

DENTAL TRIBUNE

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WHAT WOULD DR MO LAR DO?

In the seventh article of this series, Richard Lishman explains what to consider when purchasing a second practice.

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INTERVIEW

Dental Tribune spoke with Dr Rubén Davó about the new Trefoil implant solution from Nobel Biocare.

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ENDO TRIBUNE

Read the latest news and clinical developments from the field of endodontics in our specialty section included in this issue.

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BDA survey shows most dentists want to leave NHS

By DTI

LONDON, UK: New doubt has been cast on the future of NHS dental care, as a recent survey issued by the British Dental Association (BDA) has found that the majority of dentists currently working in the service intend to leave it within the next five years. The results further showed that one in two dentists under 35 see no future for themselves in the NHS.

Instead, that demographic is now considering increasing the private work they do, working in private practice or moving abroad. Buying a practice is no longer considered a viable option, according to the poll, as only 16 per cent of those surveyed thought they would be able to own a practice in the next five years.

The worrying figures come after statistics from NHS Digital



Demonstrations against NHS cuts in London.

showed that the income of dentists in England and Wales has decreased by almost 35 per cent over the last decade. According to the

BDA, the government is mainly to blame, as commitments to overhaul the controversial 2006 dental contract have not been honoured.

"The dental contract has reduced our patients to a line in a spreadsheet. This conveyor belt model of care has decisively failed

both our patients and the young dentists on whom the future of the service depends," said Chair of the BDA's Young Dentists Committee Dr Harman Chahal. "Young NHS dentists are being asked to make impossible choices. They are offered no reward for going above and beyond, just the constant threat of penalties for not hitting government targets."

Chair of the BDA's General Dental Practice Committee Dr Henrik Overgaard-Nielsen added that, while young dentists remain the backbone of the dental workforce, government has made NHS high-street practice so unattractive that the next generation is now looking to the exit.

"Practices across the UK are already reporting major recruitment problems. This is a crisis made in Westminster, and Westminster must respond," he urged.

Report: Policymakers given steps to act against dental caries

By DTI

LONDON, UK: A new report, published last week by the Alliance for a Cavity-Free Future (ACFF) and the Policy Institute at King's College London in the UK, has highlighted the importance of demonstrating to policymakers the economic benefits of tackling the high rate of dental caries and gaining their commitment to the fight against the disease. The authors have further proposed key steps to speed up the process towards a cavity-free world.

The report is the product of discussions that took place at a Policy Lab meeting in June. This session for the first time brought together individuals from a range of different backgrounds—dentists, economists, public health officials, policy advisers, educators and psychologists—to provide

new perspectives on the continuing problem of dental caries.

While the science on preventing the disease and stopping early-stage caries progressing is already well understood, efforts to apply it have so far fallen short, the report's experts emphasised. They estimate that the potential economic and health benefits of a cavity-free world are significant, especially considering that caries has common risk factors with other non-communicable diseases, such as diabetes and metabolic syndrome. Reducing the risk factors associated with caries could thereby also help improve health more generally and reduce the fi-



nancial costs arising from other conditions, they explained.

To have policymakers actively engaged in the fight against the disease, systematic economic and comprehensive clinical data must be collected, the report urged. In addition, increased efforts should be made to accelerate the move towards a greater focus on preventative dental care. To this end, the authors proposed creating new remuneration systems for dentists to ensure that caries prevention and control are properly rewarded, as well as promoting efforts to encourage behaviour change in the public and implementing incentives for the industry

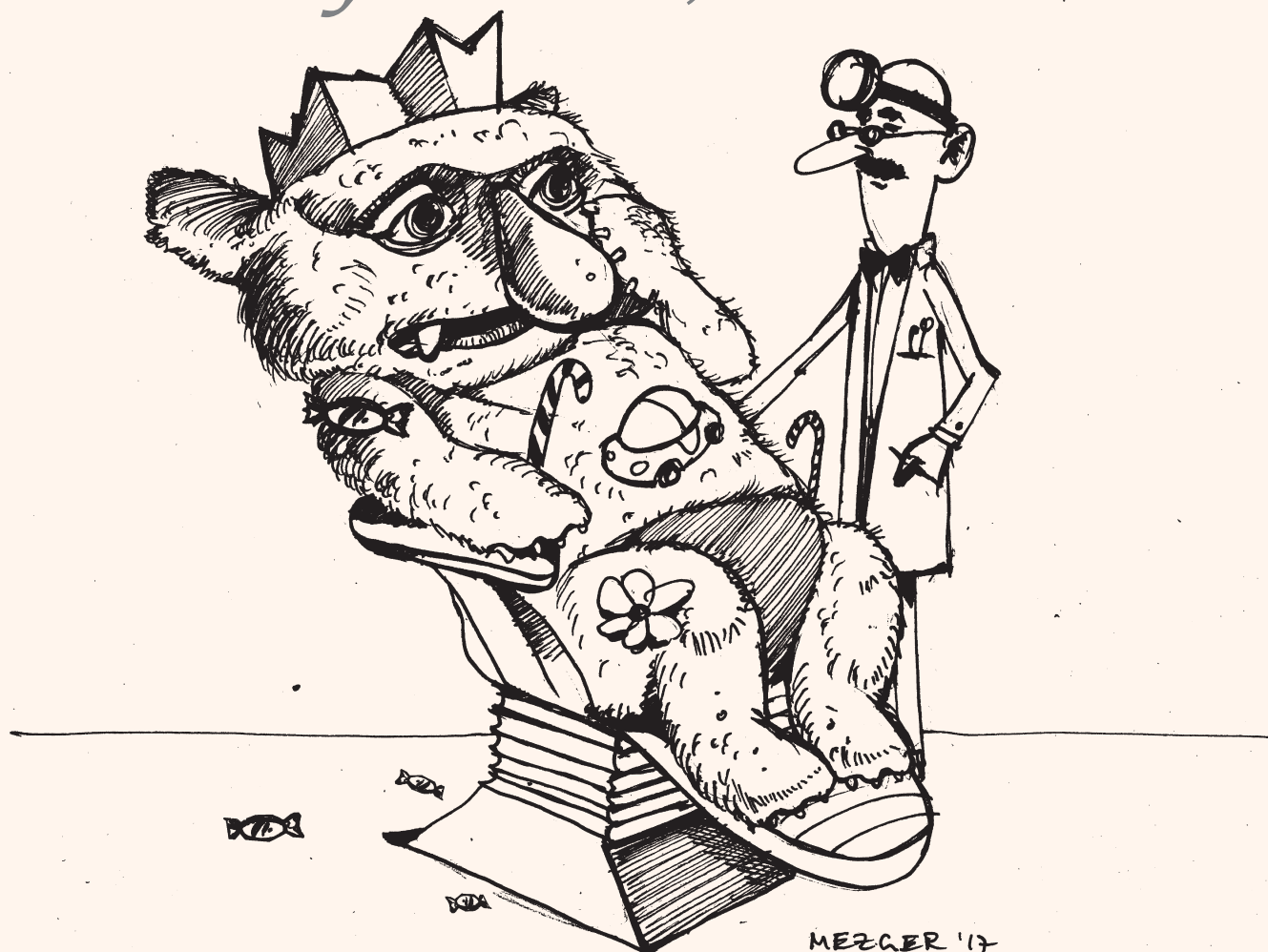
to adopt more socially responsible agendas, among other measures.

Concerning the proposal to revise dental remuneration systems, ACFF Global Chairman Dr Nigel Pitts told Dental Tribune Online: "Current payment systems do not typically pay dentists to 'do prevention' and there is no financial incentive for dentists to spend time and resources on preventatively oriented care pathways. In order to see progress, this needs to change."

In addition, Pitts highlighted the importance of closer collaboration between dental and medical practitioners. "Maximising the effectiveness of caries preventative caries management will increasingly draw on a multidisciplinary workforce of teams made up of

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"Too many sweets, eh?"



GDC: First results of fitness to practise analysis published

By DTI

LONDON, UK: Dentists who are male and have an Asian background are more likely to be investigated by the General Dental Council (GDC), an independent analysis of the regulator's fitness to practise (FtP) data has suggested. It also found that foreign dentists who registered by taking its Overseas Registration Exam were less likely to be involved in an FtP case than their counterparts from the European Economic Area region.

In fact, dentists from that area were over-represented in FtP proceedings, according to the data.

The analysis commissioned by the GDC is the first to examine data from its FtP process in depth and is part of the organisation's ongoing efforts to reform dental regulation. Although the findings do not necessarily reflect the actual situation owing to gaps in the information-gathering process, the regulator said it is planning to share them with its partners in or-



der to help transform internal processes and policies, like the development of new materials to ease the transition of dentists who were trained abroad into UK dentistry.

They will also be used for a state of the nation report that is anticipated to be released in 2019, the GDC added.

According to the Professional Standards Authority, the regulator

opened 250 cases in 2015/2016 that met FtP criteria.

"This is a major step towards improving our use of data and intelligence to inform upstream regulation initiatives—to improve patient protection, ensure the public maintains confidence in dental services and to better support professionals," explained the GDC's Executive Director of Fitness to Practise, Jona-

than Green. "We made a commitment within shifting the balance to use data and intelligence to inform our approach to regulation and this statistical analysis of our fitness to practise data is one of the ways we are working to fulfil this."

"We have already started to use the findings to feed into our ongoing work to deliver our commitments," he also said.

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professionals with a mix of skills best suited to the environment they work in and the range of patients they support. This involves empowering the existing workforce with the knowledge they need and also, where possible, expanding the range of people who

can advise, refer and, in some cases, treat around issues of dental caries and dental health."

Untreated dental caries in permanent teeth affects 2.4 billion people and was the most prevalent condition among all participants evaluated in the 2016 Lancet

Global Burden of Disease study. Untreated caries in children's teeth was the tenth most prevalent condition, affecting over 621 million children worldwide.

"It is our job as dental and health professionals to ensure that the health of the public and

patients is our priority. By working together across stakeholders to progress a shift towards prevention rather than just restorative treatment of caries, we will be ensuring a healthier future for millions as well as securing greater access to care for excluded patients," Pitts said.

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Mechanism behind oral thrush discovered

By DTI

LONDON, UK/PITTSBURGH, USA:

A recently discovered peptide toxin has been identified by a team of UK and US researchers as

harmless fungus which results in the painful infection.

“Surprisingly little is known about how fungal immunity in the mouth operates,” said co-senior

importance of Candidalysin. Not discovered before 2016 by Professor Julian Naglik at King’s College London, the toxin is the first peptide toxin identified in any fungus that was found to infect humans.

defence network at barrier sites of the body. This knowledge may ultimately be harnessed to design antifungal vaccines,” Professor Julian Naglik from King’s College London Dental Institute, who discovered

pain that makes it difficult for patients to eat or swallow. It is also believed to be responsible for other serious fungal infections, especially in infants and other patients with a compromised immune system

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Candida albicans is a causal agent of opportunistic oral and genital infections in humans.

the cause for the mouth to develop an oral thrush. The substance called Candidalysin, which is produced by the fungus *Candida albicans*, was found to punch a hole into cells lining the mouth thus triggering the immune response, they wrote in a study published by the journal *Science Immunology*.

Helper immune cells then attack the hyphae of the otherwise

author Sarah L. Gaffen from the University of Pittsburgh School of Medicine. “And, until now, it was unclear why *Candida* does not establish an invasive infection in healthy humans.”

In their study, the researchers used a combination of human oral epithelial cells cultured in laboratory dishes and mice infected orally with *Candida*, to show the central

Understanding its role in the infection mechanism in the mouth could eventually lead to better treatments for the condition and other fungal infections, the scientists said. They added that despite millions of fungal infections worldwide, there are no commercially available anti-fungal vaccines yet.

“Our research provides vital clues to understand the immune

Candidalysin in an earlier study, said. Awarded a large National Institutes of Health (NIH) grant, Gaffen and Naglik announced to further explore the role of Candidalysin signalling in oral immunity in the near future.

An oral thrush is one of the most common fungal infections of the mouth. While it is treatable with topical medication, it often causes

such as HIV/AIDS patients, denture wearers and those on immunosuppressants, including chemotherapy and drugs to prevent the rejection of transplanted organs.

The paper, titled “Oral epithelial cells orchestrate innate Type 17 responses to *Candida albicans* through the virulence factor Candidalysin” was published in *Science Immunology* on 3 November.

Tooth found in Dorset traces human lineage to rat-like creature

By DTI

PORTSMOUTH, UK: According to new research from the University of Portsmouth in England, fossils from the oldest mammals belonging to the line that led to human beings have been discovered on the Jurassic Coast of Dorset in the UK. The two teeth are from small, rat-like creatures that lived 145 million years ago in the shadow of the dinosaurs. The animals are reportedly the ancestors of almost all mammals alive today.

The discovery of the teeth was made by University of Portsmouth undergraduate student Grant Smith. Dr Steve Sweetman, a research fellow at the University of Portsmouth and the study’s lead author, said: “Grant was sifting through small samples of earliest Cretaceous rocks collected on the coast of Dorset as part of his undergraduate dissertation project in the hope of finding some interesting remains. Quite unexpectedly, he found not one but two quite remarkable teeth of a type never before seen from rocks of this age. I was asked to look at them and give an opinion and even at first glance my jaw dropped.”

The teeth were recovered from rocks exposed in cliffs near Swanage, which has given up thousands of iconic fossils. “The teeth are of a type so highly evolved that I realised

straight away I was looking at remains of Early Cretaceous mammals that more closely resembled those that lived during the latest Cretaceous—some 60 million years later in geological history. In the world of palaeontology there has been a lot of debate around a specimen found in China, which is approximately 160 million years old. This was originally said to be of the same type as ours but recent studies have ruled this out. That being the case, our 145-million-year-old teeth are undoubtedly the earliest yet known from the line of mammals that lead to our own species,” said Sweetman.

Sweetman believes the mammals were small, furry creatures and most likely nocturnal. One, a possible burrower, probably ate insects and the larger may have eaten plants as well. Noting that the teeth are of a highly advanced type that can pierce, cut and crush food Sweetman said, “They are also very worn which suggests the animals to which they belonged lived to a good age for their species. No mean feat when you’re sharing your habitat with predatory dinosaurs.”

The paper, titled “Highly derived eutherian mammals from the earliest Cretaceous of southern Britain”, was published in the *Acta Palaeontologica Polonica* journal on 7 November.

New survey reveals how often Brits skip toothbrushing

By DTI

LONDON, UK: Only two-thirds of British people brush their teeth the recommended two times a day, a new survey has found. The remaining third only use their toothbrush once a day and primarily in the morning,



One in three men only brush their teeth once a day.

when it has the least effect. Furthermore, two per cent of respondents in the survey said that they do not brush their teeth at all.

There is a slight glimmer of hope, as 8 per cent of the respondents said they brush three or more times a day. However, the figures pose worrying questions regarding the nation’s attitude towards oral hygiene. Guidelines issued by the NHS state that teeth should be cleaned for at least two min-

utes before going to bed and a second time during the day.

Furthermore, it appears the vast majority of Brits do not floss, since only one-third of all those surveyed responded that they make daily use of this interdental cleaner.

Men, especially, do not seem to be keen on cleaning their teeth, as one in three reported only brushing them once per day. However, with only 26 per cent who said they skip a second brush regularly, women were found to have slightly better oral hygiene practices.

The survey, the results of which were released this week, was conducted on behalf of YouGov UK and involved over 2,000 adults from across the UK, representing all the respective age groups and social grades. Those in the C2, D and E groups (skilled, semi-skilled and unskilled manual workers; state pensioners, casual and lowest-grade workers, unemployed people with state benefits only) were found to brush less frequently than their middle-class counterparts, and those aged between 25 and 54 appeared to be less concerned about their oral healthcare routine than those outside this age group.

EuroPerio and Dental Tribune International renew collaboration

By DTI

AMSTERDAM, Netherlands/LEIPZIG, Germany: With thousands of dental professionals expected from around the world, EuroPerio9 is set to be one of the largest and most influential dental meetings next year. The event's organiser and Dental Tribune International (DTI) have now announced that they will again be collaborating for the 2018 edition, which is to be held in Amsterdam in June.

The organisations first worked together for EuroPerio8, which was held in London in the UK in 2015. For 2018, DTI will again produce a special edition of its show newspaper title *today international* on each of the three days of the event. In addition, DTI edi-

dental Specialist Forum and a number of sessions aimed at the various members of the dental team. The scientific programme will be accompanied by a large trade exhibition, which will fea-

ture the latest innovations from leaders in the field, such as CURAPROX, EMS and Philips.

"I think that the combination of the location, the scientific pro-

gramme and our marketing strategies will create a very interesting meeting," congress chair Dr Michèle Reners commented. "Even with such a large attendance, everybody can have the benefit of

and experience EuroPerio in a positive way."

More information about the event can be found on the official website, www.efp.org/europerio9.

AD



DTI will produce a special edition of its show newspaper title *today international* on each of the three days of EuroPerio9 in Amsterdam.

tors will provide daily coverage on EuroPerio9 from the Amsterdam RAI Exhibition and Convention Centre on its news website and social media channels.

With its congress newspaper, DTI already provides daily news on all significant global dental congresses and exhibitions, including the International Dental Show in Germany, the FDI World Dental Congress and the Annual Scientific Meeting of the European Association for Osseointegration.

First held in Paris in France in 1994, EuroPerio is organised every three years by the European Federation of Periodontology, a professional body representing over 30 organisations, with 14,000 members, worldwide. The last edition saw a record attendance of 10,000 visitors, including some of the most high-profile experts and scientists in the field.

For the upcoming edition in Amsterdam, the organiser is anticipating a similar number. Highlights will include a live surgery as part of the Master Clinician/Perio-

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“We are now putting the mouth back in the body”

An interview with paediatric dentistry consultant Dr Claire Stevens, Manchester

The nationwide Dental Check by One (DCby1) campaign aims to combat dental caries in British children by spreading awareness that dental check-ups should be performed even before a child's first tooth appears. At the BDIA Dental Showcase in Birmingham, *Dental Tribune* spoke with Dr Claire Stevens, president of the British Society of Paediatric Dentistry and a consultant in paediatric dentistry at the University Dental Hospital of Manchester, about the programme.

While the oral health status of children seems to have improved in the UK in recent years, there are still record numbers of children presenting to hospitals to have their teeth extracted. How can this be explained?

The high number of general admissions for multiple extractions in children isn't new. Current figures are taken from the Hospital Episode Statistics [a data warehouse containing details of all admissions, outpatient appointments, and accident and emergency attendances at NHS hospitals in England] gathered by NHS Digital and are probably more accurate than ever before owing to vastly improved data collection.

When compared with previous methods of data collection, we think it's likely, in fact, that general admissions are starting to go down.

Sadly, there are communities in which children are not taken to the dentist and there is a high level of unmet need, reflecting societal inequalities. This is one of the most challenging aspects we face as a society.

With £50.5 million spent annually on dental extractions in 0- to 19-year-olds on a disease that is nearly always preventable, downwards is the only way for these statistics to go.

When was DCby1 launched, and how did the idea come about?

The DCby1 concept has been nascent for some time. It's in the *Commissioning Guidelines for Paediatric Dentistry* (still unpublished) and was one of the key aims to emerge from a stakeholders' day organised by the British Society of Paediatric Dentistry (BSPD) last year.

Speaking at the British Dental Association conference in May



this year, I spoke publicly of DCby1 for the first time. A new statistic had just emerged and this was that only 19 per cent of 0- to 2-year-olds in the UK had seen a dentist by the age of 2. I challenged my audience to see four extra children under 2. If every dentist took up the challenge, the number of children see-

ing a dentist before their second birthday would go up by 10 per cent. The campaign had its formal national launch at the BSPD conference in September.

The programme encourages parents and caregivers to take children to the dentist before they have reached their first birthday. What is the evidence regarding the benefits of seeing a child at that early age?

We know that an unacceptable number of children as young as 2 or 3 are suffering from early childhood caries. We also know that one in eight 3-year-olds has caries, so leaving interventions until school age is too late. The only way to change this is by getting in early with preventative advice. We know that a good diet and regular brushing with fluoride toothpaste can prevent dental disease.

Why do you think such a campaign is necessary?

We need a radical approach to bring about change. However, we are undertaking the campaign progressively. We are building awareness by reaching out to parents through health visitors, school and nursery nurses, doctors and pharmacists.

In other European countries, like Germany or France, it is common to have children see a dentist before they even reach the age of 1. Why is the UK still behind in this regard?

Somehow in this country, we have not placed a high enough value on oral health. I am glad to say that we are now putting the mouth back in the body.

What organisations are supporting the campaign and how?

We have had the most fantastic support across dentistry and

healthcare generally. Countless organisations are getting on board with sharing the very simple DCby1 message. If parents hear this wherever they go, they will feel empowered to ask for a dental check and this will become the norm. We are making this issue everyone's business, and we are glad to be seeing such a positive response.

What feedback did you receive after the launch of the campaign, and what do dentists have to do to join in?

Last week, I curated the @NHS Twitter handle and I took the opportunity to broadcast the DCby1 message. A typical response was the following from a mother: "Thank you for your tweets. Taking my 16-month-old to the dentist for her first appointment on Monday because of it."

Support from the profession has also been heartening. Joining in is simple. All the information a dental practice needs is on the BSPD website.

Do you think that celebrities, such as Jamie Oliver, who publicly lobby for a sugar tax are creating more awareness around topics like diet and sugar intake and therefore maybe even have a positive influence on children and parents?

Definitely, yes. We live in a culture in which celebrities play an important role, and probably more than any other celebrity, Jamie Oliver has had a positive influence on healthy eating. He is also a parent, so his impact can be felt in schools and in homes. If Jamie was reading this, I am sure he too would be sharing the DCby1 message.

Thank you very much for this interview.

AD



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European dental market survey available in digital and hard copy

By DTI

KORTRIJK, Belgium: The 2017 *Survey on the European Dental Trade* provides a valuable overview of

relevant topics and trends in the European dental industry. Launched by the Association of Dental Dealers in Europe (ADDE) at this year's International Dental

Show in Cologne in Germany, the latest edition of the market review is now available in digital format. Dental dealers and manufacturers can purchase the survey report

now via the new ADDE online shop.

Again produced in collaboration with the Federation of the

European Dental Industry, the 2017 *Survey on the European Dental Trade* indicates a further shift towards digital dentistry, manifesting in overall growth of online shopping and use of CAD/CAM systems and intraoral scanners. Besides analysing current trends, the report covers the latest medical device regulations, parallel trade, market surveillance and free movement of dental professionals.

AD



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EAS once again aims to be the main Continuing Professional Development provider for aligner orthodontists and allied professionals involved in aligner treatment delivery through the 2nd EAS Congress and future meetings.

The Congress will allow also orthodontists and companies to meet on a face-to-face basis.

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Among the survey findings are that the number of practising dentists grew slightly compared with 2015 (in all European countries, excluding Sweden, Denmark and Bulgaria, which were not analysed), totalling about 282,000 in 2016. In contrast, the number of active dental technicians decreased across Europe. The number of patients per dentist remained the same across Europe. In terms of sales, the most significant growth rates were observed in Austria, France, Hungary, Spain and Italy. Regarding the European average across sales segments, sundries, implants and technical services remained stable, while equipment sales increased slightly.

"Our 2017 Survey on the European Dental Trade comprehensively assesses the sales values for the main product categories, sales segments and distribution channels. It also provides unique insights into the market shares of dental dealers and manufacturers in the European Union," said President of the ADDE Dominique Deschietere. This includes the number of customers and end users, sales values and segments (equipment, sundries/consumables, prostheses, technical services, implants, radiography and CAD/CAM), the use of computers and e-commerce, distribution channels, and VAT charges and their impact on the market.

The latest survey is now available for purchase on the ADDE website in hard copy and as a PDF from the new ADDE online shop.

Legislative parity and transition period priorities for dental industry post-Brexit

By DTI

LONDON, UK: The British Dental Industry Association (BDIA) has called on the negotiating heads of both the UK and the European Union to agree to a transition period after the Brexit. In a letter addressed to Secretary of State David Davis and chief Brexit negotiator for the EU Michel Barnier, the organisation, together with the Federation of the European Dental Industry (FIDE), said that such an extension would be necessary to assure parity in UK and European medical device legislation in the framework of a new trade agreement.

“Recently published EU legislation will be applicable in the UK until it leaves the EU in March 2019,” they stated in the letter. “Thereafter, there is a risk that UK and EU legislation may diverge, to the detriment of patients and businesses across Europe.”

Among other points, both organisations have recommended that an agreement should include the UK’s adoption of EU medical device regulations and the country remaining an active participant



Negotiations between the UK and the EU have stalled recently.

alongside EU member states in the European regulatory framework.

Furthermore, the UK should maintain full involvement and participation in the EU database for

medical devices (EUDAMED), they wrote in the letter.

“The production and supply of dental devices often involves a complex cross-border network across

Member States. In other international markets, it is non-tariff barriers, often arising from conflicting regulatory regimes, that most seriously limit trade,” they added. “Ensuring that such barriers do not

emerge between the EU and UK will be crucial in protecting the future oral health of EU and UK citizens, and the global competitiveness of European dental businesses.”

According to the BDIA, the UK represents one of the key markets in the European dental market, with an annual turnover of almost £0.5 billion. It is the first time that the BDIA and FIDE have publicly announced a detailed list of priorities for the ongoing negotiations.

With their letter, both organisations have joined a growing number of industries worried about the state of Brexit talks and the negative impact of a no-deal scenario as proposed by several members of the UK cabinet, including Prime Minister Theresa May. The start of negotiations for a post-Brexit deal was recently postponed by the EU after discussions about the future rights of EU nationals in the UK and vice versa, and a “divorce bill” stalled in October.

After invocation of Article 50 of the Treaty of Lisbon, UK membership of the EU will end on 29 March 2019.

Newly launched device makes every toothbrush smart

By DTI

LONDON, UK: A new, innovative device designed to support patients in their toothbrushing routine has been launched in the UK today. Brushlink tracks individual behaviour, like brushing frequency, duration and—for the first time—angle, and provides real-time guidance and performance monitoring to users.

While tracking of brushing behaviour is already available with the latest generation of electronic toothbrushes, Brushlink can be used with manual toothbrushes too, according to developer and London dentist Dr Dev Patel. Users of the device receive a score after each brush and tips on how to improve their behaviour. The collected data can be sent to a mobile app via Bluetooth and stored for up to three months for later use.

The main intention behind the device was to give dentists more information about their patients’ brushing behaviour in addition to encouraging better brushing, Patel said. “We have always had to rely on what we see inside the mouth every six months rather than having any



third said that they brush their teeth thoroughly.

In addition, over 60 per cent reported never having received correct brushing instructions from their dentists.

The study was conducted by Opinium between 24 and 26 October.

“There is no substitute for good tooth brushing practices when it comes to maintaining a healthy mouth, yet it would appear from the survey that there is

reliable data about how people are brushing. I invented Brushlink to plug this gap by providing coaching to patients but also accurate monitoring of everything they are doing with their toothbrush between dentist visits.”

The launch follows worrying results of a new study that has indicated that brushing habits among people in the UK are seriously lacking. Conducted among 2,100 participants, it found, among other things, that one in two people constantly miss a quarter of their mouths when brushing. Brushing efficiency was worst among young people, according to the study, of which only every

a lot more that we can all do to achieve this effectively,” commented Prof. Elizabeth Kay, MBE, Foundation Dean of the Plymouth University Peninsula School of Dentistry, oral health topic expert for the National Institute for Health and Care Excellence, and a Brushlink scientific committee member. “The fact that this survey is in association with the launch of a new dental care product—and one which I think is the most amazing oral health product that I have seen in a long time—should encourage people to take its findings seriously, as it has been commissioned by a group of dentists who are passionate about improving the oral health of the nation,” she added.

Fewer products removed from BDIA Dental Showcase

By DTI

BIRMINGHAM, UK: Less counterfeit or non-compliant dental equipment than last year had to be removed from the BDIA Dental Showcase, a representative of the Medicines and Healthcare products Regulatory Agency (MHRA) has revealed. Over the three days of this year’s show in Birmingham, the organisation found an estimated 500 pieces of equipment that may have posed a threat to public safety, MHRA investigator Maxine Marshall told *Dental Tribune Online* in Birmingham.

The numbers are in line with a general trend of less critical equipment entering the marketplace in recent years. Particularly the distribution of high-risk equipment like handpieces and K-type-files has been on the decline, which is the result of the work that the agency has been doing with the British Dental Industry Association (BDIA), according to Marshall. Since 2014, both organisations have been running an awareness campaign aimed at dental professionals and the general public to educate about the

possible dangers of fake or non-compliant products.

“I think the message is understood. There have definitely been fewer referrals of counterfeit products to MHRA,” Marshall said. “However, our work remains challenging because of the Internet. We constantly track suspicious websites and remove listings from online marketplaces.”

Marshall announced that her organisation is planning to talk to both organisers and exhibitors of the Dental Showcase to introduce measures that help identify possibly suspect products earlier in future exhibitions. The successful cooperation with the BDIA will also continue.

According to MHRA figures, over 10,000 individual pieces of non-complaint or counterfeit dental equipment are seized in dental practices per year in the UK. Recently, the General Dental Council had to suspend a 32-year-old dentist from Preston in Lancashire who, after inspections, was found to have purchased risky equipment on an Internet auction website at least three times.

What would Dr Mo Lar do? Part 7

By Richard Lishman, UK

Over the course of an 11-part series, the 4dentists group explores ways to tackle a number of personal and professional challenges by providing advice and guidance to a fictional character Dr Mo Lar. In this seventh article of the series, Managing Director of the 4dentists group, Richard Lishman explains how Lar should go about purchasing a second practice to expand his business.

Among many other business ambitions, Dr Lar would like to expand his business by purchasing an additional practice. He already has some experience of practice acquisition, having gone through it once before, but there are a number of other factors that must be considered the second time round. As such, he will need to make sure that he has the necessary support before and during the process. Lar also needs to consider the impact of current market trends and think

about having enough time available for the process before placing a bid, as one wrong move could jeopardise his overall financial goals. The location of the new practice is important as well, since too much travelling time between the two could have a direct impact on his ability to successfully run both businesses.

Practice funding

In order to secure funding for a second time, Lar has to be able to prove that he can afford the repayments. Detailed accounts and affordability tests are therefore imperative leading up to the bidding stage, as is the careful

compilation of a business plan. As for the actual borrowing, he has the option of borrowing the entire sum of the money from the bank

or releasing funds from his existing practice and then taking out a smaller loan. Say Lar has been making profits of £200,000 per annum for the last three years, but has only drawn £150,000, it would equate to a total increase in net worth of £150,000. If he wanted to, Lar could borrow that equity from the business. Of course, he should discuss both options with his Independent Financial Adviser before making a decision.

Interest rates are another important factor Lar should consider before purchasing his second practice. If he were to take out a loan with a different provider than the first time and they offer better rates, he could use this opportunity to move all his funding to one place. Not only would that simplify his repayments, but it would make them cheaper too.

Besides additional funding, Lar would be required to have the necessary critical illness and life cover in place, as all banks require purchasers to have the correct cover in the event of sickness, injury or death. With life cover already in place from his first acquisition, he would simply need to update his policy to reflect his additional financial responsibilities.

Considering business structures

When expanding a business, there is an opportunity to change its corporate structure. As it stands, Lar is the sole proprietor but, should he choose to, he could form a partnership, incorporate to become a limited company or register as a limited liability partnership. Purchasing an additional practice will change his tax structure, liability and tax burden so it is important that he chooses a structure that will make the business worth his while. In order to increase his income and save on tax, he will need to work closely with an accountant to weigh up his options.

Employees

Purchasing another practice will undoubtedly involve taking on more staff. As such, Lar should consider consulting a lawyer to put together the necessary contracts for new employees. The principle statement would need to clearly detail certain provisions, such as the legal names of the employer and the employee, the job title, the date of the commencement of employment, the details of compensation, the working hours and leave. Most importantly, he must make sure that all the terms of the contract are standardised across all members of staff; otherwise it could lead to allegations of discrimination.

For staff who are self-employed, his lawyer needs to draft an appropriate written contract detailing their arrangement, as there are considerable risks to dental practice owners associated with these agreements.

There really is a lot to consider before expanding a business or practice, which is why it is always advisable that someone in Lar's position utilises the services of an expert team. Only then, can one guarantee that the process is executed seamlessly, with excellent results at the end.

*In the next article:
Lar looks at selling his business.*



Richard Lishman is the Managing Director of money4dentists, a firm of specialist independent financial advisers who help dentists across the UK manage their money and achieve their financial and lifestyle goals.



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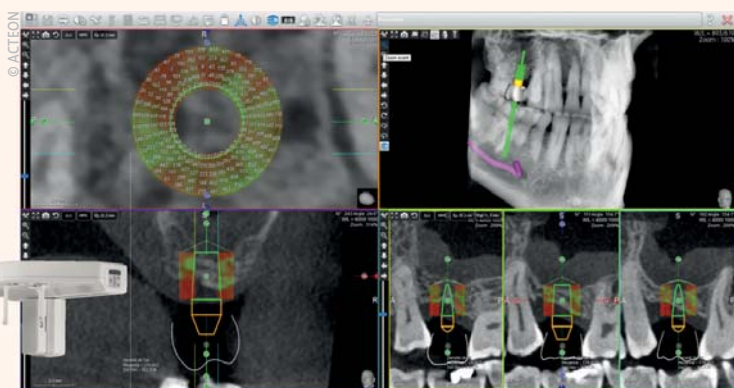
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A whole new dimension of imaging precision

By Julia Maciejek, DTI



Like many fields in dentistry, implantology has been transformed by technological innovations since its humble beginnings more than half a century ago. As the aesthetic and osseointegration properties of implant materials have continued to improve, the number of dental patients opting for implants has risen steadily. With this increase in procedures has come a demand for atraumatic and safe surgery with fewer postsurgical complications. Since 2005, French company ACTEON has established itself as a leader in digital medical imaging and high-frequency ultrasonic devices. Supported by its excellent clinical results, ACTEON continues to push the boundaries of what is possible in implantology as it seeks to provide products that optimise both the patient's and the dentist's experience.

With an emphasis on research and development in dentistry and medicine, ACTEON has successfully expanded its offering and introduced several new products earlier this year. Its two multidisciplinary research and development teams and four manufacturing plants are all located in western Europe: in Mérignac (equipment and pharmaceuticals) and La Ciotat in France (dental imaging), Tuttlingen in Germany (medical imaging) and Milan in Italy (dental imaging). These teams work very closely together and production processes are highly controlled owing to their geographical proximity. This is further enhanced through collaboration with international dental surgeons, leading to the manufacture of devices that, according to ACTEON, deliver the best results for patients through minimally invasive and less traumatic treatments.

ACTEON granted *Dental Tribune International* an exclusive look behind the scenes of its 3,200m² manufacturing plant in Milan, where many of the company's intraoral and extraoral imaging devices are produced. The team was proud to introduce its flagship model: X-Mind trium. This extraoral radiographic unit was first introduced at the International

Dental Show (IDS) in 2015 and received a major update just in time for the 2017 fair. It offers a complete range of innovative solutions for diagnosis and treatment planning. Considerable attention has been paid to image quality and homogeneity, including X-ray emission, processing, stability and geometry. "X-Mind trium combines CBCT, panoramic and cephalometric imaging, which is why it is called a three-in-one device," explained Claudio Giani, director of imaging research and development at the Milan site. He demonstrated that CBCT imaging is accomplished using a rotating gantry with a fixed X-ray source and a detector. Giani told us that, during the rotation, multiple sequential projection images, ranging from 150 to 450, are acquired to complete the arc. This procedure varies from a conventional medical CT scan, which uses a fan-shaped X-ray beam in a helical progression to acquire individual image slices of the field of view (FOV) and then stacks the slices to obtain a 3-D representation.

When we first approached X-Mind trium, we noticed right away the distinctive ergonomics of the radiographic unit. The device has an extremely short U-arm, which moves around the patient during the image acquisition phase. This is supported by the patented kinematics and collimation and aids comfortable positioning of the patient's jaw. The entire system is designed with ergonomic efficiency in mind and takes up very little space in the practice room. With a secondary collimator (X-ray tube assembly) installed, the patient is not exposed to additional collimator movements.

Excellent quality assurance

ACTEON produces high-end quality products that undergo a tried-and-tested quality control process. "The production of X-Mind trium has risen month after month, especially since we obtained U.S. Food and Drug Administration approval and then launched X-Mind trium in the US," stated

Alvise Reither, the Milan factory manager. He explained that, by changing the factory's layout and the flow of materials, new workflow processes were established. The manufacturing plant is continuously expanding, and with additional operators, it is able to meet the demands of the market.

"In this factory, we use the Kanban approach principle, which means that we produce on stock, but finalise the product based on order. This way, we can balance demand with available capacity," added Reither.

Moreover, ACTEON applies significant quality controls during all processes, from the assembly of the core of the machine to final testing, which includes checking of the components and the configuration of the workstation. According to the factory manager, this procedure has been streamlined significantly in comparison to last year. Reither showed us a large number of testing cabinets containing devices being checked. With complete concentration, employees in front of computers verify the correctness of every step before the X-Mind trium units are distributed. It is in this context that a large quantity of X-Mind trium devices are manufactured, tested and shipped each week.

"We have an excellent product quality. We want to ensure a high-quality standard, so employees take turns at the workstations. We also want to make sure that each employee knows and understands all the processes leading up to the finalisation of the product, establishing an appreciation of the importance of each step in the assembly. We further want our employees to respect ACTEON's standard of quality. This follows the two steps of the quality control: (1) checking that all cables and parts are well assembled and (2) testing the machine's functionality in the testing cabinets. Our quality manager also inspects the components when they are sent to us and before we put them into stock. No parts are assembled externally. A mix of components, cables, mechanical parts, motors and sensors are assembled by hand. That is also part of our quality management," Reither detailed.

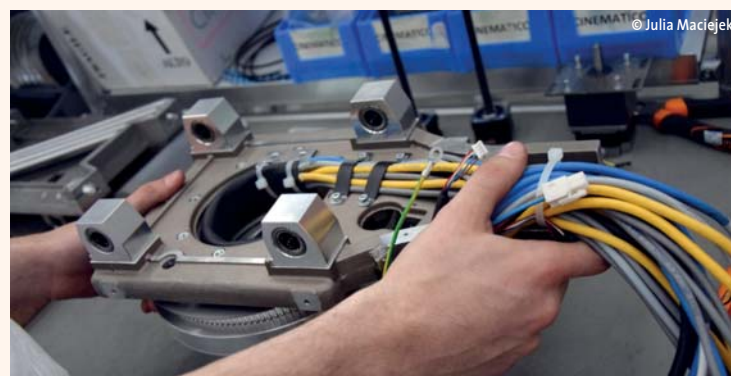
Sharp images

Excellent image quality is essential for treatment planning and diagnosis. In CBCT, exposure is incorporated in the FOV. This means that only one rotational sequence of the gantry is necessary to acquire

enough data for image reconstruction. "In implantology, a CBCT image is indispensable for planning simulation and determining the exact nerve location. With only one image, the entire dental arch can be visualised, which allows for optimal diagnostic planning possibilities. X-Mind trium has a range of FOV options displayed in detail and without movement artefacts. He

rithm has been developed in terms of the graphics processing unit (GPU) and a specific type of GPU is installed inside the workstation of X-Mind trium when the CBCT function is configured," explained Giani.

This algorithm is used to determine the apparent image definition and bone density to facilitate clinical decision-making. The filters



emphasised that the exposure time is very low and the reconstruction time is three seconds. We saw that, with a cephalometric image, the entire maxillofacial area is shown, making it highly suitable for oral and maxillofacial surgeons. Furthermore, it has a small voxel size of only 75µm and a fast reconstruction time of 29 seconds. X-Mind trium can be equipped with one or two sensors for an efficient workflow.

With ACTEON's expertise in medical imaging, a dedicated analytical algorithm has been implemented for X-Mind trium. "We have achieved exceptional results, which are able to provide advanced clinical indicators that will be helpful for practitioners in the future," stated Giani proudly. "The analytical algo-

ensure detailed recording of the image acquisition by low-noise micro-stepping motors.

Low radiation dose

With X-Mind trium, high radiation exposure is a thing of the past. The low-radiation protocol decreases the required amount of X-ray emissions by a third using the algebraic reconstruction technique. This means that the radiation dose for the patient can be reduced by 50 to 70 per cent. This low-dose imaging guarantees a maximum FOV with minimal radiation exposure to the patient. "This is essential because we do not care only about good images but also about the well-being of the patients," stated Reither. Furthermore, the software of X-Mind trium monitors radia-

tion and ensures that the levels of exposure are kept low.

User-friendly software

Computer scientists would say the software is as important as the hardware. ACTEON provides intuitive and ergonomic imaging software that has all the required functions—scanning, measuring, editing, commenting. In the factory cellar, Reither explained the special features of the ACTEON Imaging Suite software and stated that it can be linked to most practice management software and all ACTEON imaging products, such as the X-Mind trium, CBCT and panoramic devices, and intraoral scanners. It is compatible with both macOS (and soon iOS) and Windows and has a TWAIN driver for full compatibility with all imaging software. This gives practitioners the ability to move around and interact directly with their patients.

The radiographic unit is in continual operation at most dental practices. It is clearly imperative then to ensure that dental professionals have the skills to adequately handle the devices and take high-quality images with the correct settings. "The user-friendly software enables the customer to either use the workstation provided or use their own. However, with the workstation provided, our professional and efficient team of service technicians can perform remote connections to solve problems of configuration or calibration. We want our customers to choose the software option that is best for them," explained Reither.

Safe surgery

X-Mind trium offers extraordinary functionality in the field of implantology, making it suitable for more demanding treatments. Misleading or insufficient information obtained from a radiograph can lead to the loss of an implant, one of the worst scenarios for both the patient and the dentist. "In pre-implant procedures, accurate measurements of the bone density and volume are essential to guarantee a higher success rate in implantology. The 3-D capability of X-Mind trium also facilitates safer osseointegration," said Giani. Clinical decision-making has seemingly become easier than ever with X-Mind trium.

Certainly, our tour would not have been complete without a look at ACTEON's well-known Piezotome ultrasonic brand. Thousands of dentists worldwide have adopted the company's celebrated Piezotome devices as their choice for pre-implant surgery, with Piezotome Cube representing ACTEON's new standard. It is a powerful ultrasonic device with a rotary motor, as well as a handpiece and a tip, ensuring optimum performance. Leading oral surgeon and implantologist Dr Angelo Trödhhan successfully uses Piezotome Cube in his everyday treatment procedures. "The Pie-

zotome's ergonomics makes the device naturally intuitive and reliable. Furthermore, it enables surgeons with less experience to perform a variety of treatments. In accordance with the cutting selectivity, soft tissue (membranes and nerves) is preserved. During piezoelectric surgery, fine and precise cuts minimise bone loss. In 98 per cent of cases, patients do not need to use analgesics postoperatively and barely any swelling is observed. Sur-

gery with Piezotome Cube maintains the patient's quality of life," said Trödhhan.

In implantology, bone grafting materials may be necessary for the implant to succeed. For this reason, QUALIOS was developed, and it was first introduced at IDS 2017. The material has a unique bone-supporting structure and high level of mechanical resistance. Its large interconnected pores make it particu-

larly suited to bone colonisation, and it is completely resorbable, ensuring high-quality bone regeneration. Being entirely synthetic, it is free of any contamination risk that comes with products of animal or human origin. It is clear from this that QUALIOS complements ACTEON's implantology product line.

In ACTEON's continuous product expansion, patients' well-

being continues to be the top priority. We felt the passion employees put into their daily work to support ACTEON's innovative portfolio for imaging and piezoelectric surgery. These products have positioned the company as a pioneer in oral surgery and dentistry. They are less invasive, safer and faster to operate, and provide patients and practitioners with the best treatment options available.

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“This new protocol is almost universal”

At the Nobel Biocare Symposium in London, Dental Tribune spoke with Dr Rubén Davó from Spain about the new Trefoil implant solution

With Trefoil, Nobel Biocare recently introduced a new implant solution or protocol for achieving a fixed, definitive fixed full-arch restoration of the mandible in one day. Combining a pre-manufactured titanium bar, three implants and a simplified restorative workflow without provisionals, it reduces the time to teeth and chair time compared with conventional fixed treatment with implants, according to the company. At its recently held London symposium, Dental Tribune spoke with oral and maxillofacial surgeon Dr Rubén Davó from Alicante in Spain, about the system.

placed properly in more than 99 per cent of the cases.

While we were also evaluating success rates, the second important thing we looked at was the number of patients we were able to treat with the system and how many we had to turn away because of their anatomical circumstances. Looking at our results, we can say that this new protocol is almost universal, as we had to refuse only a few patients, owing to things like an insufficient distance between the mental foramina or a mandible that was not wide enough.

high number of implants were used to rehabilitate edentulous patients.

However, the main problems with Novum were related to the prosthetic framework, which posed difficulties from a functional and aesthetic standpoint. As a refined system, Trefoil has completely addressed these problems.

What patient groups are going to benefit from this new protocol?

Potentially all patients edentulous or soon-to-be edentulous

cause this protocol does not depend on new technologies or sophisticated therapies. It requires only one surgeon and a basic laboratory to provide patients with fixed immediate teeth.

How difficult is it to learn the Trefoil protocol?

I would recommend doing at least five cases. After that, the clinician should feel comfortable and confident in performing the protocol. While it is not a very complex surgery, the practitioner will need a little bit of training. Nobel Biocare is very aware of that and

tical learning experience. Consequently, they felt very comfortable performing the surgery.

According to Dr Kenji W. Higuchi, one of the developers of Trefoil, the system will be the next big thing in implant dentistry. Would you agree with that statement?

I think it has become very difficult to innovate in this field because many things have been introduced over the last 20 years. I have no doubt however that, in China, India and other developing countries, this will start a revolution because now more people will



“It requires only one surgeon and a basic laboratory to provide patients with fixed immediate teeth.”



Davó (second from right) discussing Trefoil at a Q&A session in London.

You were one of the first clinicians worldwide to have worked with Trefoil and evaluated its clinical performance. How did you become involved, and what results have you achieved?

I have been collaborating with Nobel Biocare's clinical research department for many years on various projects. Nevertheless, it was an honour and privilege when they asked me to clinically evaluate the new Trefoil system. From a surgical point of view, we looked at the accuracy of the template guided surgery. We know that the fixation-compensation mechanism allows around 0.5 mm of discrepancy. In our clinical study, we found that structures could be

The survival rate for implants and prostheses was near 99 per cent after one year.

Almost 20 years ago, a similar treatment protocol was introduced to the market with Brånemark Novum, but it was discontinued in 2007. What makes the Trefoil system different?

In my opinion, the Brånemark Novum system was ahead of its time. While from a clinical point of view it demonstrated good success rates, the market was not ready for it. You have to remember that, in those days, treatment concepts like immediate loading or guided surgery did not exist. Furthermore, usually a

in the mandible can benefit from this protocol. Furthermore, Trefoil will increase patient acceptance rates because it applies to a patient group that may avoid this type of procedure (fixed dentures) owing to a lack of time or money.

The goal of Nobel Biocare is to reach more people for whom a lack of financial resources is a limiting factor. That is why it is an ideal solution not only for more affluent parts of the world like Europe or the US but also for markets like India or China. With Trefoil, the number of people that can be treated by means of fixed dentures will be much larger be-

offers a number of courses in many markets.

You have led some of these courses in Germany, Spain and the UK, to name a few. What has the initial feedback been?

Those who were involved in the clinical studies on Trefoil are teaching the courses now, and this has the advantage that attendees can gain from our experience gained in treating many of these cases. Our goal is to avoid both complications and any possible problems. The feedback has been extremely positive. Many participants have taken the course because they felt it offered the right concepts and provided a good prac-

have access to these treatment possibilities. Trefoil will also address a gap in many Western countries, where we see many patients that do not want removable dentures, but cannot afford fixed dentures because of a lack of time or their financial situation. The only thing I do not know is how long it will take to gain widespread market acceptance. Usually these things take time, sometimes even years. However, all the positive feedback we have received lately has made us extremely positive about the future prospects of the system.

Thank you very much for the interview.

Use of laser ablation electrospray ionisation to study *in vitro* oral plaque biofilms

By Marcelo B. Aspiras, Callee Walsh, Greg Boyce, Haddon Goodman, Panagiota Tsatsos & Michael Dodds, USA & UK

Dental biofilms play a crucial role in the overall health of the oral cavity. They are composed of bacteria, bacterial products, extracellular DNA and an extracellular matrix that serves to bind biofilm together and contributes to the characteristic stickiness of plaque. As a complex ecological community on hard surfaces of the dentition, such as teeth, they produce virulence compounds that exacerbate the host inflammatory response.

Plaque bacteria utilise nutrients from saliva and the food we eat for their energy needs and metabolic requirements. Interventions, which employ a combination of actives and attributes unique to each product, include the use of toothbrushes, mouthrinses, toothpastes and chewing gum, which take advantage of salivary flow and mastication mechanics unique to the oral cavity.

Optimising interventions against biofilm requires a thorough understanding of its dynamics and physical characteristics. In

the case of actives present in toothpastes, mouthrinses or chewing gum, this knowledge provides the foundation for understanding how effectively an active affects the plaque biofilm. This includes understanding how deeply an active penetrates the biofilm and affects bacterial metabolic pathways to reduce overall activity.

Ultrastructural invasive techniques such as fluorescence *in situ* hybridisation have been useful in visualising the location of labelled bacteria in oral biofilm samples. In some cases, select biofilm metabolites have been fluorescently tagged and traced in the biofilm, but they remain invasive techniques requiring considerable sample preparation. Clearly, new technologies that provide a more global, comprehensive and real-time assessment of what is truly taking place in the multispecies biofilm are needed.

A novel technology known as “laser ablation electrospray ionisation for mass spectrometry” (LAESI-MS) has revolutionised sample introduction and data analysis for high-throughput biological MS. The LAESI DP-1000 system (Protea Biosciences) is a new-generation high-throughput direct ionisation system that directly analyses biological samples

containing water without the need to apply chemicals or introduce tags or tracers, thus allowing for virtually no sample preparation.

Most significantly, the technology performs 2- and 3-D depth profiling of oral biofilms, allowing for analysis of the 3-D spatial distribution of various molecules throughout the biofilm directly as they exist in nature. This study investigates both the distribution and the effect of a test active on select molecules and metabolites in oral biofilms to assess its antimicrobial or antiplaque effects.

The experimental protocol

In order to simulate the topography, growth conditions and substratum on which dental biofilm grows, pooled human saliva was used to grow two-day mixed species biofilms on vertically suspended hydroxyapatite (HA) discs (Fig. 1). Prior to inoculation by multispecies bacteria, the discs were pretreated with filtered pooled saliva to allow for the proteins that enable initial bacterial attachment to coat the discs. This step is known as “preconditioning”. Inoculum was then added together with 100 ppm of the test active to monitor effects on adherence and colo-

nisation of biofilm bacteria in the substratum.

Additional multispecies saliva biofilms were maintained as no-treatment controls. Untreated and treated biofilms were then frozen at -80°C to ensure preservation of the biofilm architecture prior to LAESI analysis. LAESI-MS and tandem MS were applied to determine the 3-D spatial distribution of the active and the various molecules the active potentially affected in the myriad metabolic and chemical signalling pathways of the biofilm. These molecules included quorum sensing factors, metabolites, virulence factors, and others. The area of analysis for both the untreated and the active-treated biofilms on HA discs is shown in Figure 2.

Results

As mentioned earlier, the spatial distribution of the active in the experimentally treated biofilms was assessable in both 2- and 3-D. Heat map analysis of five horizontal planes with their corresponding x and y coordinates provided precise localisation of the active for each plane in the untreated and treated biofilms. The composite result of the vertically stacked heat maps allowed for relative localisation of the active in the

treated sample for each of the five planes, revealing the highest concentration in the plane furthest from the substratum (Fig. 3).

In addition to mapping where any given active had penetrated the oral biofilm, LAESI was used to map relative localisation of select molecules in the treated and untreated biofilms. The autoinducer-2 chemical signalling molecule, which is involved in cell density-dependent quorum sensing, was mapped. The heat map signal for this molecule was considerably reduced throughout all coordinates, relative to untreated controls, indicating reduction of the presence and activity of this molecule and thus suggesting that the active reduced levels of autoinducer-2 in the treated biofilms.

In addition, the levels of the amino acids arginine and lysine were investigated in untreated and treated biofilms. Arginine is naturally found in saliva and is utilised by some plaque bacteria, resulting in the production of ammonia and carbon dioxide. These two amino acids were chosen as surrogate molecules to further validate the use of LAESI to map diverse molecules of interest in the oral biofilm. Arginine was found in greater abundance relative to lysine in the untreated

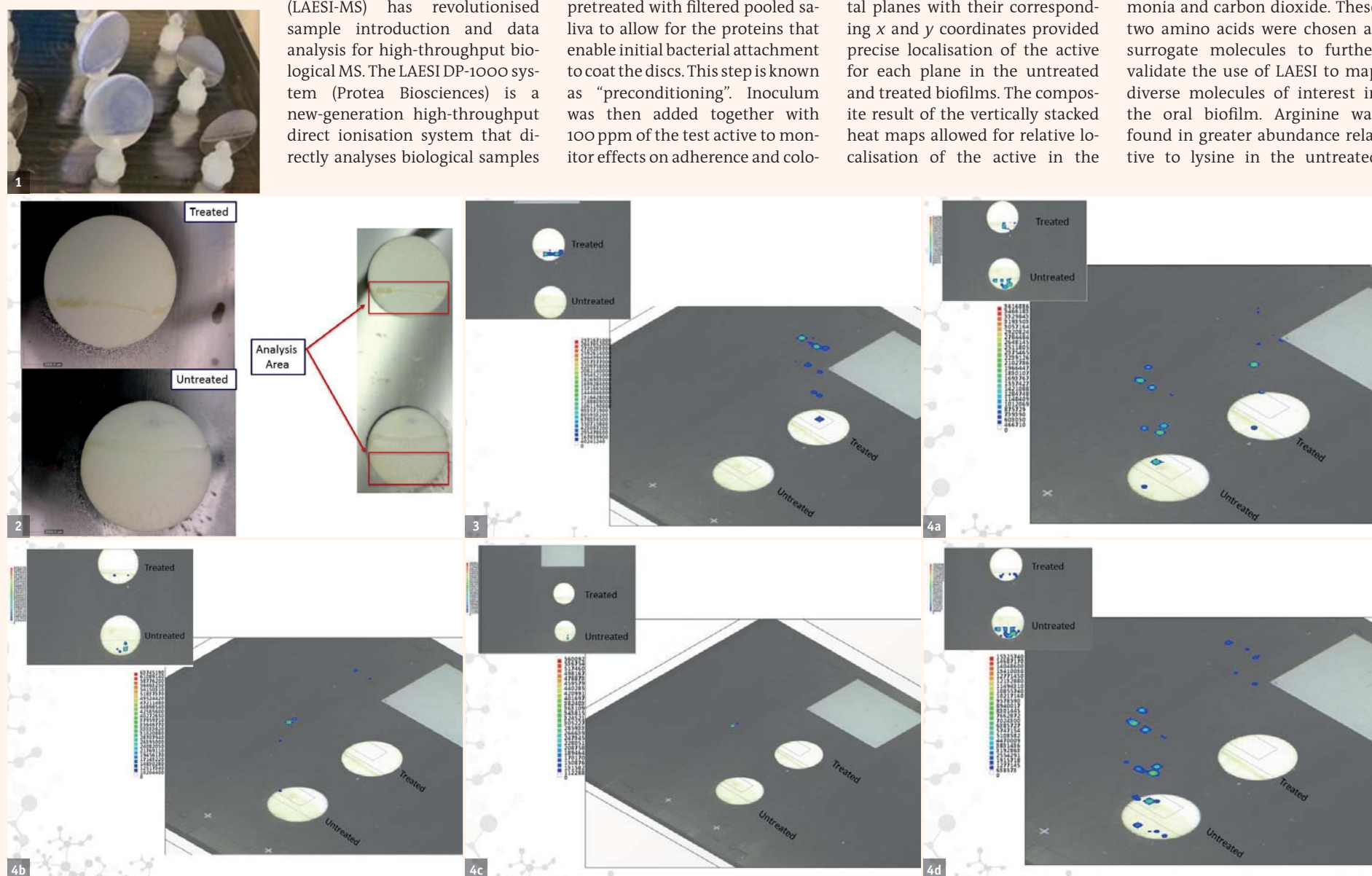


Fig. 1: Representation of vertically suspended 5 mm HA discs on which a two-day mixed species biofilm was grown. These biofilms were later stained for visualisation purposes, as biofilms analysed by LAESI are left unstained. – Fig. 2: Actual area of analysis on HA discs shown for both the untreated and the active-treated biofilms. – Fig. 3: LAESI-MS ion map showing 2-D (left panel) and 3-D distribution (right panel) of the active (m/z 385.316) on treated and untreated biofilms. Five planes are represented in the 3-D heat map rendition, where the active can be clearly seen concentrated in the upper layers of the treated biofilm. – Figs. 4a–d: LAESI-MS ion map showing 2-D (left panels) and 3-D distribution (right panels) of (a) autoinducer-2 (m/z 215.98), (b) arginine (m/z 175.12), (c) lysine (m/z 147.24) and (d) lactate (m/z 112.08). In all molecules tested, reductions in levels and distribution relative to untreated samples were seen in the treated biofilms, suggesting direct effects due to the presence of the active.

samples, as shown in their respective heat map analyses. Upon treatment with the active, the levels of both molecules were drastically reduced relative to their untreated controls.

Finally, the levels of lactate were investigated in untreated and treated biofilms. Lactate is a by-product of sugar fermentation by caries-causing bacteria such as *Streptococcus mutans*, which con-

verts sucrose to the sticky glucans that help keep the biofilm intact. Thus, the relative levels of lactate can serve as an indicator of cariogenic activity or the risk of caries progression in the supragingival plaque biofilm. Comparison of the heat maps of the untreated biofilms to those of the active-treated biofilms showed relative reduction of lactate levels in the treated biofilms for all x and y coordinates investigated (Figs. 4a–d).

Discussion and future implications

The application of an MS-based analytical method for oral biofilms that requires virtually no sample preparation represents a breakthrough in improving our understanding of what is really taking place in the oral plaque biofilm in response to chemical challenges. Mere removal of bulk plaque biomass from the inter-

proximal sites is insufficient to account for paradoxical clinical outcomes of test subjects whose gingival health improved even when little plaque biomass was removed. This suggests that the biological activity of specific plaque toxins and other bacterial products embedded in plaque biofilms and their distribution in the biofilm may be more important in triggering the gingival inflammatory response than bulk plaque

alone. It is important to understand where these bacterial compounds or metabolic by-products localise in the plaque biofilm, since their location can influence both the magnitude and the sustainability of the pathogenic response.

Pathogenicity factors that localise closer to the biofilm–substratum interface may prove to be more protected from external chemical or mechanical stressors. In instances in which the compound adversely affects the substratum itself (such as lactate and its role in demineralising HA), the continued close proximity of the compound to vulnerable substratum may prove to be particularly harmful over time. Being able to construct a stratified map of where these compounds localise in the layers of the biofilm thus provides strategic insights into how to best manage them.

Conversely, there is little knowledge to date, but high value gained, in understanding how chemical actives directed against the biofilm and its constituents behave as a function of how deeply the actives penetrate the oral biofilm. Although antiplaque efficacy can be gauged as antiplaque (e.g. destabilising or disaggregating biofilm), antimicrobial (e.g. bacteria-killing) or a combination of both effects, it is clear that multiple factors that act in concert to constrain the biofilm penetration capacity of many actives found in toothpastes, mouthrinses and medicated chewing gum will ultimately reduce antiplaque efficacy of even the most effective chemistries.

Ultimately, developments such as quantitative measurement of biofilm depth from the underlying substratum to the surface of the biofilm, along with co-localisation and quantitation of levels of actives relative to the concentration of surrounding molecules of interest, will bridge the gaps in establishing a direct causal relationship between an active and the metabolic pathways it affects. The reported investigation represents the first successful demonstration of this application in dental research.

It is envisioned that future research interests will also be expanded into analysis of biofilm on coupons grown in the human mouth to generate plaque biofilms truly grown in the oral cavity that can be conveniently removed and later analysed ex situ. This will inform transient changes in crucial metabolic pathways in naturally occurring plaque and may help identify predictable markers for charting plaque regrowth after external challenges. LAESI thus represents a unique tool for exploring the inner workings of oral plaque biofilms that combines the sensitivity of MS analytical chemistry, the 3-D visual analysis afforded by confocal microscopy and minimal effort in sample preparation.

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CASE REPORT

Dr Vittorio Franco explains treatment of a 22-year-old male patient with a history of trauma to his maxillary incisors.

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INTERVIEW

Dental Tribune spoke with Dr Craig Barrington, USA, about his technique for capturing high-definition endodontic images.

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ROOTS SUMMIT

Everything to know about the most important international event in endodontics in 2018.

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Cleaning is key

By Aws Alani, UK

Completely disinfecting the canal system is challenging when all factors are considered. If we are looking at the nano level there are approximately 76,000 dentinal tubules per square millimetre of dentine. Each of which can harbour a colony of bacteria. Then there may be inaccessible anatomy such as lateral canals, apical deltas or fins.

in combination with hand filing significantly reduced bacterial load. As such chemomechanical instrumentation was shown to be crucial for endodontic success. They compared irrigation with saline, 0.5 and 5% hypochlorite over a sequence of 5 appointments. Interestingly they found no difference in the reduction of bacterial

It seems that irrigation and instrumentation are both highly inter-related in canal disinfection. Take washing your car for instance, purely covering it with soapy water and rinsing won't remove the motorway bugs and bird produced projectiles. A good scrubbing with a sponge is needed, or if you are really serious about

from the dentine. The smear layer prevents bacteria residing in the dentinal tubules from being exposed to the irrigant as well as reducing the contact between the dentine and sealant during obturation. Hence, utilising EDTA to remove the smear layer prior to obturation but after completion of preparation and instrumenta-

housing the community of microorganisms. They not only share resources, they also share information that promote each other's survival through RNA or DNA. As the majority of bacteria will be encapsulated in this layer, purely irrigating without disrupting this layer is inefficient. The word disrupting is a bit kind really—it needs to be destroyed to reveal all its contents and expose it to the bleach for chemical action. It is the methods of disruption of the canal biofilm that has seen a lot of development over the last 10 years or so. Much in the same way a pressure washer can clean that more quickly and efficiently than a sponge, energising the disinfectant results in improved cleanliness.

Energising the irrigant

This can take many forms. The simple and straightforward form ensures appropriate exchange of the fluid and displacement into the recesses where airlocks may reside. This can be achieved through applying a GP point into the prepared canal to displace and disperse.

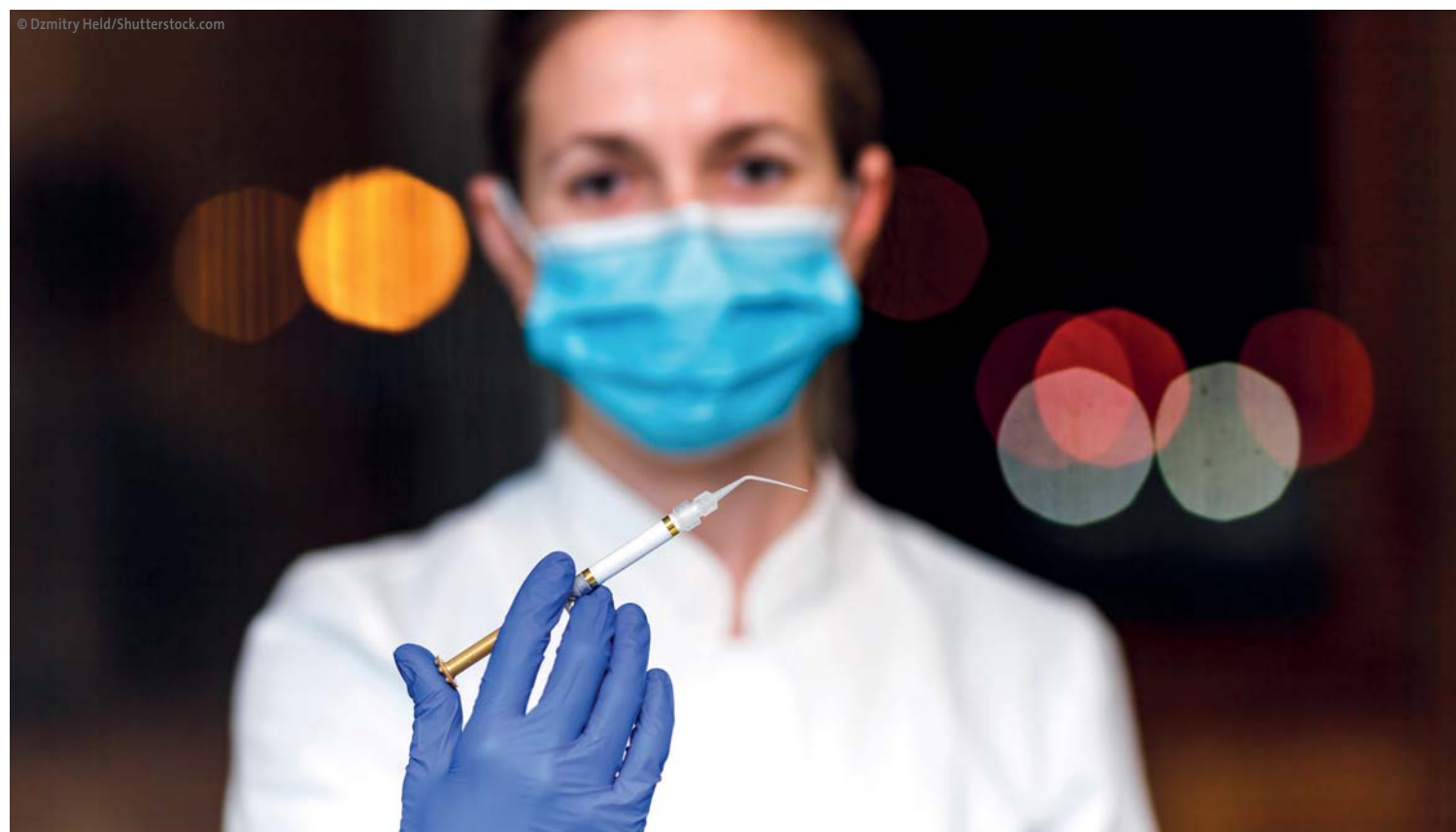
Ultrasonic irrigation transmits energy by an oscillating instrument. This results in two different phenomena. Cavitation is the growth and subsequent collapse of small gas bubbles due to a drop in pressure. Acoustic streaming is the bulk movement of fluid when pressure waves are projected, resulting in vortex motion around a fast moving oscillating instrument. This results in shear stresses to tear the biofilm apart.

Bacteria and the biofilms

Unlike what we once thought, bacteria do not tend to just sit alone and remote from each other. If only they were this antisocial and could be picked off one by one! Bacteria join forces and create symbiotic groups, share resources and protect each other from external influence. This is commonly known as a "biofilm", which has a thin but robust layer of mucilage that adheres to a solid surface

Keeping the canal clean

Once irrigated and prepared, the clinician has a choice—to obturate or to dress. Some may argue that the canal is cleanest at the end of instrumentation and that for convenience, obturating in a one visit arrangement is the best option. As we know, not all bacteria are removed or killed during treatment. Dressing the canal with calcium hydroxide may continue the



These are factors that need considering outside of canal curvatures that may or may not be entirely visible in the plane of the radiograph. It is clear that outside of the contact our files make with the walls of the root canal there needs to be chemical disinfection to further reduce bacterial load. Irrigants disinfect as well as lubricate instruments and they dissolve the pulp. Sodium hypochlorite has been the mainstay irrigant for decades.

During the 1980s, Bystrom and colleagues investigated the effect of mechanical instrumentation with and without adjunctive use of hypochlorite. They found, unsurprisingly so, that when compared to pure mechanical instrumentation, the use of hypochlorite

load between 0.5 and 5% hypochlorite. Despite what was likely to be a comprehensive protocol for these teeth, 7 of the 15 specimens in this study still had bacteria that they could grow at the end of treatment. The presence of cultivable bacteria does not necessarily mean we have failure—it merely means that there may be a cohort of bacteria that have resisted treatment. Mechanical instrumentation does reduce bacterial load by itself—this is by way of physical removal of tissues where bacteria reside, while also facilitating the dispersal of the irrigant into the canal. Siquiera and colleagues found that enlarging the canal from size 30 to 40 resulted in a significant decrease in endodontic pathogens.

cleaning, a pressure washer! This begs a further question—how would your patients feel if they knew that, more or less, the same or very similar liquid they use to clean bathroom suites is the same that we use to clean the inside of their teeth? On recent evidence of a dentist to the "stars" appearance on national TV not much—he advocated using charcoal to whiten teeth, which you may be able to buy from your local petrol station for barbecues.

Hypochlorite is an effective bactericidal but does not remove the smear layer. The smear layer is a mix of organic material (protein, pulp remnants, saliva, microorganisms) with an inorganic components consisting of minerals

process of eradication of the residual microorganisms over a 2-week period. The choice between the two schemes sometimes boils down to the presenting factors of the case. Where a tooth is difficult to instrument, has a large lesion or is quite obviously chronically infected with a history of pain, then dressing may be more of a consideration. If a tooth is treated in a de novo manner and treatment goals are achieved with no history of

pain then a single visit treatment could be utilised.

The goal of obturation is to seal the canal system to prevent any reinfection and entomb any bacteria not eradicated by chemo-mechanical debridement. If the obturation is through the apex, this can have significant implications. GP through the apex can carry bacteria outwith of the canal and exacerbate symptoms. A for-

eign body reaction could also develop.

We also have to remember that a beautiful obturation of a canal achieved without rubber dam and utilising saline or local anaesthetic irrigation is sub-standard treatment. It can be difficult to assess the “quality” of treatment when a radiograph of a “failed” tooth is examined in this context. Indeed, an obturation that is short of the radi-

ographic apex having been treated under rubber dam and with copious amounts of irrigation is more likely to be successful than the previous scenario. Attributing too much significance to the radiographic appearance of the obturation is short-sighted. Indeed, Katebzadeh and colleagues in the late ‘90s witnessed healing in the absence of obturation where teeth were instrumented and irrigated optimally under isolation. Seal-

ants are also antibacterial and aid filling the voids between the GP and the canal system. One further option would be to provide a sub-seal to each of the canal orifices. This can be achieved by removal of 1 mm of GP and packing a good thick mix of IRM packed with a plugger.

Covering the cusps

The provision of a coronal restoration (if provided optimally) can improve the coronal seal while also structurally protecting the underlying tooth tissue. Due to endodontic treatment, resulting in reduction of tissue bulk and stiffness the risk of fracture increases. Where both mesial and distal margins have not been breached and the access cavity is confined to the occlusal surface, a crown restoration may not be required. Once a margin is breached the tooth is more likely to flex and result in cracks or fractures. A commonly asked question, “When should the crown be provided? Soon after the root canal treatment or when the treatment has proven to be successful?” If the success of endodontic treatment is significantly in doubt then this should be communicated to the patient and a well compacted direct restoration may be the best option, otherwise an onlay or if tooth tissue is significantly reduced, a crown should be provided soon after completion.

Conclusion

Bacteria are public enemy number one in dentistry. Disinfecting the root canal system by irrigating in combination with mechanical instrumentation is key to success in root canal therapy. Preventing further re-infection or persistence of residual bacteria after the formal stages of treatment through dressing initially and a quality coronal seal subsequently is as important as the root canal therapy.

Editorial note: Aws Alani is leading a two-year postgraduate diploma in operative dentistry at King's College London Dental Institute www.restoratedentistry.org. More information is available online at www.kcl.ac.uk/study/postgraduate/taught-courses/operative-dentistry-pgdip.aspx.



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Irrigating the root canal: A case report

By Dr Vittorio Franco, UK and Italy

The patient reported on in this article is a student in dentistry and his parents are both dentists. They referred their son to a good endodontist, who then referred the case to me. As always, peers are more than welcome in either of my practices, in Rome and London, so when I treated this case, I had three dentists watching me, a future dentist on the chair, placing a great deal of pressure on me.

The 22-year-old male patient had a history of trauma to his maxillary incisors and arrived at my practice with symptoms related to tooth #21. The tooth, opened in an emergency by the patient's mother, was tender when prodded, with a moderate level of sensitivity on the respective buccal gingiva. Sensitivity tests were negative for the other central inci-

sor (tooth #12 was positive), and a periapical radiograph showed radiolucency in the periapical areas of both of the central incisors. The apices of these teeth were quite wide and the length of teeth appeared to exceed 25 mm.

My treatment plan was as follows: root canal therapy with two apical plugs with a calcium sili-

cate-based bioactive cement. The patient provided his consent for the treatment of the affected tooth and asked to have the other treated in a subsequent visit.

After isolating with a rubber dam, I removed the temporary filling, and then the entire pulp chamber roof with a low-speed round drill. The working length

was immediately evaluated using an electronic apex locator and a 31 mm K-type file. The working length was determined to be 28 mm.

As can be seen in the photographs, the canal was actually quite wide, so I decided to only use an irrigating solution and not a shaping instrument. Root canals are usually shaped so that there will be enough space for proper irrigation and a proper shape for obturation. This usually means giving these canals a tapered shape to ensure good control when obturating. With open apices, a conical shape is not needed, and often there is enough space for placing the irrigating solution deep and close to the apex.

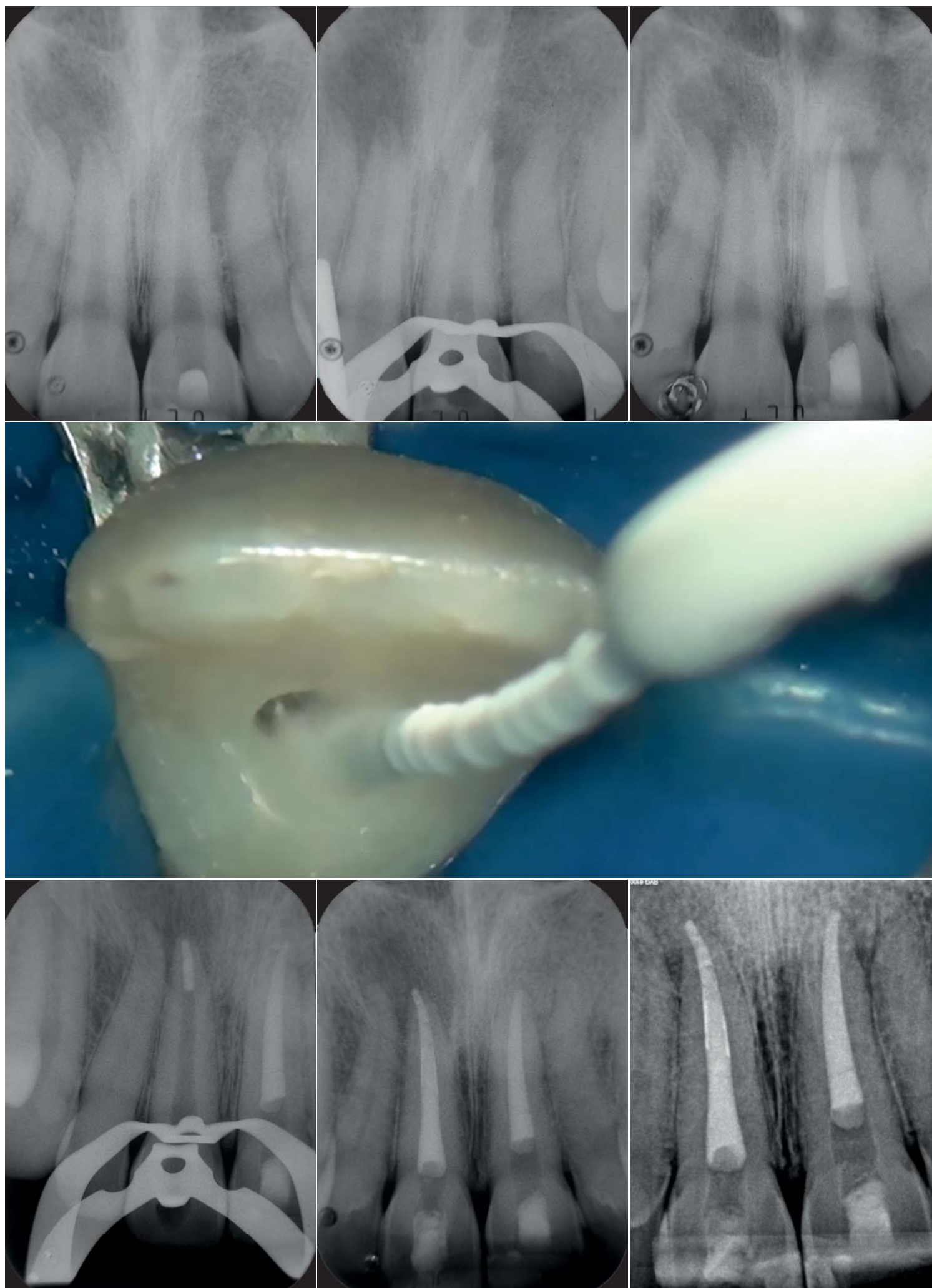
I decided to use only some syringes containing 5 per cent sodium hypochlorite and EDDY, a sonic tip produced by VDW, for delivery of the cleaning solution and to promote turbulence in the endodontic space and shear stress on the canal walls in order to remove the necrotic tissue faster and more effectively. After a rinse with sodium hypochlorite, the sonic tip was moved to and from the working length of the canal for 30 seconds. This procedure was repeated until the sodium hypochlorite seemed to become ineffective, was clear and had no bubbles. I did not use EDTA, as no debris or smear layer was produced.

I suctioned the sodium hypochlorite, checked the working length with a paper point and then obturated the canal with a 3 mm in thickness plug of bioactive cement. I then took a radiograph before obturating the rest of the canal with warm gutta-percha. I used a compomer as a temporary filling material.

The symptoms resolved, so I conducted the second treatment only after some months, when the tooth #11 became tender. Tooth #21 had healed. I performed the same procedure and obtained the same outcome (the four-month follow-up radiograph showed healing).

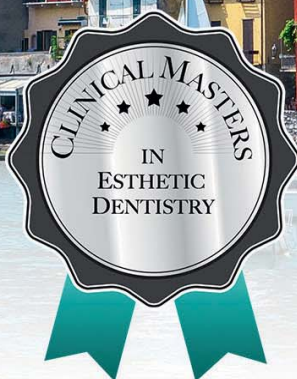


Dr Vittorio Franco is an endodontist who runs an endodontic referral practice in Rome and a practice in London. An active member of the European Society of Endodontology, Franco is also the President-elect of the Italian Society of Endodontics.





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“The immense variability of human tooth anatomy”

An interview with Dr Craig Barrington about his technique for capturing high-definition endodontic images

With his high-definition photography of complex root canal systems, Dr Craig Barrington, who practices dentistry in Waxahachie, Texas, is developing quite a name for himself. Just check out his presence on Facebook, at [craigbarringtondds](https://www.facebook.com/craigbarringtondds). In an interview with *DT America*, Barrington talks about how he captures these high-definition endodontic images and how he uses them to increase his knowledge and help improve the level of care he provides to his patients.

Please tell our readers a little bit about yourself and your dental practice.



Dr Craig Barrington

I graduated Summa Cum Laude from the University of Texas Health Science Center in San Antonio in 1996. I am a general dentist in Waxahachie, Texas. I have been in my current location for 20 years.

What do you like best about practicing dentistry?

I most enjoy the science, the biology and having a front-row seat in and around the ability to interact with, affect and watch the human body function and heal. I appreciate the ability to solve problems and the ability to work on problems that are yet to be solved. I like being a part of a “past, present and future” continuum that is the overall profession of dentistry. I enjoy having the ability to affect an individual person, from patient to fellow practitioner to dental student, all the way up to having the ability to have a positive effect on humanity across the globe.

Who influenced you most in your career?

First, I would thank Dr Joel B. Alexander. He was an endodontic professor when I was in dental school who encouraged and taught the value of recalling your cases in order to assess your treatment outcomes.

Secondly, I would thank Dr Terry Pannkuk. After much awareness, pursuit of and concentration on the topic of mentorship, I certainly believe he is the best doctor alive today. He has done much for our profession from a philosophical standpoint to the actualities of clinical healthcare. He sees the value in this tooth clearing and diaphonization project I am involved in and consistently has provided more support and encouragement than anyone else. He has kept me motivated even if it is just by simply saying “wow, that result is amazing”. I can’t say enough about what he has done for me personally or in my career as my friend and mentor. I continue to learn from him daily and I hope that somewhere along the way, I reciprocate some of the support he has given me over the years.

You have become known for your high-definition photography of the root canal anatomy. How did you become interested in this area?

That too goes back to Dr Alexander and Dr Pannkuk. Both of these doctors influenced me to recall my work in endodontics and truly take a scientific approach to the question of whether endodontics actually works and whether it actually works in my hands. After recalling many of my own cases, I started to see failures and problems that I was not satisfied with. I started to postoperatively evaluate my work and found that there were clinical aspects I could change to improve my outcomes. It was via the internet that I met Dr Arnaldo Casteallucci. After the interactions we had, I saw the cover of his textbook.

The tooth on the cover put me in awe. This was the first “cleared tooth” I had ever seen. It is from there that my interest in clearing teeth originated. I just had to figure out what was going on and how and why it worked. Fifteen years later, I am still manipulating processes in the diaphonization of human teeth in search of the “answers”. I have a patent pending in the clearing process, and the knowledge it has provided has become one of the most valuable tools in pre-operative and postoperative evaluation of the internal anatomy of human teeth.

Can you tell our readers a little bit about how you go about capturing these images? It must take some technical skill.

The photography is actually not difficult. It is oil immersion oblique illumination light microscopy, which has been done in histology labs for years. It is, however, a new realisation in this area for dentistry. In dentistry, we are familiar with the study of microscopic histologic sections. Teeth, on the other hand, are gross histologic specimens that can understandably be seen via the naked eye; however, viewing of the internal anatomic structures is greatly enhanced with microscopic evaluation. Any photographs of the teeth I work with are simply obtained through my “artistic” ar-

Today, I see characteristics of the internal anatomy of human teeth that I never thought possible or knew existed. Visualising the immense variability of human tooth anatomy has changed my clinical practices and improved my clinical results, which benefits the patients I treat.

Do you perform endodontic therapy yourself or do you typically refer cases out?

I do all of my own endodontic treatments in my office. It has taken me years to identify the area of dentistry that I love. Perhaps one day I will take the necessary

we can just take the time to follow our rolls as doctors. Doctor by definition means “to teach”, and proper teaching is not going to take place via advertising. Marketing is one aspect. Advertising is another. We have to start the movement toward patient-centered treatment, with the true healthcare providers taking the first step away from any notion of what would or could be considered advertising in healthcare.

Is there anything you would like to add?

I am respectfully honored by this opportunity, your questions



Dr Craig Barrington uses oil immersion oblique illumination light microscopy to capture high-resolution images of root canal anatomy. (All images provided by Dr Craig Barrington.)

range of the specimen in either a visually interesting position or in what I would consider an educational interpretation that I think would most benefit the viewer of the photograph.

What have you learned most by taking these root canal photographs?

As Napoleon Hill said: “Whatever your mind can conceive and believe, it can achieve.”

Where I sit today in my understanding of tooth clearing and diaphonization, I at first thought was never possible. It started as a simple question, then the development and realisation of a goal. The process has been consistently evolving and delivering information and results ever since.

steps to specialise, but life is currently focused on my family and my children.

Is there anything you would like to see changed about the way dentistry is practiced today?

Absolutely! More than you can imagine or can be covered in this session. In short, we need to work on our ethical standards within the profession itself and move back toward being true, real doctors over the business-focused patient treatment we are seeing overwhelm the practice environment today. The actual care of the patient is always in competition with and in direct contrast to the business and profit. We have to get back to patient-centered practices. The profits are there in mass quantities if

and in you finding significance in this work of mine. Thank you!

Editorial note: This interview originally appeared in *roots* magazine, No. 1/2017.

Dr Craig Barrington

received his DDS from the University of Texas Health Science Center San Antonio in 1996 and is a member of Omicron Kappa Upsilon. He is also an associate member of the American Academy of Endodontists. He maintains a practice in Waxahachie, Texas. He has written various articles and publications on the dental operating microscope in general dentistry. For comments, questions or presentation requests, please contact Barrington at cbdds002@yahoo.com.

ROOTS SUMMIT: Registration open for 2018 edition

By DTI

BERLIN, Germany: Seats for the next ROOTS SUMMIT, the premier global discussion forum dedicated to endodontic dentistry, are still available. The event, featuring lectures and workshops, will be held at the European School of Management and Technology (ESMT) in Berlin from 28 June to 1 July 2018. Approximately 500 visitors are expected at the international meeting, which is again being organised in collaboration with Dental Tribune International.

Mexico, Spain, the Netherlands, Brazil and India. The 2016 ROOTS SUMMIT took place in the UAE and was one of the most signifi-

cant events in endodontics that year, drawing over 300 dental professionals to Dubai. These meetings have been known for

their strong scientific programmes. An early bird discount of 20 per cent is being offered and dental students too will be

granted a 20 per cent discount. Additional information and on-line registration can be found at www.roots-summit.com.



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Although the 2018 ROOTS SUMMIT will mainly feature presentations on the latest techniques and technologies in endodontics, the organisers are inviting dental professionals in all fields, as well as manufacturers in the industry, suppliers of endodontic products and anyone involved in the practice of endodontic treatment, to attend.

It has been announced that foremost opinion leaders, including Drs Steve Buchanan, Frederic Barnett, Gergely Benyócs and Elisabetta Cotti, will be speaking at the conference next year. There will also be the opportunity to participate in hands-on workshops, speak to industry professionals on-site and engage with new equipment, procedures and protocols in endodontic dentistry. A number of dental companies specialising in endodontics, including META BIOMED and FKG Dentaire, have already confirmed their participation.

The ROOTS SUMMIT, which started as a mailing list of a large group of endodontic enthusiasts in the 1990s, has grown significantly over the last few years. With currently more than 24,000 members from over 100 countries, it evolved into one of the most prominent global learning forums in the dental industry.

Previous conferences have been held in Canada, the US,



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*More speakers will be announced later
*Last names in alphabetical order



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