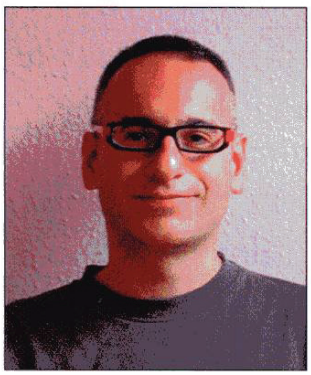
Air abrasion revisited

AIR ABRASION HAS COME OF AGE WITH THE INTRODUCTION OF HELIUM TO THE PROCESS, WRITES PHIL EISENBERG



Phil Eisenberg qualified from Guy's Dental Hospital in 1988 and has worked in general dental practice in Blackheath, London ever since. His practice website is www.sparklysmile.co.uk

In 1998 I journeyed to the centre of several fissures with my newly acquired air abrasion unit.

I found that many fissures I had been monitoring had active decay present in them. The minimally invasive preparations possible with the air abrasion unit were a perfect educational tool to improve my diagnostic skills for fissure caries.

The original air abrasion units of the 1950s had been superseded by more sophisticated versions in the 1990s. My initial reservations for air abrasion were unfounded. I thought the powder would present a problem for my patients and my surgery and I thought the equipment might be prone to mechanical failure.

I found neither of these to be a problem: the powder was tolerated more easily than the water from a high-speed drill and I only use about two coffee cups full per year despite using the machine extensively.

My machine has yet to develop a problem and has been in use every day for five years.

My initial enthusiasm for the technique did wane though.

I was diagnosing more and more extensive lesions, which I was previously missing. The air abrasion units currently available are efficient at cutting through hard enamel surfaces, but slow when reaching the softer, leathery carious dentine in a tooth.

I found I was reaching for my conventional drill more and more to manage these larger cavities.

My patients truly appreciated the pain-free, drill-free techniques I had been using on small cavities and were often disappointed when I had to tell them I was going to use my drill to complete these larger cavity preparations.

Recently I have embraced laser detection of caries with the Diagnodent and even more minimal treatment options using ozone. These tiny active lesions detectable have been ideally treated with conventional air abrasion, ozone and glass ionomer cements.

However, I have still been coming across large lesions that I would like to treat without the need for a drill.

In June, I was truly delighted when speaking to Brian Jackson at Dental Practice Systems to hear that he was going to California to meet with Angel Figueras.

Angel has been using air abrasion for 15 years and has been instrumental in the design of many air abrasion units currently on the market. He has developed an improved way to use air abrasion.

Helium is used to accelerate the effect of the aluminium oxide particles used in air abrasion and this makes the tissue removal process much more efficient. Enamel and dentine can now be removed easily and quickly with little pain and no drill.

TECHNICAL DETAILS

Helium is a colourless, odourless noble gas with an atomic number of two and is the second most abundant element in the universe after hydrogen.

Helium is non-toxic and can safely be stored in pressurised tanks - it is non-flammable and presents no risks in the surgery. Helium can easily be obtained by liquefaction and separation from natural gas. 'Balloon quality' helium is required rather than medical helium (medical helium has a water content causing the powder to clog).

DENTAL ABRASION IMPLICATIONS

Helium expands (decompresses) as it enters air and it warms up as it decompresses.

The cutting efficiency of the air abrasion machine is increased by at least 40% and in use the rate of removal of enamel and

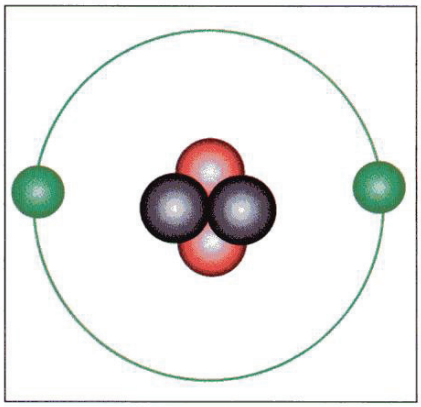


Figure 1: A helium atom

TABLE 1: OTHER USES FOR HELIUM

Filling balloons (blimps), as it is a much safer gas than hydrogen

As an inert gas shield for arc welding in countries where helium is cheaper than argon

Protective gas in growing silicon and germanium crystals, and in titanium and zirconium production

Cooling medium for nuclear reactors

A mixture of 80% helium and 20% oxygen is used as an artificial atmosphere for divers and others working under pressure

Cryogenic applications

Pressurising liquid fuel rockets

TABLE 2 - FINANCIAL IMPLICATIONS

Cost of upgrade to the Crystalmark:
DV1 can be upgraded for £500

Cost of helium:
£300 to 600 per year

dentine approaches that achieved by a fast handpiece.

The amount of helium required even if used exclusively for abrasion all year should only cost £300 to £600 (depending how many cavities you decide to cut with it). There is a one off set-up fee to convert a Crystalmark air abrasion machine for helium use of about £500.

PRACTICAL IMPLICATIONS

Enamel and dentine are removed extremely efficiently. The more efficient cutting means that less air pressure is required and subsequently the patient feels less pain. The warming of the air also means less pain is experienced.

The more efficient cutting means that less powder is required overall.

About 25% more powder is required whilst abrading, but as the cutting efficiency is about 40% greater there is an overall reduced amount of powder used.

This greater efficiency leads to a reduction in dwell time whilst cutting and less pain. Dwell time is the amount of time you have to hover over an area to remove the desired amount of tissue. As the unit cuts more efficiently, you do not have to hold the nozzle still in one place for too long. This leads to less stimulation of the tooth's nerves.

Less pain means larger tip sizes, allowing more powder through and greater cutting power with less pain sensation.

The only 'down side' is the more efficient cutting effect means more care is required to protect adjacent teeth from iatrogenic damage and practice on extracted teeth is essential prior to clinical treatments. Mirror heads also need to be changed more frequently as they become frosted - alternatively disposable mirrors may be used.

Maintenance procedures need to be undertaken slightly more frequently. The increased cutting efficiency wears pinch valves in the air abrasion unit - these are cheap and easily replaceable.

A positive financial aspect is working without the need for anaesthetic means you can work in several quadrants at any one appointment and there is no waiting time for the anaesthetic to work.

This together with your patients' appreciation of pain free quiet treatments is worth its weight in gold.

Drill-free dentistry has now truly arrived - and with accelerated air abrasion techniques it is possible in conveniently short appointments.

Carisolv (chemical removal of decay) is a time consuming process, conventional air abrasion is little quicker but is more convenient - however helium enhanced air abrasion efficiently removes both enamel and dentine leaving the tooth surface clean and ready for restoration.

This technique combined with the earlier diagnosis of fissure caries using laser detection and minimally invasive treatment procedures using ozone means children and young adults may never need fear the dentist again.

The accelerated abrasion techniques also improve the other tasks air abrasion can perform - for example repairing fractured crowns, cleaning up restorations prior to cementation or re-cementation, removing posts and is the perfect compliment to the use of ozone for treatment of early carious enamel lesions.

Acknowledgements

I would like to thank Brian Jackson for his support in researching the continued development of air abrasion in the United Kingdom - he is truly helping dentists and indirectly our patients too.

Brian visited Crystalmark Dental Systems, Inc in California (www.crystalmarkdental.com) - they have been developing air abrasion processes for over 35 years and are the first company to power their abrasion system with helium.

The UK distributor of Crystalmark is Dental Practice Systems. Telephone 01438 820550 for more information.

Thanks also to Angel Figueras for the images of teeth prepared with dental abrasion. His website (www.dentalairabrasion.com) features a complete history of air abrasion and its uses. PD

Figure 2: Molar with early fissure caries

Figure 3: Removal of only diseased tissue

Figure 4: Minimal preparation

Figure 5: Ready for restoration

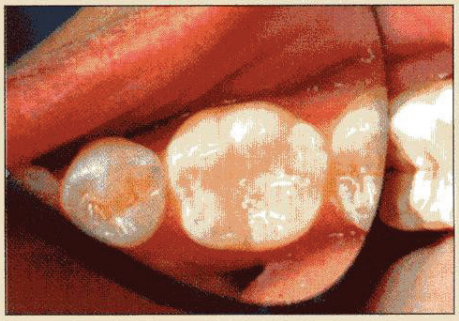


Figure 6: Completed restoration