its employment for medical, dental & veterinary purposes. This statement has been echoed by thousands of health professionals who use ozone in clinical practices around the world, and millions of patients that have been treated.

The correct operation of the Ozi-cure™ meets all current Health and Safety Regulations in all countries. The Ozi-cure™ is completely safe when used according to the Ozi-cure™ Operating Instructions.

Ozone is perceived to be a dangerous gas; let's put this into a scientific context. In 1978 an FDA Report showed that 1.5 million people were hospitalised by

pharmaceutical reactions, and there were 140,000 deaths from prescription drug usage.

In stark contrast, a 1980 German Medical Society Report for Ozone Therapy cited 5.6 million ozone treatments carried out for that year. Of the 5.6 million ozone treatments, there were just 40 reported cases of side effects (0.000007%), and 4 deaths from inappropriate administration of ozone gas. Ozone remains *the* safest and the most effective pharmaceutical treatment.

In World War I, ozone was used to treat wounds, burns and infections. The modern development of ozone's application to Medicine began in the 1950s in Europe, Australia, Israel, Cuba, Brazil and Columbia. Today, over 9000 doctors, dentists & vets worldwide now routinely use ozone in their clinical management.

Research in Cuba, Europe, the USA and South Africa concerning the anti-microbial efficacy of ozone has continued over the last twenty years and has conclusively shown the ability of both gaseous and dissolved ozone to eradicate a wide range of bacteria, bacterial spores and viruses (Baysan and Lynch, 2001; Ishizaki, 1986; Katzeneleson, 1974; Vaughan, 1987; Whistler and Sheldon, 1989).

A clinical guide for the use of ozone in dental and medical practice is included with every Ozi-cure™ device sold.

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