Volume 64 Number 1 February/March 2018

# irish dental association

Jurnal of the Irish Dental Association Iris Cumainn Déadach na hÉireann

# Injection perfection

The conventional inferior alveolar nerve block: is there a more predictable alternative?

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References: 1. Baysan A et al. Reversal of Primary Root Caries Using Dentifrices Containing 5,000 and 1,100 ppm Fluoride. Caries Res 2001;35:41-46. + After 6 months use. \*YouGov Omnibus for Colgate UK, June 2015. Claim applies to the Colgate® brand.





# Science is our bedrock

Two peer-reviewed papers and a clinical feature in this edition make a strong contribution to dentists' knowledge and awareness of their respective topics.



Scientific content is the solid foundation upon which we seek to build every edition of the *Journal*. In this edition, we are well served by a range of authors delivering contrasting but very helpful papers. Our peer-reviewed paper from Dr Brian Dunne assesses the alternatives to the conventional inferior alveolar nerve block. It is a comprehensive review, well-researched and a valuable reminder to us that we have alternatives. We always seek to ensure that we have the best methods available to our patients. Dr Dunne concludes that the intra-osseous technique and buccal infiltration with 4% articaine are effective alternative methods for achieving mandibular pulpal anaesthesia. He also calls for further research stating: "Further investigations into local anaesthetic efficacy would benefit from the introduction of standardised testing methods, reducing heterogeneity of the literature."

And speaking of conclusions, Georgina Staunton and Dr John Hyland have submitted a paper on techniques to overcome dental fear, improving attendance and compliance. This is most welcome and includes the following from their conclusion: "When an anxious patient presents in pain for treatment, dentists have an opportunity to initiate a behaviour change, increase patients' repertoire by allowing them to engage with treatment and to cope with intervention via reinforcement of alternate behaviours". Georgina is both a graduate in psychology and a dental hygienist, while her co-author, Dr Hyland, is a Chartered Psychologist, and their paper is a very welcome contribution to an issue that has a profound effect on our working lives.

Drs Ed O'Reilly and David McReynolds have co-authored a clinical feature on creating a customised emergence profile on implant crowns using the digital workflow. This introduces and illustrates a technique to condition and record such a profile around dental implants placed in the posterior segments of the mouth. Again, we are fortunate to have such high calibre contributions to our

*Journal* and we are grateful to all of the authors and reviewers who volunteer their expertise for the betterment of the profession.

#### **Practical advice**

The betterment of the profession was on everyone's minds at the IDA's Practice Management Seminar in Croke Park at the end of January. Our comprehensive report in the Members' News section includes statistics from the Dental Treatment Benefits Scheme (DTBS) showing the predicted return of significant numbers of scale and polish and periodontal treatments to be provided under the Scheme. Michael Finn of Matheson Solicitors spoke on the General Data Protection Regulation (GDPR), which is upon us on May 25 next. He said that dentists have to make themselves familiar with it as it applies to everyone who holds personal data – and that it gives companies more responsibilities and people more rights. You have been warned!

Another solicitor, this time Bill Holohan of Holohan Law, advises us in a special feature that the option to settle potentially difficult commercial and business disputes by mediation has now been afforded to dentists by new legislation. The Dental Complaints Resolution Service has been a successful mediator of complaints by and with patients. Mediation is a practical, speedier and much less expensive way to resolve business problems

Elsewhere we have a lovely letter from Diarmuid Shanley recording the passing of Prof. Martin Hobdell, who was (among many other things) Head of the Department of Community Dental Health/General Practice in the School of Dental Science and Dublin Dental Hospital from 1983 to 1992.

In 'My IDA', we hear from Dr Dina Dabic who qualified at home in Serbia. She has been practising in Ireland for the last two years and is an enthusiastic representative of foreign-qualified dentists on the Council of the IDA/IDU. Her experience is an enlightening one for all of us.



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## Opportunities and challenges

Much is planned for the coming year and there are new systems and significant new regulatory changes for dentists to get their heads around.



There was a sell-out crowd in Croke Park on January 27, for the Association's annual practice management seminar, 'Roaring Success'. The General Data Protection Regulation (GDPR) comes into force with a bang on May 25, 2018, across the EU, and Michael Finn of Matheson Solicitors explained this complex and wide-ranging law to the assembled dentists. The Association will be providing significant assistance to members to meet their data protection obligations, and we will also be issuing guidance to members on the implications of the Minamata Convention, which seeks to phase down the use of mercury and amalgam fillings in the years ahead.

The Association's GP Meeting was held in the morning at our Croke Park meeting. Representatives from the Department of Social Protection and the HSE then spoke about the new online claiming systems for the DTBS and DTSS, and both received plenty of queries from dentists present.

One major focus of the seminar was optimising the running of your practice and getting the best from your staff and yourself, with talks from top names in dentistry and psychology. World-renowned psychologist Prof. Ian Robertson spoke about what makes a winner and gave his intelligent and simple tips on how we could all change our mindsets into winning ones. We have received some great feedback about the event from those who attended and you can read the full report of the seminar in the Members' News (p.25).

The first meeting of the Joint Consultative Group of the IDA and HSE took place a day before the practice management seminar on January 26. This meeting looked at issues with the DTSS and discussions will continue to try and get the best service for dentists and patients as we await talks on a new contract, hopefully in the near future.

#### **Annual Conference**

The Annual Conference 2018 takes place from April 26-28 in The Galmont Hotel, Galway. As usual, it will be a packed three days with speakers and CPD covering the broad spectrum of dentistry. The IDA and IDU AGMs take place

on Thursday, April 26 starting at 6.00pm, and the deadline for the submission of motions is Thursday, March 22. I would like to invite all dentists who can attend to come along and enjoy the range of educational and recreational activities on offer.

#### Making things easier

One of the objectives identified by the Association in recent years was the need to provide more support to dentists who are newly qualified and new to the country. These dentists need assistance getting to know the Irish dental profession. With this in mind, the Council of the IDU recently established a working group for newly qualified and overseas-qualified dentists. We are anxious to reach out to these dentists to identify what support they feel they need and to show them how the Association can be of assistance to them throughout their dental careers in Ireland. The working group will be run by Drs Dina Dabic and Rebecca Gavin, who will be sending out a survey soon to help inform and quide their activities.

#### Dentist awards on the move

The only downside of last year's Sensodyne Sensitive Dentist Awards was the fact that there wasn't enough room for all the dentists who wanted to attend the sold out gala awards ceremony in the RDS. Due to this demand, it has been decided to move the event to the larger venue of the Clayton Hotel, Burlington Road (formerly the Burlington Hotel) in 2018. This will allow more dentists and dental teams to enjoy what really is a special night for the profession.

Finally, I would like to congratulate the Association's Employment and Communications Officer, Roisín Farrelly, on the birth of her baby daughter, Ailbhe. I would also like to wish the very best to our outgoing Events and CPD Administrator, Gráinne McQuaid, and thank her for all the work she has done for the Association. We are pleased to welcome Patricia Larkin, who will cover for Roisín, and Aoife Kavanagh, who is taking over Gráinne's position.

#### Dear Sir,

Many colleagues would wish to know that Prof. Martin Hobdell died in Norfolk, England, on December 15, 2017, in his eightieth year. Martin was Head of the Department of Community Dental Health/General Practice in the School of Dental Science and Dublin Dental Hospital from 1983 to 1992. He is survived by his wife Helen Keegan, a former administrator in the School of Dental Science, two sons and a daughter. Sadly, another son predeceased him.

Martin was devoted to advancing human rights; this had a fundamental influence on his professional career in practice, teaching and research. He was one of the most influential dental academics internationally, especially in countries with developing economies. Martin stressed the need for healthcare systems that were appropriate and affordable for the country or region while prioritising those in greatest need of care.

Typifying his ethical stance on human rights issues, he was a strong supporter of the Anti-Apartheid Movement in Dublin, London and South Africa. He was an active campaigner in helping the African National Congress in South Africa and was held in high regard for his contributions and support by many of its leaders. Martin was a thought provoker throughout the dental world. Some regarded his approach as controversial and beyond the traditional confines of the profession. This was hardly surprising given his strong criticisms of vested



Email/: dentanet@eircom.net www.dentanet.ie interest, cronyism and his questioning of the moral imperatives of commercial sponsorship of research and conferences from such interests as those involved in promoting the consumption of sugar, alcohol and tobacco, especially in countries with developing economies. He was acutely aware of the broader geopolitical and socio-educational influences on health.

Martin promoted an integrated dental curriculum based on a consensus of staff and student representation, agreeing stated aims, objectives and prioritised outcomes. Emphasis was placed on the acquisition of clinical competence in primary dental care appropriate to



Prof. Martin Hobdell.

community needs and systems. He emphasised the importance of objective, fair and appropriate continuous assessment methods to ensure the safe delivery of patient care by the new dental graduate.

Apart from Trinity College Dublin, Martin held senior academic appointments in King's College, London, The London Hospital Medical College, University of Texas Health Sciences Center at Houston, School of Dental Medicine, University of Pennsylvania, the University of Mozambique and the University of the Western Cape, South Africa. He had extensive international experience as an external examiner at undergraduate, graduate and doctoral levels.

He was an active consultant/reviewer on behalf of the *Federation Dentaire Internationale*, the American Dental Association and the American College of Dentists among others. His international leadership was recognised by the American Dental Association where he acted as consultant and adviser. He was a frequent World Health Organisation consultant and led the WHO Collaborating Centre in the Dublin Dental School and Hospital. That also had a strong influence on thinking in the Association for Dental Education in Europe, especially at the time of major expansion of the European Union embracing central and eastern countries of Europe.

Martin completed reports on behalf of the World Health Organisation and/or the national health authorities on oral healthcare systems in Spain, Tanzania, Cambodia, Lao PDR, Vietnam, Mozambique, and South Africa, as well as a strategy for the continent of Africa. He served on innumerable consultancies in countries around the world. He was a reviewer for ten dental/medical international journals.

The predominant interest in his 80 peer-reviewed scientific publications relates to dental public health and health services management. His advocacy in respect of ethical healthcare is reflected in six of his most recent publications before ill health compromised the prodigious influence of this leading academic. Ireland, and specifically Trinity College Dublin, was privileged to have shared the benefits of his wisdom and thought-provoking observations. Our sympathies and thoughts are with Helen and his children on their loss.

#### **Diarmuid Shanley**

(Professor and former Dean, Dublin Dental University Hospital)





Figure 2.



#### Quiz questions Submitted by Dr Jerome Philip.

Answers on page 45

Figure 1.

On a visit to an outreach dental facility in a developing country, a 60-year-old gentleman presented with a bluish swelling intra-orally on the left side of his lower jaw. It was painless and noticed about three months prior to attending the clinic. A traditional orthopantomogram was taken (**Figure 1**) and revealed what appeared to be a well-circumscribed unicystic lesion.

#### Questions

- 1. What would be your top three differential diagnoses?
- 2. Are there any other lesions that may be of surgical concern given the bluish hue?
- Keeping in mind that CT/MRI scans may not be available, how would you proceed with the management of this lesion?
- 4. **Figure 2** shows the aspirate to be 'straw'-coloured fluid with cholesterol granules. Would this narrow your differential diagnosis?
- 5. **Figure 3** shows one treatment option. What is it and what benefits might this have?



#### Diary of events

#### FEBRUARY

- 23 South Eastern Branch IDA Annual Scientific Meeting Ormonde Hotel, Kilkenny
- 23 Metro Branch IDA Annual Scientific Meeting



Alexander Hotel, Dublin 2

#### MARCH

- 13 Munster Branch IDA Meeting
  - Maryborough House Hotel, Cork

Speaker: Prof. Duncan Sleeman on '20 years of maxillofacial surgery in Cork'

22 Metro Branch IDA – Supper for Learning Davenport Hotel, Dublin, 6.00pm–7.30pm

#### APRIL

13-14 Orthodontic Society of Ireland, Spring meeting

Stillorgan Topic is 21st century orthognathic surgery. Details and further information on www.orthodontics.ie.

#### 26-28 IDA Annual Conference 2018



The Galmont Hotel, Galway

#### MAY

10 Irish Society of Dentistry for Children Annual Scientific Meeting Midlands Park Hotel, Portlaoise, Co. Laois

#### JUNE

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For more info, log on to www.efp.org/europerio.

#### Are you compliant?

Later this year dentistry will see the introduction of new guidelines and regulation from both HIQA and the Environmental Protection Agency regarding oral radiation. With this in mind, the IDA will host a compliance workshop for all members on Saturday, May 19, in this area. The workshop will also include a session on meeting your legal obligations under employment law and a session on the Minamata Convention.

#### GDPR – are you ready?

#### FREE 2202E6F6163686573204069 FREE SEMINAR FOR MEMBERS 24.03.18 CADO 7368

The General Data Protection Regulation (GDPR) is the new EU Regulation on data protection, which will come into force on May 25, 2018.

The GDPR is relevant to all information relating to an individual who is, or can be, identified by that information, including data that can be combined with other information to identify an individual. In a dental practice this is relevant to all patient information and also for your employees. An information seminar will take place on Saturday March 24 (venue to be confirmed) for all IDA members and practice managers on this issue. More information to follow.

#### Wrigley Grants 2018

The Irish Dental Association, in conjunction with the Wrigley Company Foundation, is delighted to announce year three of grant aid towards worthy oral healthcare projects around the country.

Dental support grants are available to help fund specific community service projects with a focus on improving oral health and educating participants in this area. Up to five projects across the country will be funded, with one project receiving funding of €8,000, two receiving €2,500 and two receiving €1,000. The scheme is open to all IDA members to apply.

Application forms will be sent to all members and will be available to download from www.dentist.ie.

#### Looking forward to Christmas!



Date for your diary – The annual Sensitive Dentist and Dental Team of the Year Awards will take place on Saturday, December 1, at the Clayton Hotel, Burlington Road, Dublin 4. A night not to be missed by all dental team members.

#### A great result in Croke Park



The IDA Practice Management Seminar 2018 took place on January 27 in Croke Park. Speakers gave their expert knowledge on need-to-know topics for dentists, such as the new online payment systems for the DTBS and DTSS, and the upcoming General Data Protection Regulation (GDPR).

Dr James Goolnik, from the highly successful Bow Lane Practice in London, gave his insight into how to get the best from staff and keep patients coming back. Dr Brid Hendron gave her thoughts on motivation, and how to get employees to do tasks because they want to, not just because they are told to. World-renowned Trinity College psychologist Prof. Ian Robertson shared the well-researched tips he has learned over his career on what makes a winner. For the full report on all this and more information to help your practice improve and stay compliant, check out the Members' News on p25.

#### International Women's Day lunch

To celebrate International Women's Day, Women in Dentistry (WiDen), in conjunction with the Irish Medical Organisation (IMO) and the Irish Pharmacy Union, are hosting a lunch on Friday, March 9, at 25 Fitzwilliam Place. There will be three short presentations at the event from Dr Brid Hendron, dentist, Mary Rose Burke, pharmacist and CEO of Dublin Chamber of Commerce, and Dr Ann Hogan, President of the IMO.



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### **JOIN US IN 2018!**

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#### Plastalgin from Septodont



Septodont states that the highest-quality alginate impressions are ensured using its product, Plastalgin. According to the company, the product combines economy with accuracy, dimensional stability and durability, is easy to mix, dust free, and perfect for all manner of uses, from orthodontic study models to models for mouth guards, etc.

> Plastalgin is available in regular and fast-setting versions. Septodont states that it is a top-quality alginate for high degrees of accuracy. According to the company, it is naturally hydrophilic, so takes up liquid easily for quick and efficient

mixing without bubbles, and is tear resistant to allow multiple models to be poured, depending on the individual impression. It is available in two flavours: Plastalgin (Regular) Apple; and, Plastalgin (Fast) Apricot. It is available from dental retailers in 454g bags.

Septodont also makes biocompatible restorative and endodontic technologies, such as Biodentine and BioRoot RCS.

# Quintess Denta and Straumann strengthen Irish offering

Quintess Denta states that it is proud to announce a further Straumann partnership: "We are delighted to add a number of key Straumann brands to our portfolio, namely Botiss and Medentika. In addition to supplying Neodent, which is now the second largest manufacturer of dental implants in the world, the addition of these two brands offers greater choice to customers in Ireland".

#### Relaunch of Xylocaine and Citanest



DMI states it is delighted to announce that it has signed a formal agreement with Dentsply Sirona guaranteeing continuity of supply of Xylocaine and Citanest for the Irish market. These anaesthetics are fully licensed by the Health Products Regulatory Authority (HPRA) for use in Ireland. These products are now packaged in boxes of 50 for your convenience, and DMI states that both are competitively priced and offer substantial savings for your practice.

#### Oral cancer screening glasses

Oral cancer is not only one of the most frequent cancers globally, it also often goes undetected in the early stages. Early detection through regular check-ups and full-mouth screenings are an essential part of preventive dentistry. Early discovery is the most crucial step in saving lives, with first-stage oral cancer having an 80-90% survival rate.

Pierrel Group has made Goccles, specialist glasses which the company states offer a non-invasive, simple and painless test of the oral cavity for early detection of cancer. Using fluorescence technology alongside a common curing light, Pierrel states that Goccles enable rapid screening of internal surface areas of the mucosa, in order to provide an accurate aid to detection of dysplasia and early cancer.

According to the company, Goccles have an innovative optical filter that allows a clear visual of the oral cavity and accurate detection of anomalies within.

Pierrel states that the technology is quick, simple and easy to use, as well as being a completely pain free and non-invasive way of checking that your patients are healthy and safe from oral cancer.



Quintess Denta states that Medentika provides high-quality components and abutments, which are compatible with all major implant systems, without compromising on precision and quality. The company also believes that Botiss biomaterial products are engineered to predictably and reliably regenerate soft and hard tissue.

Quintess Denta says: "This expanding range of flexible solutions is designed to provide patients with the functional and aesthetic result they desire. It is the total solution for regeneration that can potentially elevate the patient experience and your practice success".

#### DPL appoints new head in Ireland

Dental Protection says it is pleased to announce the appointment of Dr Martin Foster as the new Head of Dental Services in Ireland.

Martin qualified from Edinburgh Dental School in 1986. He is a registered specialist in paediatric dentistry, with a master's degree in public health, a diploma in health service management and a background in general practice. He was previously responsible for NHS Lothian Children's Dental Service in Scotland as an assistant clinical director, and is a regular presenter on a range of legal and ethical issues, with a particular interest in communication and risk management. DPL states that Martin's main areas of focus as the Head of Dental Services in Ireland will include maintaining the high quality of services provided by Dental Protection and developing them further, with the valuable insight provider states Martin will also continue to collaborate with the IDA, challenging some of the key issues facing dentists in Ireland. Martin's

appointment follows the recent departure of Dr Sue Boynton after more than five years in the role.

# PLAQUE CONTROL: 'GOOD' CAN BE BETTER



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A combined analysis of 29 clinical studies on essential oils has been published in the *Journal of the American Dental Association*.

This showed that after 6 months of using **LISTERINE®**, after brushing and inter-dental cleaning, **37%** of patients had at least half their mouth free from plaque, compared with only **5.5%** of those who just brushed and used inter-dental cleaning.<sup>1</sup>

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# Johnson Johnson

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References 1. Araujo HW, et al. J Am Dent Assoc 2015;146:610–622. 2. Johnson & Johnson, Data on file. IRE/LI/16-1891

# BRING OUT THE BOLD<sup>™</sup>



# Dentists' Provident re-enters income protection market

In January this year, Dentists' Provident launched its day one income protection option for Irish dentists.

Until now, none of Dentists' Provident (DP) plans had approval from Revenue, meaning that dentists were not entitled to tax relief on their premiums. Any claim that was made on a DP plan was tax free, but only for the first 12 months, making it very inefficient from a cost perspective.

The new DP 'Select Income Protection' day one policy has received approval from Revenue, so tax relief is allowable to dentists on the new plan. However, to avail of this new policy, all applicants (both new and existing members) will have to undergo underwriting and this particular factor may not suit all of DP's existing clients.

#### What's different from the old DP plan?

The main difference between the new and old plans is that there will no longer be a savings element to the new version. Some DP members have policies that were initiated as far back as the early 1980s, and many of those polices will have an appropriation account attached that will give them a bonus at age 60. Current DP members will be familiar with annual notifications of bonus declarations on their savings. The new select plan will not have that savings element attached to it, making it purely a protection product.

There are a number of additional benefits to the new plan, all of which are important when considering the best option for your circumstances:





- maximum cover is now €8,333 per month or €100,000 per annum previously it had been €78,000;
- new applicants up to the age of 56 will be taken previously the maximum age of applicants was 50;
- cover and claims on the new policy will go to age 65 (up from 60);
- waiver of premium is now in place on the select product, which means that in the event of a member claiming, they won't have to pay their membership premium during that time;
- indexation is available on the new plan, meaning that you receive a higher amount of cover each year;
- tax relief is now available on premiums as the scheme is Revenue approved; the rate at which relief is given relates to the highest marginal rate the dentist is paying – this increases from 20% to 40% at €34,550, so anyone earning in excess of that will get 40% relief on premiums; and,
- guaranteed premiums are now available to members if they choose. Previously on the old plan, membership premiums increased on an annual basis in line with risk and age. A dentist can still have this option if they wish; alternatively, they can choose to have the premium stay the same for the remainder of their career. The guaranteed premium is a more expensive option in the beginning, but over time it gives significant savings to members, particularly the younger they are when they join.

To move from the old to the new package will involve undertaking the entire application process, including underwriting. This means that illnesses suffered while under the existing plan may not be covered, as they become pre-existing conditions on a new application. From experience though, many dentists are grossly under covered, as they may have initiated their claim a long time ago, when their income was lower, and have never properly reviewed it. The introduction of this new plan certainly gives more options to dentists for their income protection cover.





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## Mediate, don't litigate

Mediation can prevent disputes escalating, so what can new mediation laws offer dentists?

Conflict within practices, with patients, suppliers or business partners can be exhausting, frustrating and very, very expensive. While the Dental Complaints Resolution Service can help dentists to resolve disagreements with patients, new legislation offers dentists a chance to settle potentially difficult commercial and business problems without incurring huge legal costs.

Did you know that it is only 200 years since the right of trial by battle was outlawed? If you do not know what that means, let me explain. You got the biggest and ugliest 'champion' you could find to go out and beat the proverbial out of your opponent's 'champion' in a David v Goliath showdown. (Gentlemen would simply draw pistols at dawn.) The theory was that God would be on the side of the person who was in the right, and virtue would prevail. The right of

#### Bill Holohan

Bill is a solicitor, and the Senior Partner of Holohan Law. He is the current Chairman of the Chartered Institute of Arbitrators – Ireland Branch (www.ciarb.ie), a member of the Law Society ADR Committee, and a council member of the Mediators' Institute of Ireland. trial by battle was outlawed in 1819, and then battles moved to the courts, where you got the biggest and ugliest solicitor/barrister you could find to beat the proverbial out of your opponent in the hope that you would win.

One hundred years ago Pádraig Pearse described the education system as the murder machine, but that description could now more accurately be applied to the litigation system. UK Supreme Court Justice Lord Jonathan Sumption described litigation as follows: "Litigation generates obsession and provokes resentment. It sharpens men's natural conviction of their own rightness and their suspicion of other men's motives. It turns indifference into antagonism and contempt. Whatever principle may be formulated for allowing secondary litigation in some circumstances, for every case in which an injustice is successfully corrected in subsequent proceedings, there will be many more which fail only after prolonged, disruptive, wasteful and ultimately unsuccessful attempts".

In short, litigation destroys people, their reputations, their mental health, their relationships, their futures, and their finances. Litigation is public, and might not even work after all that, e.g., debts are not recovered, both parties end up unhappy, and the result may not be enforceable straight away. In another case, a judge described the parties as having been "completely cuckoo", as the results of mediation were, as he described it "astonishingly good".

#### One true faith

I have been a solicitor for some 35 years now and I have successfully practised the dark art of litigation for much of that time. I still do to some extent. Undoubtedly, there were some client casualties along the way. I have no objection to people paying me to litigate if that is what it takes. But I would prefer them to pay me to bring about a cost-effective solution to their problem, and in double quick time rather than them getting a court judgement, which is simply a piece of paper declaring a result, which may at the end of the day be of no practical use or benefit to them. Mediation can deliver a cost-effective, mutually agreed and workable solution to problems, in short order. I therefore now describe myself as someone who, having worshipped in the satanic church of litigation for over 20 years, converted to the one true faith of mediation about 12 years ago.

So, what is mediation? Mediation is one method of alternative dispute resolution (ADR). Mediation is a process whereby an impartial, trained professional helps people in disputes to talk about their situation, express their concerns and come up with ideas about how to resolve it. The Mediation Act 2017, which was passed last September, and has been the law of the land since January 1, defines mediation as meaning "a confidential, facilitative and voluntary process in which parties to a dispute, with the assistance of a mediator, attempt to reach a mutually acceptable agreement to resolve the dispute".

A court case is a hideously expensive and extremely destructive poker game of an inquest, conducted to try to establish who was more in the wrong in the past, with each side playing their cards close to the chest if they can, whereas

Minimum costs to get to day one of a High Court case are €60,000 on each side, often much more. Even with solicitors involved, mediation would cost less than one-tenth of that.

mediation focuses on the future, and on helping parties to identify and agree on mutually acceptable and workable solutions. The parties talk to the mediator and, if possible, to each other with the assistance of the mediator. Like Humpty Dumpty, the mediator gets to see over both sides of the wall, and if parties, in complete confidence, put their cards on the table with the mediator, knowing that those cards will not be shown to the other side without their express consent, the mediator can then see both sides, help clear up any misunderstandings, miscommunications or misinterpretations, foster mutual understanding, and see if there is some common ground for a solution, then



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#### FEATURE

helping the parties to identify and agree on that solution.

#### Advantages

The advantages are obvious. The process is entirely confidential to the parties and people do not have to wash their dirty linen in public. It all happens in a completely private, confidential, very calm and relatively stress-free environment (mediators do not bite). Mediation can be organised in a matter of days, whereas litigation can take years with legal costs spiralling beyond the imagination of either party. The parties do not even have to meet each other face to face, and aggressive questioning in court or arbitration is completely avoided. Whereas litigation is a very negative mental process, mediation can be very positive. The focus is on the future. I often say: "Let's not get into matters historical, in case they become matters hysterical". Relationships can be preserved and people can continue working together in the future. This is particularly important in employer/employee situations, workplace mediation, or where people are working together in a partnership or associate relationship. It could be a problem with a landlord (or tenant). Parties get to decide the result, if it is legally enforceable and the extent to which it is.

#### **Cut costs**

While lawyers can be involved, and often are, they do not have to be. The costs involved are a fraction of what it costs to go to court. Minimum costs to get to day one of a High Court case are  $\leq 60,000$  on each side, often much more. Even with solicitors involved, mediation would cost less than one-tenth of that. Anecdotally, more than 90% of cases get resolved at mediation. Who would not want to have a problem sorted in a matter of days or weeks rather than years? One of my solicitor colleagues who was new to mediation, and assisted a party to a dispute which was successfully resolved at mediation, afterwards summed up his impression as follows: "You know what? Going into it, I was very iffy about this mediation lark, but you know something – it worked! Things got sorted quickly. The client was very happy".

Just about sums it up.

#### Legal obligation

Lawyers now have a legal obligation under the Mediation Act to advise clients, in writing, before commencing court proceedings, about the advantages of mediation, and must give them information in relation to mediation, mediators, etc.

How is any of this relevant to dental practitioners? For example, before Christmas I successfully mediated settlement of a dispute that was likely to end up in court, where two dental practitioners had problems arising from the sale of a practice. Although it had been heading for court, because the parties opted for mediation, no lawyers were involved in the mediation, and after one day of the mediation meeting, matters were resolved. The total cost involved for the parties was less than what it might have cost to get a solicitor to get a barrister's opinion and have them draft legal proceedings.

I have successfully mediated workplace disputes, and partnership and commercial disputes, and all were completed quickly and at minimal expense. Who then would want to go to court/litigation rather than mediation? I remember a line from King Lear: "O, that way madness lies; let me shun that; No more of that".

Think about it. The Irish Dental Association can help to explain the options available to you, including engaging accredited mediators, where you face a seemingly intractable dispute.

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#### CLINICAL FEATURE



FIGURE 1: Following the surgical phase of implant dentistry, the patient will present to the restorative operator with a peri-implant soft tissue emergence profile which is cylindrical and circular in form. Implant surgery by Dr Ronan Allen.



FIGURE 2: Without conditioning the initial cylindrical and circular peri-implant soft tissue form, the resultant emergence profile on the implant crown will be ridge lapped. This design is unhygienic, may not predictably support a peri-implant pseudo-papillae and does not maximise the potential mechanical properties of the implant crown at its cervical region.



FIGURE 3: A more harmonious emergence profile is achieved with the definitive implant crown following several appointments in which the periimplant soft tissue is conditioned by exerting gentle pressure in a step-by-step protocol. Laboratory work by Damian O'Connor, O'Connor Restorative, Limerick.

# Creating a customised emergence profile on implant crowns using the digital workflow

Optimising biomechanical and aesthetic outcomes in implant prosthodontics.

Modern dental implants are essentially prosthetic devices which aim to perform the functions of the natural tooth root. However, by necessity, and unlike the natural tooth root, dental implants are cylindrical in form and circular in diameter (**Figure 1**). Without adjustment of the resultant cylindrical and circular emergence profile, a definitive implant crown will tend to have a ridge lapped form (**Figure 2**). Not only is this form impossible to clean by the patient at home, but it may be unpredictable in terms of supporting a pseudo-papillae around the definitive implant crown. The subsequent dead space caused by missing papillae is unaesthetic and may lead to further functional problems such as food entrapment. Furthermore, without a bulk of restorative material at the cervical portion of the definitive implant crown, the crown itself may be at increased risk of prosthetic complications such as fracturing of the crown framework or veneering material.<sup>1,2</sup>

To overcome these problems, an interim implant-supported restoration may be used to condition the peri-implant soft tissue by exerting gentle pressure on the tissue in a slow, step-by-step protocol, resulting in a refinement of the soft tissue architecture.<sup>3</sup> In taking these steps, it is possible to achieve a more harmonious emergence profile, which mirrors that of the natural tooth, is conducive to health and results in a restoration which is pleasing in appearance (**Figure 3** and **Figure 4a-4e**).

However, a new problem arises once the operator intends to transfer this

conditioned emergence profile to the laboratory technician. On removal of the interim implant-supported restoration, the peri-implant soft tissue will tend to quickly collapse, before there is time for an implant impression coping to be placed.<sup>4</sup> Using a conventional workflow, this problem is circumvented by using customised impression copings, which may be time consuming to fabricate (**Figures 5a** and **5b**).<sup>5</sup> However, with the use of an emergence profile intra-oral scanning option, the digital workflow can bypass the need for customised impression copings because the conditioned emergence profile may be scanned immediately following removal of the implant-supported restoration and before an implant scan flag is placed.<sup>6,7</sup>

This clinical article introduces a technique which may be used to condition and record a customised emergence profile around dental implants placed in the posterior segments of the mouth, using the digital workflow.

#### **Case report**

Following successful placement of a dental implant in the lower left first molar site, in a delayed loading protocol, the patient returns to the restorative operator to begin the restorative phase of implant treatment. At this stage, the resultant emergence profile of the peri-implant soft tissue is cylindrical and circular in form (**Figure 1**). An implant scan flag (ELOS Medtech Dental, Sweden) may be placed on the implant to register its three-dimensional



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#### CLINICAL FEATURE



FIGURE 5: Using the conventional workflow, customised impression copings must be fabricated to accurately record a conditioned emergence profile into the definitive restoration, otherwise the periimplant soft tissue will collapse before an implant impression can be made. Definitive laboratory work by Eurocast, Dublin.



FIGURE 4: Peri-implant soft tissue maturation and pontic site development carried out over a ten-week period using implant-supported provisional restorations permits the creation of soft tissue contours which facilitates the design of an optimum emergence profile in the definitive restoration. Implant surgery by Dr Edward Madeley. Emergence profile development by Dr David McReynolds.



FIGURE 6: An ELOS scan flag is placed on the implant in order to register the implant's threedimensional location in the mouth, when making a digital intra-oral scan. The scan flag is to the digital workflow what an impression coping is to the conventional workflow.



FIGURE 7: Three customised PEEK healing abutments are designed and machine fabricated. Each abutment is progressively larger than the last and has an emergence profile that is convex and smooth. Laboratory work by Glenn McEvoy, Eurocast, Dublin.

location, in order to make a digital intra-oral scan and fabricate a virtual cast (**Figure 6**). In this case, a 3Shape TRIOS (3Shape, Denmark) intra-oral scanner was used.

At the dental laboratory, three customised healing abutments are designed and milled in polyetheretherketone (PEEK) using computer-aided design and computer-aided manufacturing (CAD-CAM) technology (**Figures 7a-7c**). These customised healing abutments are designed such that their emergence profile is convex and smooth. Each healing abutment is progressively larger than the last, and when placed in the mouth will result in an exertion of gentle

pressure on the peri-implant soft tissue in a slow, step-by-step protocol, until an ideal emergence profile has been achieved (**Figures 8a-8c**).

Once all involved parties are pleased with the conditioned emergence profile, a new digital intra-oral scan is made in two clinical steps. First the emergence profile of the peri-implant soft tissue is captured immediately on removal of the customised healing abutment, before the tissue has time to collapse. This emergence profile data is locked by the scanning software. Second, the three-dimensional location of the dental implant is registered using an implant scan flag (**Figure 9a**). This scan data is then emailed to the dental laboratory. At the

#### CLINICAL FEATURE



FIGURE 8: When placed in the mouth, each customised PEEK healing abutment will exert gentle pressure on the peri-implant soft tissue in a slow, step-by-step protocol, until an ideal emergence profile has been achieved. At this stage, it is important that any tissue blanching associated with expanding the peri-implant soft tissue resolves within 15 minutes to prevent an adverse tissue reaction. Emergence profile development by Dr Edward O'Reilly.



FIGURE 9: Once the emergence profile has been conditioned, a new digital intra-oral scan is made. The first stage of this scan records the peri-implant soft tissue emergence profile data alone, immediately on removal of the customised PEEK abutment. This information is locked before a scan flag is placed to register the three-dimensional location of the dental implant. At the dental laboratory a cut-back coping is designed on the resultant virtual cast. This coping is machine fabricated and hand stacked with aluminous porcelain to form a definitive screw-retained implant crown on a milled polyurethane cast. Eurocast, Dublin.



FIGURE 10: The appearance of the patient at definitive fitting. Note the excellent gingival response to the new implant crown.

dental laboratory, a definitive cut-back coping is designed with a customised emergence profile, mimicking that which was conditioned using the customised healing abutments (**Figure 9b**). In this clinical article, this design was machine fabricated in zirconia and the resultant cut-back coping was layered with handstacked aluminous porcelain (**Figure 9c**). The definitive screw-retained implant crown is tried into the mouth for biomechanical and aesthetic evaluation and, pending patient and operator approval, may be definitively fitted (**Figures 10a-10c**).

#### Acknowledgements

The authors thank Glenn McEvoy and his team at Eurocast for the lab work seen in **Figures 5**, **7**, **8**, **9** and **10**. The authors also thank Damian O'Connor and his team at O'Connor Restorative for the lab work seen in **Figure 3**.

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# Digital dental records - friend or foe?

Digital record keeping has the potential to make dentists' lives easier, but it's important to be aware of the risks.

Record keeping is one of the most important aspects of dental care. Digital records can make record keeping easier; they allow integration into overall practice management and can lead to improvements both for clinicians and patients. However, they do carry certain risks.

There is a professional obligation to create records to document dental treatment that is provided to patients. There are a two of pieces of legislation that require practitioners to keep records. These are the Freedom of Information (FOI) Acts 1997 and 2003, and the Data Protection Acts 1988 and 2003, which are designed to work in tandem.

Good records should be a narrative of the treatment carried out and allow another party, or the clinician, to be able to understand the rationale behind the treatment that was carried out, as well as what was planned. Indeed, the Dental Council is very clear on what it expected: "9.1. You must keep accurate and up-to-date records for all your patients. You must keep these records in a safe place..."

Digital records can assist in these requirements, and during recent years there has been a considerable increase in the adoption of digital dental records in practice. The main benefit of digital records is that they are legible and the information is presented in a consistent manner, although this is often dictated by the choice of software. This consistency should improve patients' overall care and lead to a better patient experience within the practice.

Another useful feature of digital records is the ability to have other data included in the record, such as the appointment date and time, as well as cancelled and rearranged appointments; this can be useful to describe a patient's attendance pattern.

#### Some pitfalls

There is a tendency when digital records are used to rely solely on this as the record. It is important to realise that there are other pieces of information that form part of the record, such as laboratory dockets, clinical correspondence, and study models. It can be helpful if these other pieces of information can be scanned into the record to allow easy access and storage, provided the image is an accurate representation and can be stored in an unalterable format.

Another issue that is present with digital records is the use of abbreviations and codes that are software specific, the meaning of which may not be obviously apparent to an outside observer.

In addition, the recording of cavity shapes and restorations tends to be very similar, with no facility to elaborate on the actual size and shape of the



restoration. This can lead to problems if the records are examined for other purposes, such as forensic identification.

#### Oversight

When digital records are used it is very important to have an audit trail of all of the information contained within the record, as well as a robust system for backing up the data.

While it may well be possible to alter the records, it is important that no attempt is made to add or remove any item without making it very clear that it is an alteration. Changes made to digital records are very likely to be recoverable from the raw data even if the displayed record appears unaffected. The computer will record the date and username of all alterations to the file. Security of the data is paramount. Each user should have separate logon details, and data should only be entered when logged on with the individual's details.

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#### The use of templates

One of the real risks – that the quality of the data contained within the record can become compromised - stems from the use of automatic template notes. These are drawn up by practices or indeed included by the software providers for ease of use. However, the use of these templates needs careful consideration as they can in fact lead to a loss of accuracy in the record. Classic examples include:

- "Crown fitted and occlusion checked" when fitting a veneer; and,
- "...warned of risk of OAF" when extracting a lower tooth.

The use of templates can also lead to the record looking identical, particularly if pre-completed templates are used for procedures such as examinations or periodontal treatment. This can make it difficult for a dentist to state with certainty that this did indeed occur, and can have an adverse effect on the credibility of both the records and the dentist.

There is also a temptation to add the template note prior to the appointment or treatment of the patient. This can lead to problems if the note is not altered to reflect the discussions that occurred or even in some cases if the patient does not attend and the note is not deleted.

The use of automatic templates is not in itself a problem provided certain safeguards are in place. It is important to make sure that the entry accurately

reflects the treatment carried out and is not just a generic entry. Also, the templates should not be pre-populated with answers and space should be left to complete these in the template.

One other aspect that needs to be ensured is that the software can produce a hard copy print out of the complete and accurate record as well as a full audit trail of alterations if necessary. It is not uncommon for the software to print out an incomplete copy of the records, which can cause problems if these are requested by a regulator or solicitor.

Overall the use of computerised record-keeping systems can provide an opportunity to improve the quality of record keeping. They can lead to an improved patient experience and other benefits that come with greater integration with practice management systems, but care is needed to use them to their full potential.

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# A misunderstood city

Mehul Sundip Vithlani, a final year dental student at Queen's University Belfast, travelled home to Mwanza in Tanzania to shadow a local dentist.

#### **Diverse yet united**

Tanzania is Africa's second fastest developing country, and is home to around 57 million individuals of at least 125 different ethnic groups, making it a very diverse yet united republic. Despite being staffed by experienced professionals, the Tanzanian health system is often compared unfavourably by the public with systems such as the NHS in the UK, and indeed, for economic reasons, there are many drawbacks to the Tanzanian health system. The health sector cannot afford the equipment and resources that may be easily available elsewhere. Many Tanzanians, or at least the affluent, choose to travel abroad to have their annual health check-ups, medical treatments and dental treatments. There is a common misconception among the majority of the citizens that the dental work offered here is not up to standard.

#### Summer elective experience



Basic life support training in Mwanza.

During my summer holidays, I had the amazing opportunity to carry out work experience with Uniqueserve Dental Clinic in Mwanza. On my first day, I was welcomed by Dr Abed and his team of dentists and staff, and was given a tour of the clinic. I had previously carried out work experience there, before starting the BDS course four years ago. Now, as a final year student, I observed the clinic differently. This time I knew how a sterilisation room and surgery should be set up with appropriate zoning, and how the whole clinic works together in unison. I was surprised to see that most of the dental clinic was set up as per recommendations, which I did not expect due to the bad publicity circulated about Tanzanian dentistry.

During my two weeks there, I observed a range of dental treatments, including root canals, extractions, restorations and periodontal scaling, to name a few. Oral health among Tanzanians is very poor, with some patients brushing only once a day and others who smoke and chew tobacco frequently. Most of the treatments were therefore root canals and extractions. Having said this, Dr Abed and his team are always promoting preventive oral healthcare, which forms a huge part of their treatment plans. Observing treatments carried out by dentists with over 13 years' experience was truly overwhelming.

#### **Getting involved**

I was encouraged to make my suggestions regarding improvements for the clinic, and noted a few concepts that could be introduced. I was asked to run a first aid emergency course on basic life support, on which we get annual

training in Belfast, but which Uniqueserve has never had before. At first I was quite nervous, as I was about to lecture very experienced dentists. However, having honed the art of hiding my nerves as a dental student during terrifying exam situations, I built my courage to simply go on. I arranged a medical emergencies presentation, which was very well received by the staff, and the next day I taught the practical aspect under Dr Abed's supervision. I also introduced the use of alcohol gels outside clinics, the seven-step hand washing technique, and a sharps injury protocol, to add to the clinic's crossinfection policy. For myself, I could see and feel that over the two weeks I became more confident, more vocal about my ideas, and a good team leader.

#### 'Clinic on wheels...'

Five years ago, for my work experience in A Levels, I shadowed Bridge2aid, a non-governmental organisation. It was overwhelming to go out and witness the disparity that I have always heard of regarding healthcare in my country, but had never

experienced first hand. We travelled to locations miles away from the main cities, where a dental clinic is unheard of. Villagers are forced to travel to simply be offered an extraction. Bridge2aid gathers volunteer dentists from around the world to offer emergency treatments to such remote areas all over Tanzania – a 'clinic on wheels'.

My more recent trip showed me that there still exists a huge disparity between the rich and poor in Tanzania, regarding their dental health and the care they receive. Hence, Tanzanians overall still suffer from a wide range of oral health problems. Having said this, with the recent addition of Uniqueserve, and other small clinics like it, fewer patients opt to travel for their treatments.

This experience has been an eye-opener for me, and taught me a lot, and I will be ever thankful for the opportunity. Not only this, but I believe my team working skills, interpersonal skills and overall knowledge of dentistry has hugely been improved. Whatever I have learnt through this experience, I will carry forward into my final year and later as a dentist.

# Applied behavioural analysis principles in dentistry: techniques to overcome dental fear, improving attendance and compliance

Dental fear is a global, socially important health concern, impacting quality of life, psychological wellbeing, and oral and general health. Avoidance behaviour influences patients' attendance, with pain often the antecedent catalyst for accessing care.

Applied behaviour analysis (ABA) studies the application of the principles, methods, and procedures of the science of behaviour as applied systematically to improve socially significant behaviour.

Dental teams using behavioural assessment can assess dental fear, its aetiology and nature, to identify apprehensive patients. Dental fear should be acknowledged, discussed and evaluated. Effective communication increases patient satisfaction, co-operation and compliance, and reduces dental fear. Assess, advise, agree, assist, arrange. ABA strategies help patients to resolve dental fear through coping and increased self-efficacy, but require willing and motivated patients. Goals should be set, with patients' self-identified barriers removed.

Behaviour modification therapies aim to change undesirable behaviours through learning, behavioural and cognitive strategies. Cognitive behavioural therapy (CBT) techniques focus on thought and behavioural patterns to help patients identify unproductive or self-defeating thoughts, and is currently the most accepted and successful psychological treatment for anxiety and fear. Patients should be aided during treatment via coping to restructure perceptions of dental treatment with perceived control and predictability. Anxiety can affect memory, resulting in catastrophising and remembering increased pain after treatment.

Dental fear can be managed with behavioural and/or pharmacological intervention. It is worthwhile to convince patients via role induction to participate actively in treatment as this decreases pain perception, improves mood and focuses attention away from pain. Dentists benefit more from nonpharmacological approaches, resulting in highly satisfied patients and strong practices.

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#### Introduction

The purpose of this article is to outline the uses and importance of applied behaviour analysis (ABA) in dentistry. ABA studies the tactics derived from principles, methods, and procedures of the science of behaviour<sup>1</sup> when applied systematically to improve "socially important behaviours that have immediate and long lasting meaning"<sup>2</sup> for both patients and dental treatment providers. ABA has been used in a dental setting to reduce phobia and dental care-related fear and anxiety.<sup>3-5</sup> This article outlines strategies to reduce dental fear that are consistent with ABA principles. In this article, phobia, fear and anxiety in relation to dental care will be termed "dental fear". This article will outline the aetiology of dental fear, the benefits of behavioural assessment, and possible intervention strategies useful for the dental team in helping patients to cope. The target behaviour for patients is to engage with dental treatment.

#### Aetiology of dental fear

The development of dental fear is multifaceted. Beaton, Freeman and Humphris<sup>6</sup> outlined research evidence for mechanisms of acquiring dental fear as direct learning due to a traumatic dental experience (classical and operant behaviour – see below), vicarious experience or conditioning through others' experiences, verbal threat via the media and others, or inherited and personality traits. Carter *et al.*<sup>5</sup> also included cognitive content and cognitive biases as causes for dental fear, while acknowledging the need for research.

#### Conditioning

Dental fear may be classically conditioned by a previously neutral stimulus directly eliciting responses through pairing this with another unconditioned stimulus that elicits the same response. For example, an individual who experiences a painful procedure (and the unconditioned response of anxiety/fear) during a dental visit may acquire a conditioned association between the dentist (the conditioned stimulus) and anxiety/fear (the conditioned response). Re-presentation of the conditioned stimulus (the dentist or related stimuli) can elicit the conditioned response of anxiety during the patient's next dental visit.<sup>5</sup> When aversive stimuli are avoided, fear is reduced and avoidance behaviour is maintained; this is known as negative reinforcement.<sup>7</sup>

Operant conditioning is the procedure of presenting a reinforcing stimulus immediately following the occurrence of a given response. Conditioning is said to occur if and only if the response then increases in rate of occurrence, magnitude, or relative frequency, or decreases in latency as a consequence of the operation.<sup>2</sup>

Operant behaviour is selected, shaped and maintained by consequences from past behaviours. Reinforcement is stimulus change after a response increases the likelihood of a behaviour repeating in similar circumstances.<sup>2</sup>

#### Stimuli

Stimuli and responses to them represent continuous, ever-changing interaction between an organism and its environment.<sup>2</sup> Fear-inducing stimuli in dental care settings include lying back in the "chair, pain, anticipation or memory of pain, sight and sound of hand-pieces, and receiving local anaesthetics injections and environmental factors of lack of predictability and control, inability to escape or leave the dental setting".<sup>8</sup>



FIGURE 1: Vicious cycle of dental fear.9

#### Fear

Fear is a robust, distressing emotional response characterised by immediate physiological response, apprehension, dismay, escape and avoidance that may culminate in a 'panic attack'. Anxiety is a cognitive, negative and emotional response associated with thoughts and worries, for example regarding dental treatment.<sup>8</sup> Avoidance postpones or prevents stimuli; escape terminates ongoing stimuli.<sup>2</sup>

Dental phobia, known as odontophobia,<sup>5</sup> is a situation-specific, dental carerelated phobia. Dental fear is a global, socially important health concern impacting oral and general health, psychological well-being and quality of life for patients,<sup>8</sup> which increases avoidance behaviour.<sup>4</sup> Symptom-driven treatment exacerbates dental fear and anxiety, and perpetuates a vicious cycle of dental fear (**Figure 1**).<sup>9</sup> Dental fear is a distinct emotional state that influences how and when patients will access dental treatment.<sup>8</sup> Pain is often the catalyst for accessing treatment.<sup>4</sup>

#### **Dental fear**

The dental surgery is a unique environment.<sup>7</sup> Dentists are experts in oral healthcare. Patients are experts in their own lives, values, wishes, fears, and goals.<sup>10</sup>

The catalyst for seeking treatment is the stimulus of pain, the behaviour is attending for dental treatment, and the consequence is dental treatment for the relief of pain. This amounts to punishment by removal of a stimulus, or negative punishment in behavioural terms, which can lead to the preceding behaviour being reduced.<sup>2</sup> Response cost is when the future frequency of attending for dental treatment is reduced.<sup>2</sup> This can be mediated by combining response cost with positive reinforcement and reducing the likelihood of the dental team becoming a conditioned aversive stimulus and perpetuating avoidance.<sup>2</sup>

Stimuli within the dental environment can be determinants of dental pain, and patients do not see these enough to become accustomed to them, so the stimuli retain their novelty.<sup>7</sup> Reinforcing the respondent behaviour of attending for treatment by the dental team may give patients the opportunity for concept formation or cognitive restructuring to reduce avoidance and acquire control over their dental attendance and treatment.<sup>2,8</sup> If a dental fear-inducing stimulus is presented repeatedly, the magnitude and strength of the fear response may diminish via habituation,<sup>2,8</sup> which can occur if patients return for treatment. Convincing patients in pain, with dental fear, to return for treatment should be a priority for dental teams.<sup>8</sup>

#### Types of dental fear

Mowrer's two-factor theory<sup>11</sup> says that fear-inducing stimuli in the dental care setting act as conditioned stimuli, as they are present before the unconditioned stimulus that is painful, which results in the patient having a fearful reaction or unconditioned response. Neutral stimuli, paired with the painful stimuli, result in the fear response. Previous neutral stimuli (dental sights, sounds, smells) may elicit dental fear without any painful stimulus present. Dental fear is the conditioned response. When patients avoid the dental office, fear is reduced and avoidance behaviour is maintained.<sup>7</sup>

Davey<sup>12</sup> proposed that painful dental events do not always evoke future fear. A conditioned response is more difficult to establish if many positive experiences happen between a conditioned stimulus and an unconditioned stimulus. Patients who regularly attend the dentist and have positive experiences may take longer to associate the conditioned and unconditioned stimuli to produce a conditioned response. Associations can be made between unconditioned stimulus and conditioned response following painless treatments.<sup>7</sup>

Lethem<sup>13</sup> proposed that patients who avoid the dentist out of fear either cope with pain, or have a catastrophe response. Catastrophising leads to a cycle of avoidance and potential disability. Patients' evaluation of and response to pain is important. Patients may feel their heart rate increase during dental treatment because of physiological arousal, and believe that they could have a heart attack, thereby catastrophising dental treatment and initiating fear.<sup>7</sup> Catastrophising focuses on negative outcomes to predict pain. Catastrophising dental patients may worry excessively before treatment, which causes stress.<sup>8</sup>

Reiss and McNally's<sup>14</sup> expectancy model states that some patients expect the dental situation to elicit heart palpitations, embarrassment with reduced emotional control, or to be dangerous or threatening, which increases escape or avoidance behaviours. Avoidance is maintained through negative reinforcement; fear is reduced when avoiding the dentist and reducing fear increases avoidance. Patients with high levels of dental fear expect and experience more pain than patients with low dental fear. Patients remembered suffering more pain three months post treatment than immediately afterwards. This altered memory functions to reinforce avoidance.<sup>7</sup>

Hayes, Strosahl and Wilson<sup>15</sup> outlined acceptance and commitment therapy (ACT), which looks at how patients interact with their environment. Accepting things as they are and without judgement, rather than ideally, ACT may reduce reported pain and enhance emotional, social and physical functioning, as well as increasing patients' utilisation of services. Patients' increased awareness of physiological responses, without judgement or struggle, may increase coping and make patients more tolerant of dental procedures.<sup>7</sup>

#### Table 1: Strategies for managing patients with dental fear.

Strategy type	Strategy
Non-relaxation	Communication: listen, ask, assess, acknowledge and address
	Shaping: praise for attending, for complying and completing treatment
	Distraction: breath control, legs up, physical or mental distraction
	Stop signalling: the patient raises a hand if they need a break (increases control)
	Tell-show-do: increases predictability
	Modelling: seeing a sibling complying with treatment in children
	Flooding/implosion: repeatedly exposing patients to the conditioned stimulus until the conditioned response is
Quasi relavation	
Quasi-relaxation	Biofoodback
	Acupuncture
Relaxation	Formal progressive muscle relaxation
	Computer-assisted relaxation learning
	Modified systematic desensitisation
	Hypnosis: used for somatic and cognitive anxiety
	Cognitive behavioural therapy – psychotherapeutic
Pharmacological	Inhalation sedation: nitrous oxide
	Oral sedation: benzodiazepine
	IV sedation
	General anaesthetic

#### Behavioural assessment

Behavioural assessment,<sup>1</sup> as part of a dental examination, will enable the planning, implementation and evaluation of intervention strategies aimed at reducing dental fear during treatment and habilitation. Habilitation is the change in patients' repertoire to maximise reinforcement and minimise punishment.<sup>2</sup> Habilitation can include cognitive, social, fine motor, gross motor, or other skills that contribute to mobility, communication, and performance of activities of daily living and enhance quality of life. For example, equipping patients (e.g., children) with skills for good oral health will help them to obtain reinforcement about how well their teeth look, and increase the likelihood that they will be praised, for example by their dentist, when they go for future check-ups.

#### Fear assessment

Dental care professionals using behavioural assessment with effective listening<sup>16</sup> can assess dental fear in a comprehensive manner to identify its aetiology, nature and associated components,<sup>17</sup> and understand the patient's experience, thereby reducing anxiety and aversive states.<sup>4,8</sup> Apprehensive patients should be identified and their worries discussed. Dental fear should be acknowledged, discussed and evaluated. Patients with dental fear often see dental treatment as "potentially dangerous, uncontrollable, unpredictable and disgusting".<sup>18</sup> Evaluation though interviewing, self-reporting on fear and

anxiety scales, as well as objective assessment of blood pressure, pulse rate, pulse oximetry, finger temperature, and galvanic skin response, can aid the categorisation of dental fear.<sup>3</sup> When a patient presents for treatment, they should be positively reinforced<sup>19</sup> for seeking help, not criticised for their current oral health status.<sup>4</sup> Reassurance, though well intentioned, can dismiss patient worries or complaints. Instead, communication that reflects attention, politeness, empathy and respect can facilitate dental care. Effective communication can increase patient satisfaction, co-operation and compliance, and reduce patients' dental fear.<sup>11</sup>

#### Stress response and coping

Primary appraisal is the assessment of events in the environment and secondary appraisal is a person's assessment of their own ability to cope with those events. Acknowledging that the stress response activates secondary appraisal, allowing patients an outlet for the expression of stress, protective factors can be initiated, coping mechanisms instigated and stress reduced.<sup>20</sup> The dental team can positively frame the treatment process and instigate coping.<sup>8</sup> Coping can be emotion focused, problem focused or passive.<sup>7</sup> Individuals' coping styles will affect how they respond.

Emotion-focused coping may reduce negative emotions such as dental fear when stress is uncontrollable, such as during treatment, but may delay dealing with problems.<sup>21</sup> This can be particularly relevant for the personality type known as 'blunters'.<sup>22,23</sup> 'Blunters' (who require very little expansion of explanations) prefer less information during treatment.<sup>9</sup> Problem-focused coping targets the causes of stress practically, dealing with the stressors and thereby reducing stress via problem solving. Problem-focused coping has limited use in uncontrollable situations such as dental treatment, but is useful for oral health preventive behaviour.<sup>21</sup> Those who fall into the 'monitors' personality type are relevant here. They are information seekers who like detailed descriptions of treatment, are more informed and have high expectations.<sup>10</sup> Lack of control can be a stressor; control can buffer stress, and those with an internal locus of control cope better.<sup>24</sup>

#### ABA in the dental setting

Dental treatment to remove the stimulus pain can be construed as negative punishment.<sup>1</sup> This reduces the likelihood of dental attendance in future as punishment decreases the future frequency of behaviour. Behaviour replacement strategies should be implemented for positive reinforcement of the stimuli that are contingent on behaviour.<sup>2</sup>

ABA strategies allow patients to reduce and unlearn their fears, and to resolve dental fears through coping to facilitate dental care.<sup>4</sup> These strategies increase patients' self-efficacy,<sup>25</sup> and increase attendance and acceptance of dental care plans, but require patients who are willing and motivated to participate. Goals should be set with patients, with patients' self-identified barriers to treatment removed. Practitioners should assess, advise, agree, assist, and arrange.<sup>26</sup> Careful choice of language should be used to describe sensations in a non-threatening manner.<sup>4</sup>

#### Behaviour

Appukuttan,<sup>3</sup> Botto *et al.*,<sup>4</sup> Carter *et al.*,<sup>5</sup> and McNeil *et al.*<sup>7</sup> provide information on many strategies with operant conditioning for managing patients with dental fear. Behaviour modification therapies aim to change undesired behaviours through learning behavioural and cognitive strategies (**Table 1**).

#### Cognitive

Cognitive strategies aim to alter and restructure the content of negative cognitions to enhance control over negative thoughts. Cognitive behavioural therapy (CBT) is a combination of behaviour therapy and cognitive therapy, which uses techniques focused on thought and behavioral patterns to help patients identify unproductive or self-defeating thoughts. CBT is currently the most accepted and successful psychological treatment for anxiety and fear.<sup>3</sup> Concept formation can restructure a patient's thoughts regarding sensations experienced during treatment and is a complex example of stimulus control.<sup>2</sup> Cognitive processing relates to the dental experience and the expression of pain, and patients should be aided during treatment to use coping strategies with a positive, proactive approach to pain management. Catastrophising and memories of increased pain are common aspects of treatment after the event. Cognition establishes, maintains and alters memories of dental pain and perception of the dental treatment experience, and is important, as anxiety and fear affect memory and are joined in a single construct within memories over time. Dentistry can be perceived as uncomfortable, intimidating or repulsive.<sup>8</sup> Controllability is the patients' ability to control the beginning, end, duration and intensity of the dental treatment experience. Actual control is when a response changes the experience, such as the patient raising a hand to take a break. Perceived control refers to the belief of the patient that they are in control. Giving control to patients or increasing perceived control can increase pain tolerance. Predictability during treatment, or the use of tell-show-do, can aid patients in coping.<sup>7</sup> Tell-show-do is a systematic explanation to patients of what you will do, following by showing them what you will do, how you will do it and what you will use, then doing the proposed treatment, thus increasing predictability and aiding coping.<sup>27</sup>

#### Pharmacological options

Dental fear can be managed with behavioural interventions, pharmacological interventions, or a combination of both, depending on the level of dental fear, patient characteristics, and clinical situations. Interventions are either behaviourally or cognitively oriented. Pharmacological management can be achieved with sedation or general anaesthesia. If a patient is not able to respond to and co-operate well with behavioural interventions, is not willing to undergo these types of treatment, or has extreme fear, then pharmacological treatment should be sought.<sup>2</sup>

#### Conclusion

In conclusion, dental fear is a problem for many dental patients. Patients want to be involved in their care.<sup>28</sup> There are many ways dental fear can manifest within patients. Dentists have a responsibility to reduce dental fear. When an anxious patient presents in pain for treatment, dentists have an opportunity to initiate a behaviour change, increase patients' repertoire<sup>2</sup> by allowing them to engage with treatment and to cope with intervention via reinforcement of alternate behaviours. This will facilitate future dental treatment and better oral health. Better understanding of dental fear from dental practitioners, with use of applied behavioural modification, may prevent future dental avoidance.<sup>6</sup>

A calm manner, giving reassurance, listening to patients, and informing them while encouraging active participation influence patient satisfaction.<sup>10</sup> Patients have been conditioned to take a passive role and to comply. Role induction can convince patients to participate actively in their treatment,<sup>10</sup> as this decreases pain perception, improves mood and focuses attention away from pain. Role

induction is regarding the roles of patients and providers as listeners and speakers, as many patients have been conditioned not to speak but to be silent passive receivers of care as determined by the team.

As a last resort, patients can be managed using sedation or general anaesthesia if they are unable to use psychotherapeutic interventions, are not willing to undergo these types of treatments, or are too dental phobic.<sup>3</sup> Dentists benefit more from non-pharmacological approaches as they result in highly satisfied patients and strong practices.<sup>4</sup>

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# The conventional inferior alveolar nerve block: is there a more predictable alternative?

**Précis:** The intra-osseous technique and buccal infiltration with articaine are effective alternative methods to the conventional inferior alveolar nerve block for achieving mandibular pulpal anaesthesia.

#### Abstract

Statement of the problem: The conventional inferior alveolar nerve block is considered the gold standard technique for achieving mandibular pulpal anaesthesia. This technique is considered to be technically challenging, with significant failure rates. Other alternative techniques may be more effective, and easier to administer.

Purpose of the study: The aim of this review was to investigate whether or not new local anaesthetic techniques have lessened the need for the conventional inferior alveolar nerve block.

Materials and methods: A review of the literature was conducted by completing an electronic search on PubMed using key words "local anaesthesia", "mandible" and "success rates", populating a list of articles for analysis. Key papers and books that were unavailable electronically were also manually searched to ensure a comprehensive overview. The different techniques were then compared under several headings including success rates, anaesthesia onset times and complications.

Results: There are several randomised controlled trials (RCTs) evaluating the primary methods of achieving pulpal anaesthesia in the mandible. The heterogeneity of the literature makes it difficult to conduct a systematic review and meta-analysis on the topic. The RCTs available are of a IIb evidence base, due to small sample sizes, according to the Oxford Centre for Evidence-Based Medicine, and consequentially grade "B" recommendations may be made for clinical practice. The literature describes how the intra-osseous and buccal infiltration techniques have superior success rates and onset times, in combination with less discomfort and fewer complications, than the alternatives available.

**Conclusion:** Further investigations into local anaesthetic efficacy would benefit from the introduction of standardised testing methods, reducing heterogeneity of the literature. The intra-osseous technique and buccal infiltration with 4% articaine are effective alternative methods to the inferior alveolar nerve block for achieving mandibular pulpal anaesthesia.

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	Table 1: Conventional inferior alveolar nerve block success rates.					
Author(s)	Study type	Local anaesthesia	Outcome measure	Tooth tested and pulp status	Sample size	Success rate
Goldberg <i>et al.</i> , 2008 <sup>6</sup>	Prospective RCT	3.6mL 2% lignocaine with 1:100,000 epinephrine	EPT	First permanent molar (FPM) Normal	40	53%
Jung <i>et al.</i> , 2008 <sup>7</sup>	Prospective, double-blind RCT	1.7mL 4% articaine with 1:100,000 epinephrine	EPT	FPM Normal	35	43%
Kannaa <i>et al.</i> , 2006 <sup>8</sup>	Prospective, double-blind RCT	2.0mL 2% lidocaine with 1:80,000 epinephrine	EPT	FPM Normal	31	55.6%
Mikesell <i>et al.</i> , 2005 <sup>9</sup>	Prospective, RCT double-blind	4% articaine with 1:100,000 epinephrine	EPT	FPM Normal	40	53%
Aggarwal <i>et al.</i> , 2010 <sup>10</sup>	Prospective, double-blind RCT	2% lidocaine with 1:100,000 epinephrine	VAS	"Mandibular molars" Irreversibly inflamed	97	36%
Remmers <i>et al.</i> , 2008 <sup>11</sup>	RCT	1.8mL lidocaine with 1:100,000 epinephrine	VAS	"Mandibular molars" Irreversibly inflamed	15	60%
Claffey <i>et al.</i> , 2004 <sup>12</sup>	Prospective, double-blind RCT	4% Articaine with 1:100,000 epinephrine 2% lidocaine with 1:100,000 epinephrine	VAS	"Mandibular posterior tooth" Irreversibly inflamed	72	24% 23%
Monteiro <i>et al.,</i> 2015 <sup>13</sup>	Prospective RCT	1.8mL 2% lidocaine with 1:100,000 epinephrine	VAS	"Mandibular first and second molar teeth" Irreversible pulpitis	50	10%
Zain <i>et al.</i> , 2016 <sup>14</sup>	Prospective RCT	2% lidocaine with 1:100,000 epinephrine	VAS	FPM Irreversible pulpitis	156	62.8%

#### Introduction

Local anaesthesia is defined as "a loss of sensation in a circumscribed area of the body by a depression of excitation in nerve endings or an inhibition of the conduction process in peripheral nerves".<sup>1</sup> Successful local anaesthesia is essential for dental treatment with patients rating a dentist "who does not hurt" and one who can give "painless injections" as the second and first most important criteria in their evaluation.<sup>2</sup>

The local anaesthetics used in dentistry are all amphipathic, possessing lipophilic and hydrophilic characteristics, and their classification is based upon their amide or ester linkages.<sup>3</sup> The aim of local anaesthesia is to interfere with the propagation of action potentials by decreasing the rate of rise of the depolarising phase.<sup>3</sup> The two factors involved in the action of a local anaesthetic are diffusion of the drug through the nerve sheath, and binding at the receptor site in the ion channel.<sup>3</sup> The lipophilic portion of the anaesthetic is responsible for diffusion through the cell membrane. Once in the axoplasm, the anaesthetic binds to the receptor site on the sodium ion channel in its charged form, producing anaesthesia.<sup>4</sup>

The conventional inferior alveolar nerve block (IANB) is the most commonly used technique to achieve mandibular pulpal anaesthesia.<sup>5,6</sup> This technique is considered to be technically challenging, with significant failure rates.<sup>6-14</sup> Other alternative techniques may be more effective, and easier to administer. The introduction of new local anaesthetics, local anaesthetic techniques and local anaesthetic delivery systems may indicate that clinicians are no longer complying with the best evidence-based practice. The purpose of this review is to investigate whether or not new local anaesthetic techniques have lessened the need for the conventional IANB.

#### Materials and methods

A review of the literature was conducted by completing an electronic search on

PubMed using key words "local anaesthesia", "mandible" and "success rates", populating a list of articles for analysis. Key papers and books that were unavailable electronically were also manually searched to ensure a comprehensive overview. There are several different techniques available to achieve primary anaesthesia in the mandible including: the conventional IANB; the Gow-Gates nerve block (GGNB); the Akinosi-Vazirani nerve block (AVNB); the intra-osseous (IO) technique; the intra-ligamentary (IL) technique; and, buccal infiltration (BI). Each of these respective techniques exhibits unique success rates, onset times and associated complications.

Direct comparison of the success rates of each technique is difficult due to the heterogeneity of the literature and the interpretation of "anaesthetic success" differing between researchers. Each of the following variables must be taken into account when comparing techniques: anaesthetic volume; anaesthetic type; pulpal status; the tooth chosen to anaesthetise; outcome measures; and, anaesthetic delivery systems. For instance, some studies chose to anaesthetise healthy first permanent molar pulps while others tested inflamed pulps. From the literature, most investigators consider two consecutive negative electric pulp test (EPT) readings at 80 as an appropriate method of testing anaesthesia.<sup>6,7,9,15-19</sup> The success rates of each technique are outlined throughout **Tables 1-6**.

#### Results

#### The conventional inferior alveolar nerve block

The IANB, first described by William Steward Halsted in 1884, is the most frequently utilised technique to provide mandibular anaesthesia.<sup>5,6</sup>

- The indications for an IANB are:
- 1. Procedures in either one or multiple mandibular teeth in one quadrant.
- 2. Procedures anterior to the mental foramen involving the periodontium.
- 3. Procedures involving the lingual periodontal tissues.<sup>20</sup>

Table 2: Gow-Gates herve block success fates.						
Author(s)	Study type	Local anaesthesia	Outcome measure	Tooth tested and pulp status	Sample size	Success rate
Goldburg <i>et al.</i> , 2008 <sup>6</sup>	Prospective RCT	3.6mL 2% lignocaine with 1:100,000 epinephrine	EPT	FPM Normal	40	38%
Hung et al., 2006 <sup>25</sup>	Prospective RCT	2.7mL 2% lidocaine with 1:100,000 epinephrine	EPT	FPM Normal	162	83.9%
Click <i>et al.</i> , 2015 <sup>26</sup>	Prospective RCT	3.6mL 2% lidocaine with 1:100,000 epinephrine	VAS	"Mandibular posterior teeth" Irreversible pulpitis	125	35%
Aggarwal <i>et al.</i> , 2010 <sup>10</sup>	Prospective, double-blind RCT	2% lidocaine with 1:100,000 epinephrine	VAS	"Mandibular molars" Irreversible pulpitis	97	52%
Sherman <i>et al.,</i> 2008 <sup>27</sup>	Prospective, double-blind RCT	2% lidocaine with 1:100,000 epinephrine 4% articaine with 1:100,000 epinephrine	VAS	"Mandibular posterior teeth" Irreversible pulpitis	40	87.5% 87.5%
Kohler <i>et al.,</i> 2008 <sup>28</sup>	Prospective RCT	1.8mL 2% lidocaine with 1:100,000 epinephrine 3.6mL 2% lidocaine with 1:100,000 epinephrine	VAS	"Mandibular posterior teeth" Normal	32	12.5% 87.5%

Table 2: Gow-Gates nerve block success rates.<sup>6,10,25-28</sup>

The IANB is administered by holding the barrel of the syringe over the premolars on the contralateral side to the side intended to anaesthetise. The needle is inserted lateral to the pterygomandibular raphe, to approximately 11mm above the height of the occlusal plane. The needle is forwarded in this plane to approximately 20-25mm depth.<sup>3</sup> There are conflicting opinions in the literature as to whether or not a bony end point is required at the end of needle insertion. Some authors describe how a bony end point at 20-25mm confirms that the location of anaesthetic delivery is correct. Other authors suggest that this may be a potential cause of postoperative pain via tearing of the periosteum overlying the bone, with subsequent inflammation. Furthermore, the potential for needle blunting and even breakage is increased in doing so.  $^{\ensuremath{\text{21}}}$ Once the clinician is in the correct position the syringe should be aspirated to ensure that they have not penetrated a blood vessel. The dentist then delivers the anaesthetic just superior to the tip of the lingula, ensuring close proximity to the inferior alveolar nerve.<sup>3</sup> A successful direct IANB anaesthetises all mandibular teeth, the epithelium of the anterior two-thirds of the tongue, all lingual gingivae and lingual mucosa, all buccal gingivae and mucosa between the premolars and the midline, and the skin of the lower lip.<sup>22</sup>

The IANB was shown to have a success rate between 43% and 55.6% on healthy first permanent molar pulps using two consecutive EPT readings as an outcome measure.<sup>6-9</sup> Other studies using a subjective outcome measure such as the visual analogue scale (VAS), or that anaesthetised inflamed molar teeth, had success rates between 10% and 60%.<sup>10-14</sup> The results of these studies are outlined in more detail in **Table 1**.

#### The Gow-Gates nerve block

The Gow-Gates technique was first described in 1973.<sup>23</sup> The GGNB delivers anaesthetic to the neck of the condyle with the aim of achieving close proximity to the mandibular branch of the trigeminal nerve as it exits the foramen ovale.

The indications for the GGNB are:

1. As per IANB indications.

2. If there is a history of IANB failure, anatomical variability or evidence of accessory innervation.  $^{\rm 20}$ 

With this technique, the syringe is aligned parallel to an imaginary line drawn between the intertragic notch and the commissure of the mouth. Intra-orally, the external oblique ridge of the anterior surface of the ramus is located and the thumb is moved superiorly until the coronoid process is palpated. The barrel of the syringe should be over the contralateral premolars. The needle is inserted just medial to the attachment of the temporalis muscle and advanced until the condyle is reached at 25mm depth. The syringe is retracted 1mm and anaesthetic is given, pending negative aspiration.<sup>24</sup> A wide opening is essential for success, concomitant with staying open for 20 seconds post injection to keep the IAN close to the injection site.<sup>22</sup>

A successful GGNB will anaesthetise the IAN in combination with the buccal nerve, the mylohyoid nerve and the auriculotemporal nerve. This may resolve concerns regarding accessory innervation of the dentition, and will also anaesthetise the buccal gingivae of the mandibular molars without the need for a separate buccal nerve block.<sup>22</sup>

The GGNB was shown to have a success rate between 38% and 83.9% on healthy first permanent molar pulps using two consecutive EPT readings as an outcome measure.<sup>6,25</sup> Other studies using the VAS, or that anaesthetised inflamed molar teeth, had success rates between 12.5% and 87.5%.<sup>10,26-28</sup> The results of these studies are outlined in more detail in **Table 2**.

#### The Akinosi-Vazirani nerve block

The AVNB was introduced independently by two dentists. The block was initially published by Vazirani in 1960 but was brought to the attention of educators by Akinosi in 1977.<sup>29,30</sup>

The indications for the AVNB are:

- 1. As per GGNB indications.
- 2. The presence of trismus.
- 3. Difficulty seeing intra-oral landmarks for an IANB.
- 4. Macroglossia.<sup>20,22</sup>

This technique is unique in that the patient has their mouth closed throughout. Intra-orally, the external oblique ridge of the ascending ramus is palpated. The thumb is then moved superiorly to the coronoid process. Lateromedially, the point of insertion of the needle is lateral to the maxillary tuberosity and medial

Table 3: Akinosi-Vazirani nerve block success rates.         biological						
Author(s)	Study	Local	Outcome	Tooth tested	Sample	Success
	type	anaesthesia	measure	and pulp status	size	rate
Goldberg <i>et al.,</i> 2008 <sup>6</sup>	Prospective RCT	3.6mL 2% lidocaine with 1:100,000 epinephrine	EPT	FPM Normal	40	27%
Aggarwal <i>et al.</i> , 2010 <sup>10</sup>	Prospective, double-blind RCT	2% lidocaine with 1:100,000 epinephrine	VAS	"Mandibular molars" Irreversible pulpitis	97	41%
Click <i>et al.</i> , 2015 <sup>26</sup>	Prospective RCT	2% lidocaine with 1:100,000 epinephrine	VAS	"Mandibular posterior teeth" Irreversible pulpitis	125	16%

Table 4: Intra-osseous	technique success	rates. 11,15,17-19,37,38
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Author(s)	Study type	Local anaesthesia	Outcome measure	Tooth tested and pulp status	Sample size	Success rate
Coggins <i>et al.</i> , 1996 <sup>17</sup>	Prospective RCT	1.8mL 2% lidocaine with 1:100,000 epinephrine	EPT	FPM Normal	40	75%
Replogle <i>et al.</i> , 1997 <sup>15</sup>	Prospective, double-blind RCT	1.8mL 2% lidocaine with 1:100,000 epinephrine 1.8mL 3% mepivacaine	EPT	FPM Normal	42	74% 45%
Chamberlain et al., 1997 <sup>18</sup>	Prospective clinical trial	1.5mL 2% lidocaine with 1:100,000 epinephrine	EPT	FPM Normal	20	95%
Gallatin <i>et al.</i> , 2003 <sup>19</sup>	Prospective RCT	2% lidocaine with 1:100,000 epinephrine	EPT	FPM Normal	41	93%
Jensen <i>et al.</i> , 2008 <sup>37</sup>	Prospective, single-blind RCT	1.4mL lidocaine with 1:100,000 epinephrine	EPT	FPM Normal	55	100%
Remmers <i>et al.</i> , 2008 <sup>11</sup>	Prospective RCT	1.8mL lidocaine with 1:100,000 epinephrine	VAS	FPM Irreversible pulpitis	15	87%
Cabasse <i>et al.</i> , 2015 <sup>38</sup>	Prospective RCT	4% articaine with 1:200,000 epinephrine	EPT	FPM (molar incisor hypomineralisarion; MIH) Normal	32	93.5%

to the coronoid process. Superoinferiorly, the point of insertion is at the height of the mucogingival junction of the maxillary teeth. The needle is advanced 25mm, being mindful to stay parallel to the maxillary occlusal plane, and anaesthetic is delivered post negative aspiration. There is no contact with bony landmarks.<sup>20,29,30</sup> A successful AVNB will anaesthetise the IAN in combination with the lingual, mylohyoid and buccal nerves.<sup>22</sup>

The AVNB was shown to have a success rate of 27% on healthy first permanent molar pulps using two consecutive EPT readings as an outcome measure.<sup>6</sup> Other studies using the VAS, or that anaesthetised inflamed molar teeth, had success rates between 16% and 41%.<sup>10,26</sup> The details of these studies are outlined in **Table 3**.

#### The intra-osseous technique

A variant of the IO technique was first published in 1910.<sup>31</sup> A number of specialised devices such as the Stabident system, X-Tip and the IntraFlow, have since been introduced to aid IO injections.<sup>32</sup> The IO technique is performed by creating a small perforation into the thick cortical plate of the mandible and providing a route of access to the cancellous bone beneath, and hence to the nerve supply of the dentition.<sup>33</sup>

The IO technique may be used to anaesthetise one or more teeth in the arch depending on the injection site and the amount of anaesthetic used.<sup>34</sup> After applying topical anaesthesia, the area intended to work on is anaesthetised with 0.2mL local anaesthetic for 50-60 seconds prior to perforating the cortical bone.<sup>35</sup> The perforation site should be located distal to the tooth being treated.<sup>3</sup> The point of perforation is 2mm below the intersection of a line

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running vertically from the bisection of the interdental papilla and a horizontal line running along the buccal gingival margins of the teeth. At this intersection a specialised delivery system is used to gain access to the cancellous bone. A sudden loss of resistance during perforation indicates penetration of the cortical bone to the desired location.<sup>36</sup> The anaesthetic is then delivered through the hole created in the bone, anaesthetising the tooth of interest and the teeth mesial and distal to that tooth in most cases.<sup>15</sup>

The IO technique was shown to have a success rate between 45% and 100% on healthy first permanent molar pulps using two consecutive EPT readings as an outcome measure.<sup>15,17-19,37</sup> Other studies using the VAS, or that had other variables as described in **Table 4**, showed success rates between 87% and 93.5%.<sup>11,37,38</sup> A meta-analysis published in 2003 investigated the efficacy of the IO technique and concluded that it was a suitable primary method to achieve mandibular pulpal anaesthesia.<sup>39</sup> Several RCTs executed since then have also drawn the same conclusion, as shown in **Table 4**.

#### The intra-ligamentary technique

The IL injection is based upon the ability of the anaesthetic to reach the apex of a tooth via small perforations in the socket wall when delivered into the periodontal ligament.<sup>40</sup> This technique regained popularity in the 1970s in conjunction with the advent of new delivery systems such as high-pressure dental syringes.<sup>3</sup> Today, there are computer-aided devices such as the Wand handpiece and the STA system, which help control injection rate and pressure.<sup>41,42</sup> However, the choice of syringe does not affect efficacy of anaesthesia.<sup>43</sup>

Table 5: Intra-ligamentary technique success rates.						
Author(s)	Study type	Local anaesthesia	Outcome measure	Tooth tested and pulp status	Sample size	Success rate
White <i>et al.</i> , 1988 <sup>46</sup>	Comparative study	2% lidocaine with 1:100,000 epinephrine	EPT	FPM Normal	40	79%
Edwards and Head 1989 <sup>47</sup>	Prospective RCT	0.8mL lidocaine with 1:100,000 epinephrine	EPT	FPM Normal	28	79%
Berlin <i>et al.</i> , 2005 <sup>48</sup>	Prospective, double-blind RCT	2% lidocaine with 1:100,000 epinephrine 4% articaine with 1:100,000 epinephrine	EPT	FPM Normal	51	74% 86%

#### Table 6: Buccal infiltration technique success rates.<sup>7,13,14,16,55-57</sup>

Author(s)	Study type	Local anaesthesia	Outcome measure	Tooth tested and pulp status	Sample size	Success rate
Meechan <i>et al.</i> , 2006 <sup>55</sup>	Prospective, double-blind RCT	2% Lidocaine with 1:100,000 epinephrine	EPT	FPM Normal	31	38.7%
Robertson et al., 2007 <sup>16</sup>	Prospective, double-blind RCT	2% lidocaine with 1:100,000 epinephrine 4% articaine with 1:100,000 epinephrine	EPT	FPM Normal	60	57% 87%
Jung <i>et al.,</i> 2008 <sup>7</sup>	Prospective RCT	1.7mL 4% articaine with 1:100,000 epinephrine	EPT	FPM Normal	35	54%
Corbett <i>et al.</i> , 2008 <sup>56</sup>	Prospective RCT	1.8mL 4% articaine with 1:100,000 epinephrine	EPT	FPM Normal	31	64.5%
Kwon <i>et al.</i> , 2014 <sup>57</sup>	Prospective RCT	1.7mL 4% articaine with 1:100,000 epinephrine	EPT	FPM Normal	29	62.1%
Monteiro <i>et al.</i> , 2015 <sup>13</sup>	Prospective RCT	1.8mmL 4% articaine with 1:100,000 epinephrine	VAS	"First and second mandibular molars" Irreversible inflammation	50 1	40%
Zain <i>et al.</i> , 2016 <sup>14</sup>	Prospective RCT	4% articaine with 1:100,000 epinephrine	VAS	FPM Irreversible inflammation	156	76.9%

To perform the technique, the needle is inserted at 30 degrees to the long axis of the tooth at the mesio-buccal aspect of the roots.<sup>36</sup> The needle is advanced until it is wedged between the tooth and crestal bone.<sup>44</sup> The amount of solution required is minimal at 0.2mL per root.<sup>3</sup> The most critical factor to success is that this technique is performed against resistance.<sup>45</sup> The IL technique was shown to have a success rate between 74% and 86% on healthy first permanent molar pulps using two consecutive EPT readings as an outcome measure.<sup>46-48</sup> A meta-analysis published in 2014 concluded

that the IL technique was neither superior nor inferior to the IANB and reported methodological flaws in the literature.<sup>49</sup> One prospective, doubleblind RCT has been published since then, the details of which are mentioned in **Table 5**.

#### Mandibular buccal infiltrations

Traditionally, BIs in the mandible have been disregarded, as practitioners believed the dense cortical bone prevents the dissolution of anaesthetic to the IAN.<sup>50</sup> However, there has been a renewed interest in this technique since the legalisation of articaine in the UK and US in 1999 and 2000, respectively.

Articaine has a unique chemical structure, being the only amide analgesic to contain an ester group. It also contains a thiophene ring, making it more lipophilic and potent.<sup>51</sup> This allows articaine to diffuse more readily through both hard and soft tissue.<sup>52</sup> Several RCTs have shown statistically significant differences between the success rates of using articaine 4% with epinephrine 1:100,000 versus lidocaine 2% with epinephrine 1:100,000 or 1:80,000 to achieve anaesthesia in mandibular molars with BI.<sup>16,53,54</sup>

**Table 6** outlines how the BI technique was shown to have a success rate between 38.7% and 87% on healthy first permanent molar pulps using two consecutive EPT readings as an outcome measure.<sup>7,16,55-59</sup> The less successful outcomes are reported from studies using 2% lidocaine as a local anaesthetic agent.<sup>55</sup> Those using 4% articaine showed success rates between 54% and 87%.<sup>7,13-15,56,57</sup> One recent systematic review comparing BI with articaine to an IANB with lidocaine to achieve mandibular pulpal anaesthesia concluded that they had similar outcomes.<sup>58</sup>

The success rates listed in **Table 6** reflect BI as a primary method of achieving anaesthesia in the mandible. There is a plethora of research, including a systematic review and meta-analysis, investigating BI with articaine as an adjunct to an IANB with lidocaine, showing greater success rates with a longer duration of anaesthesia.<sup>59,60</sup>

#### Local anaesthesia onset rates

Rapid onset of anaesthesia is desirable due to time constraints in practice. The location of anaesthetic delivery differs between techniques and the onset of pulpal anaesthesia varies per technique as a result of this. Regarding the IANB, the anterior teeth have a slower onset of anaesthesia than the posterior teeth and lip numbness often precedes pulpal anaesthesia.

In certain cases, the pulp may not be anaesthetised despite having an anaesthetised lip.<sup>61</sup> The clinician uses lip anaesthesia as a guide for IANB efficacy, which may not represent pulpal anaesthesia. Combining the IANB with a BI or IO injection provides profound anaesthesia, helping to prevent the misjudgement of pulpal anaesthesia onset.<sup>59,60,62</sup>

#### Table 7: Cost of local anaesthesia and equipment.

Product	Cost
2% lignospan with 1:100,000 epinephrine	€21.90 (50 cartridges) – €0.488 per cartridge
4% articaine with 1:100,000 epinephrine	€25.60 (50 cartridges) – €0.512 per cartridge
Septoject needles	€12 (100 needles of same gauge)
X-Tip (intra-osseous)	€52 for starter kit (10 needles, 10 guide sleeves, instruction card and video)
	€185 (50 needles and 50 guide sleeves)
Stabident (intra-osseous)	€135 (100 perforators and 100 needles)
Intraflow (intra-osseous)	€500 (device cost)
The Wand handpiece	€2,650 (device cost)

The onset of anaesthesia using the IO and IL techniques is rapid. The IL injection produces immediate pulpal anaesthesia, while onset using the IO technique ranges from 10 to 120 seconds.<sup>35,43,45</sup> BI provides an onset of pulpal anaesthesia between 4.2 and 4.7 minutes.<sup>16</sup> The IANB produces pulpal anaesthesia from nine minutes in the first permanent molar to 19 minutes in the central incisor.<sup>63</sup> There is conflicting evidence in the literature regarding the onset of anaesthesia using the GGNB and AVNB, with reports of performance worse than and equal to that of the IANB.<sup>6,20,64</sup>

#### Complications associated with the techniques available

All the aforementioned techniques demonstrate potential risks and complications. A common complication associated with the IANB is failure to achieve pulpal anaesthesia. There are many reasons for this including bifid mandibular canals, crossinnervation of the anterior mandibular teeth, accessory innervation by the mylohyoid nerve, infection, or due to the central core theory.<sup>65-69</sup> Moreover, the technique is challenging, especially if the intraoral landmarks are poor.<sup>70</sup>

There are other complications associated with IANBs such as dental needle breaks, with one case series reporting 65 broken needles over a ten-year period.<sup>71</sup> Furthermore, the highest positive aspiration rate of all intraoral injection techniques has been reported with the IANB, ranging from 10-15%.<sup>72</sup> Post-injection discomfort may occur with an IANB with or without trismus due to the development of a small haematoma in the medial pterygoid muscle.<sup>73</sup>

The most common neurological complication following an IANB is due to injection into the parotid gland, anaesthetising the facial nerve and resulting in a transient nerve palsy.<sup>74</sup> There is also a risk of permanent nerve injury with an IANB, somewhere between 1 in 20,000 and 1 in 850,000, with the lingual nerve most commonly affected.<sup>75</sup> Nerve blocks may cause permanent injury independent of the anaesthetic used, due to direct trauma to the nerve on insertion.<sup>76</sup> There are conflicting opinions in the literature regarding the potential neurotoxicity of articaine if given as an IANB. One meta-analysis concluded that there was no increased incidence of adverse events when comparing articaine to lidocaine in IANB.<sup>77-83</sup> Another author established that the IANB may cause nerve injury using any local anaesthetic and reported that of those who incurred injury, 25% of cases were associated with lidocaine, 33% with articaine and 34% with prilocaine.<sup>84</sup> The literature describes how delivering an IANB using articaine does not improve the technique's success rate compared to lidocaine, and given the perceived additional risk, there is no

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benefit in doing so.<sup>12,78,85</sup> Clinicians should be acutely aware of this as the potential negative sequelae associated with permanent nerve injury are significant, both psychologically and in function.<sup>86</sup> Interestingly, the labelling of articaine differs in the UK and Ireland compared to Australia and New Zealand, with the latter cartridge specifying that the agent should be used for local infiltration only.<sup>77</sup>

The other techniques available to anaesthetise the IAN are not without complications. The IO technique allows rapid entry of vasoconstrictor to the circulation, producing systemic cardiovascular effects.<sup>33</sup> The use of a plain anaesthetic to combat this decreases the success rate of the technique dramatically.<sup>15</sup> In contrast, the success rate of the IANB is not affected by using a plain anaesthetic.<sup>87</sup> There is also potential for postoperative swelling and damage to teeth during bone penetration with the IO technique.<sup>15,17</sup>

There are several drawbacks associated with the IL technique, including the possibility of a bacteraemia post injection, rapid entry of anaesthetic and vasoconstrictor to the circulatory system, short duration of anaesthesia, damage to the periodontal tissues, damage to unerupted teeth, and excessive pressure may damage injection equipment.<sup>36,40,43,44,88-92</sup>

The AVNB and GGNB have similar complications to the IANB. The GGNB has a lower positive aspiration rate of 1.6% compared to the IANB.<sup>93</sup> The AVNB does not have a bony endpoint. This increases the risk of injection into the parotid gland posteriorly, anaesthetising the facial nerve and causing a transient nerve palsy.<sup>20</sup>

#### Discussion

Several techniques have been developed to provide mandibular anaesthesia. When deciding which technique prevails as the primary method of achieving mandibular pulpal anaesthesia, one must assess the benefits and drawbacks associated with each technique. In terms of success rates and onset times, it is evident from this review that the IO, IL and BI techniques are more effective than their alternatives, in keeping with findings from systematic reviews published to date.<sup>39,49,58,60,77,78</sup>

From the patient's perspective, painless injection techniques should be prioritised. One randomised controlled trial concluded that there were no statistically significant differences between the discomfort associated with the IANB, GGNB and AVNB.<sup>94</sup> Another study using a VAS described how patients rated the IANB as the most painful technique, with IL ranked second and BI third.<sup>95</sup> Some studies have shown that the IO technique has the

potential to be moderately painful, while other paediatric studies report little discomfort during administration.<sup>19,96</sup> A recent systematic review of the literature concluded that computer-controlled local anaesthetic delivery, with devices such as the Wand, Comfort Control Syringe, QuickSleeper and iCT, resulted in less discomfort during administration.<sup>42</sup> The concept describes how a clinician may reduce pain by controlling anaesthetic injection speed. This minimises resistance felt in the tissues during administration and allows time for anaesthesia to take effect simultaneously with injection. However, it should be noted that devices such as the Wand have significant set-up costs, which may deter their use in primary care.<sup>42</sup>

It is necessary to consider the cost of each anaesthetic technique when deciding which prevails as the primary method of achieving anaesthesia in the mandible. **Table 7** outlines the cost associated with the different types of local anaesthesia and delivery systems. The GGNB requires two cartridges of local anaesthesia in order to have sufficient volume to achieve reliable success rates, doubling its cost compared to other techniques.<sup>28</sup> The IO technique requires additional equipment such as the X-Tip, Stabident or IntraFlow, which also incur extra costs.<sup>32</sup>

It is necessary to consider the procedural requirements when deciding if new techniques have led to the lack of need for the conventional IANB. For example, wider areas of anaesthesia may be required for a mucoperiosteal flap or for the treatment of several teeth in one quadrant, and necessitate an IANB, AVNB or GGNB.<sup>20,22</sup> The IO, IL and BI techniques may not anaesthetise a wide enough field for certain procedures.

The choice of technique depends upon the clinical scenario. Patients presenting with trismus may require a closed-mouth technique such as the AVNB if nerve block anaesthesia is required, or the IO or BI techniques if pulpal anaesthesia is necessitated.<sup>29</sup>

There are complications associated with all of the techniques described. Injection deep into the pterygomandibular space, as done in the IANB, GGNB and AVNB, seems to precipitate most of these. The IO technique comes with the risk of systemic cardiovascular effects and depends upon the use of a vasoconstrictor to be successful. Medically compromised patients requiring anaesthetic without a vasoconstrictor should be given an IANB using a plain anaesthetic and the IO technique should be avoided.<sup>87</sup> The complications reported with the use of the IL technique may preclude its use in practice in certain cases, while the use of a BI to achieve mandibular anaesthesia has the fewest reported drawbacks.

Dental universities across the UK and Ireland teach the IANB as the primary method of achieving mandibular pulpal anaesthesia. Some clinicians may be reluctant to use new local anaesthetic techniques as they may not have been taught how to do so during their undergraduate dental training. Furthermore, the IO technique requires further technical skill with additional equipment, which students may also not have had exposure to during their undergraduate training.

The heterogeneity of the literature makes it difficult to conduct a systematic review and meta-analysis on the topic. This would be the ideal level of scientific evidence to make recommendations for evidence-based practice. Further investigations into local anaesthetic efficacy would benefit from the introduction of standardised testing methods, eliminating variability between studies such as: anaesthetic volume; anaesthetic type; pulpal status; the teeth chosen to anaesthetise; outcome measures; and, anaesthetic delivery systems.

#### Conclusion

Several RCTs evaluating the primary methods of achieving anaesthesia in the mandible are available for analysis in the literature. The RCTs available are of a IIb evidence base, due to small sample sizes, according to the Oxford Centre for Evidence-Based Medicine, and consequentially a grade "B" recommendation may be made for clinical practice. The literature describes how the IO and BI techniques have superior success rates and onset times, in combination with less discomfort and fewer complications than the alternatives available. In conclusion, the IO and BI techniques are effective alternative methods to the IANB for achieving mandibular pulpal anaesthesia.

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#### A retrospective study on clinical and radiological outcomes of oral implants in patients followed up for a minimum of 20 years

Chrcanovic, B.R., Kisch, J., Albrektsson, T., Wennerberg, A.

**Background:** Very long-term follow-up of oral implants is seldom reported in the literature.

**Purpose:** To assess oral implant failure rates and marginal bone loss (MBL) of patients followed up for a minimum of 20 years.

**Materials and methods:** Implants placed in patients followed up for 20+ years were included. Descriptive statistics, survival analyses, and generalised estimating equations were performed. Three hundred implants were randomly selected for MBL.

**Results:** Some 1,045 implants (227 patients) were included. Implant location, irradiation and bruxism affected the implant survival rate. Some 35% of the failures occurred within the first year after implantation, and another 26.8% in the second/third year. There was a cumulative survival rate of 87.8% after 36 years of follow-up. In the last radiological follow up, 35 implants (11.7%) had bone gain, and 35 implants (11.7%) presented at least 3mm of MBL. Some 26 out of 86 failed implants with available radiograms presented severe MBL in the last radiological register before implant failure.



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Eastpoint Business Park • Dublin Road • Loughrea • Co. Galway Tel: 091-880 108 • info@pdceramics.ie • www.pdceramics.ie **Conclusions:** Most of the implant failures occurred at the first few years after implantation, regardless of a very long follow-up. MBL can be insignificant in long-term observations, but it may, nevertheless, be the cause of secondary failure of oral implants in some cases.

Clinical Implant Dentistry and Related Research 2017; doi: 10.1111/cid.12571.

#### Prosthodontic rehabilitation with monolithic, multichromatic CAD-CAM complete overdentures in an adolescent patient with ectodermal dysplasia: a clinical report

Alsayed, H.D., Alqahtani, N.M., Alzayer, Y.M., Morton, D., Levon, J.A., Baba, N.Z.

Ectodermal dysplasia is a rare, hereditary, congenital disease that affects the normal development of certain tissues and structures of ectodermal origin. The disease is manifested to different degrees of severity, and may involve the nose, eyes, hair, nails, sweat glands, and enamel. This report describes a 14-year-old boy with ectodermal dysplasia, rehabilitated with monolithic, multichromatic maxillary and mandibular computer-aided design and computer-aided manufacturing (CAD-CAM) acrylic resin complete overdentures.

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# Fibre-reinforced composite fixed dental prostheses: a four-year prospective clinical trial evaluating survival, quality, and effects on surrounding periodontal tissues

Wolff, D., Wohlrab, T., Saure, D., Krisam, J., Frese, C.

**Statement of problem:** Although fibre-reinforced composite fixed dental prostheses (FRC FDPs) are a reliable treatment option for the restoration of single missing teeth, comparatively few prospective clinical trials (PCTs) exist. **Purpose:** The purpose of this PCT was to evaluate the survival, quality outcome, and effect of FRC FDPs on periodontal health over four years.

**Material and methods**: Twenty-six consecutive patients (16 men, 10 women) receiving FRC FDPs with pre-impregnated unidirectional fibre reinforcement were included in the trial. Eighteen FRC FDPs were placed in the maxilla and eight in the mandible. Data from baseline, 12, 36, and 48 months of follow-up were recorded, and the prostheses were classified as "success", "survival", or "failure". Periodontal parameters (probing depth, clinical attachment level, plaque index and bleeding index) were assessed, and the quality was rated according to modified United States Public Health Service (USPHS)/Ryge or World Dental Federation (FDI) criteria.

**Results:** Functional survival at four years was 73.5% (95% confidence interval [CI], 52.9-87.3) with 17 FRC FDPs still functioning. Twelve of these were classified as "success" and five as "survival". Overall survival was 53.0% (95% CI, 30.4-74.4). Six FRC FPDs failed completely. Periodontal parameters did not

change over the observation period. Regression analysis showed that probing depth and clinical attachment level did not influence the survival of FRC FDPs. According to USPHS/Ryge/FDI criteria only "wear" and "surface luster" increased significantly over four years.

**Conclusions:** The survival rate of FRC FPDs confirms existing data. Negative effects on periodontal health were not seen over the period of observation. Ageing effects such as wear were recorded and indicated that FRC FPDs are at risk of disintegration, as they are composed of a fibre framework and veneering composite resin.

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## Comparison of denture tooth movement between CAD-CAM and conventional fabrication techniques

Goodacre, B.J., Goodacre, C.J., Baba, N.Z., Kattadiyil, M.T.

**Statement of problem**: Data comparing the denture tooth movement of computer-aided design and computer-aided manufacturing (CAD-CAM) and conventional denture processing techniques are lacking.

**Purpose**: The purpose of this *in vitro* study was to compare the denture tooth movement of pack-and-press, fluid resin, injection, CAD-CAM-bonded, and CAD-CAM monolithic techniques for fabricating dentures to determine which process produces the most accurate and reproducible prosthesis.

**Material and methods**. A total of 50 dentures were evaluated, 10 for each of the five groups. A master denture was fabricated and milled from prepolymerised polymethyl methacrylate. For the conventional processing

techniques (pack-and-press, fluid resin, and injection), a polyvinyl siloxane putty mould of the master denture was made in which festooned denture was laser scanned, resulting in a standard tessellation language (STL) format file. The CAD-CAM dentures included two subgroups: CAD-CAM-bonded teeth in which the denture teeth were bonded into the milled denture base, and CAD-CAM monolithic teeth in which the denture teeth were milled as part of the denture base. After all specimens had been fabricated, they were hydrated for 24 hours, and the cameo surface laser scanned. The preprocessing and postprocessing scan files of each denture were superimposed using surfacematching software. Measurements were made at 64 locations, allowing evaluation of denture tooth movement in a buccal, lingual, mesial-distal, and occlusal direction. Median and interquartile range values were used to assess accuracy and reproducibility. Levene and Kruskal-Wallis analyses of variance were used to evaluate differences between processing techniques ( $\alpha$ =0.05).

**Results**: The CAD-CAM monolithic technique was the most accurate, followed by fluid resin, CAD-CAM-bonded, pack-and-press, and injection. CAD-CAM monolithic technique was the most reproducible, followed by pack-and-press, CAD-CAM-bonded, injection, and fluid resin. Techniques involving compression during processing showed increased positive occlusal tooth movement compared with techniques not involving compression.

**Conclusions:** CAD-CAM monolithic dentures produced the best combination of accuracy and reproducibility of the tested techniques. The results from this study demonstrate that varying amounts of tooth movement can be expected depending on the processing technique. However, the clinical significance of these differences is unknown.

Journal of Prosthetic Dentistry 2018; 119; (1): 108-115.

#### Quiz answers

Questions from page 9





- 1. Top three differential diagnoses:
  - a. residual cyst;
  - b. unicystic ameloblastoma; or,
  - c. odontogenic keratinising tumour (OKT).
- 2. Vascular malformations.







- Cholesterol granules in a straw-coloured aspirate is indicative that the lesion is cystic. The lesion is possibly a residual cyst (previous radicular or dentigerous cyst) or an OKT.
- Figure 3 shows marsupialisation. The roof of the lesion was removed and sent for histology. In the meantime, the cavity is decompressed, causing it to shrink. This allows definitive surgery post diagnosis more easily.
- 3. Aspiration to ensure that it is not a vascular lesion, followed by open biopsy for diagnosis.

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- Oral surgeon or implantologist/periodontist required one hour from Dublin – to replace departing oral surgeon – ideally providing IV sedation/botox too. One day per month, established list. Also, dentist with a special interest in endo or endodontist required one day per month. Email scotty6@gmail.com.
- Orthodontist required Wexford Town. Will build to full-time quickly in newly built treatment suite adjacent to principal. Excellent support with long-term opportunity in large vibrant town famous for its coastline, countryside and culture. Contact Dr Don Ryan at info@wexfordorthodontics.ie or 086-835 5049.
- Associate dentist and specialist orthodontist required to join our wellestablished practice in north Dublin. Great working conditions, intra-oral camera, digital x-rays, microscopes, treatment co-ordinator, etc. Both positions are part-time with a view to full-time. Email Michelle.Teeling@smartdentalcare.co.uk.

Specialist orthodontist wanted to join busy, friendly, all-specialist orthodontic

practice in north Co. Dublin. Purpose-built clinic with excellent facilities and flexible sessions available. Part-time initially but likely to increase hours later. Email CV to orthoassociate2018@gmail.com for more information.

Opportunity available in specialist referral practice in Dublin City. Would suit endodontist, orthodontist, periodontist or oral surgeon. Contact steven@medaccount.ie or Tel 01-280 6414 in confidence.

#### Dental nurses/managers/receptionists

- Enthusiastic, organised and motivated nurse wanted to join a busy, modern, state-of-the-art practice in Galway. This position is a maternity leave cover with a potential for future role expansion. CV and cover letter by email to info@roscamdental.ie.
- Dental nurse required for maternity cover in modern, progressive practice in Dublin 9 commencing February 2018. Experience essential. Must be organised, motivated and have caring and friendly approach. Email CV and cover letter to niamh@drumcondravillagedental.ie.
- Full-time dental nurse required for busy dental practice in Limerick. Immediate start. Must have a strong patient focus and good attention to detail. Email nikki.richardson99@gmail.com.
- Swords Orthodontics is currently seeking a hardworking, enthusiastic individual (dental nurse) to join our team. The position will involve mostly front-of-house reception duties and treatment co-ordinating. Patient care, professionalism and excellent communication skills are a must. Email swordsorthoinfo@gmail.com.
- Dental nurse required to cover maternity leave three days a week (Monday, Tuesday, Friday). Reception and nursing duties. Abbeyleix, Co. Laois. Email neil@abbeyleixdental.com.
- Experienced dental surgery assistant required in busy Lucan practice for 10 months' maternity cover. February start. Email CV to mckeon.mcaleese@gmail.com.



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#### Hygienists

- Dental hygienist required to join our dental hygiene team in Co. Meath. This position is for Saturdays with a view to expanding. We are a very busy practice with a good mix of general, orthodontic and periodontal patients. Email dentalpracticemeath@gmail.com.
- Hygienist required for two days+ at Shields Dental and Implant Clinic Limerick. Email hello@shieldsdentalclinic.ie or ring Conor on 061-480070, or 085-751 1529.
- Full-time hygienist required at Shields Dental and Implant Clinic private practice in Limerick. Email hello@shieldsdentalclinic.ie or ring Conor on 061-480070 or 085-751 1529.
- Dental hygienist required to join busy Galway City practice. Full-time, five days/week. Private and PRSI patients. Email ronan@renmoredental.ie.
- Gentle and caring hygienist required for modern and busy general dental practice in Westport. Fully computerised surgery with excellent support team. Full-time or part-time position available. Please email your CV to info@westportdental.ie.
- Dental hygienist required for busy practice in Mullingar. Hours flexible. Experience or new graduate welcome. Email drurydent@eircom.net.
- Enthusiastic and gentle hygienist required for modern and busy general dental practice in Galway. Fully computerised surgery with excellent support team. Full-time or part-time position available. Please email your CV to jmedental@gmail.com.

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- Dental practice for sale, Co. Donegal. Two modern, well-equipped surgeries. Third surgery/sterilisation room. Large catchment area. Realistic price. Email dentaldonegal@gmail.com.
- Dublin 20. Well-established practice (48 years), private/PRSI list. Modern, well-equipped surgery with digital radiography. Shared facilities and overheads including existing nursing and administrative staff. Extensive private parking. Flexible terms regarding start and payment options. Email john@odwyerdelaney.ie.
- South Dublin surgery to let, 20-year lease to buy option. Current patient book, website, two other rooms available. Email southdublindentalclinic @gmail.com.
- For sale/to let Charleville, Co. Cork. Long-established (44 years) general practice. Prime location corner building in town centre. Ground floor, two surgeries, OPG, air conditioning, 65% private practice. Extensive catchment area. Email patmullane@eircom.net.

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 Recommended fluoride level (1350-1500ppm) for caries prevention in 'Delivering better oral health. An evidence-based toolkit for prevention'. 3rd edition, Public Health England, June 2014.

## New to the parish

Originally from Serbia, Dr Dina Dabic has been based in Dublin for two years.

#### What led you to first get involved in the IDA?

I joined the IDA when I moved to Ireland. In Slovenia, where I worked after graduation, there was no equivalent dental association so it was a bit of an unknown concept, but it helped me to get to know about dentistry in Ireland.

#### What form did that involvement take?

I used the classified ads to help me to find a job, and I also consulted IDA Head Office for help when I moved here, and always found that they responded very promptly and were very helpful. Then I began to go to meetings, first in the Metro Branch. I was surprised and impressed by the range of events the IDA organises, and the social aspect too, and I became more involved.

#### What is your involvement now?

Last year, the IDA decided to reach out to foreign-graduated dentists in Ireland to offer them support and help them to integrate into the dental community here. I was asked if I would like to take part in that initiative and become a member of the IDU Council to represent the opinions of foreignqualified dentists working in Ireland. It's very exciting - and a big honour. We are developing a range of activities and tools that will hopefully help both incoming dentists from abroad and dentists who are recently qualified in Ireland to overcome challenges and integrate successfully. It will be interesting to see how it develops and how the ideas we have come to life - some of them at least!

## What has your involvement in the IDA meant to you?

Being a part of the IDA helped me to feel less isolated in a new environment. I really believe that a strong professional network is important for everyone and every interaction makes us stronger. Sharing knowledge helps you move forward and develop both career wise and personality wise, but it's only possible if you put yourself out there and grow your network. It's also good from a well-being perspective.

I'm also learning a lot as a Council member. I didn't know how much hard work

goes on behind the scenes to produce every guideline, every protocol, every negotiation. It's showed me that dentistry is about a lot more than what you experience in the clinical setting.

## What has been the single biggest benefit of IDA membership for you?

It would have to be meeting colleagues whose knowledge, ethics and dedication to the profession and their patients is truly admirable and very inspiring.

## How would you like to see the Association progress into the future?

I believe that the Association will continue to represent the interests of the profession in the best possible way. I would definitely like to see it grow and to offer more to its members. It would be great to see a strong force of young dentists

joining the IDA and taking an active part in its work. The IDA is the voice of the profession in Ireland but it should also be the ears, and the more thoughts and ideas we share, the better the IDA will be in representing our interests.

Dina graduated from the University of Belgrade, and worked in Slovenia for five years before moving to Ireland two years ago. She lives in Dun Laoghaire with her husband, who works in IT. In their spare time they try to get to know their new home as much as possible and love travelling around Ireland. She also likes to read, do the occasional Pilates session, and keep in touch with family and friends around Europe.





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