Volume 59 Number 1
February/March 2013

IDA
irish dental association

Journal of the Irish Dental Association

Iris Cumainn Déadach na hÉireann

Breaching regulations

In a class of its own... A must-have for any dentist

NSK Ti-Max Z Series Contra-angles

NSK Ti-Max Z Series contra-angles feature the smallest head and slimmest neck dimensions in the world*, providing a standard of operational visibility like never before. Accessing otherwise difficult oral regions is made significantly easier by the miniaturised, ergonomic design.

NSK are so confident about the durability and performance of their new Ti-Max Z Series contra-angles, they come as standard with a 3-year warranty.

10 day 'try before you buy'**
To arrange your 10 day free trial contact NSK on 0800 6341909 or your preferred dental supplier.

PEACE OF MIND 3 YEAR WARRANTY

MultiPad Integrated System

NLX nano, the smallest micromotor in the world†, is lighter than conventional micromotors making especially speed increasing contra-angles feel more like an air turbine in the hand. When built into your existing treatment centre and controlled using NSK's MultiPad, the NLX nano reaches speeds of 1,000 - 40,000 min-1 and delivers a powerful 3.4Ncm torque.

NSK's MultiPad is the only control pad on the market capable of controlling both a micromotor and a scaler, making upgrading easier than ever.

As recommended by...

"The NSK Ti-Max Z95L speed-increasing handpiece provides complete speed control and delivers an exceptionally smooth running bur, these advantages equate to more precise margins and potential for improved overall clinical results."

Dr Paul Mandon-Gassman, Sturry Dental Practice
www.sturrydental.co.uk

As recommended by...

"The use of the speed-increasing handpiece is a must for the finesse of the preparation and for margin and retention features. With the support of NSK, I have been able to teach my delegates how to cut a more precise preparation."

Paul Tipton, Tipton Training
www.tiptontraining.co.uk

As recommended by...

"The Z95L is a tremendous handpiece that combines high torque, bright fibre-optics, and a small head size to make it the most efficient handpiece I have ever used."

Dr Ian Cline, Private Practitioner, Central London
Course Director, Cosmetic Dental Seminars
www.cosmeticdentalseminars.org

As recommended by...

"The Z95L enables me to deliver precision to my work that is in a class of its own. Combine this with its tiny head, superb optics and comfortable ergonomics and it really is a must-have for any dentist."

Christopher Leech BDS MJDF (RCS Eng)
Barker Dental Care, Southampton
www.barkerdentalcare.co.uk

NSK contra-angles and turbines are compatible with KaVo® and W&H®

For more information call your Territory Manager:
ROI: Angela Glasgow on +44 (0)7525 911006 or
NI: Dominie Curran on +44 (0)7541 864641

Alternatively call NSK:
NI: 0800 6341909 ROI: 1800 848959

NSK

NSK United Kingdom Ltd Office 5 Gateway 1000 Arlington Business Park Whittle Way Stevenage Hertfordshire SG1 2FP
www.nsk-uk.com Tel: 0800 6341909/1800 848959 +44 (0)1438 310670 Fax: +44 (0)1438 310671

*As of March 2011. Applies to Z95L only **Terms and conditions apply † As of November 2010

1302JIDA

Published on behalf of the IDA by
Think Media, 537 NCR, Dublin 1

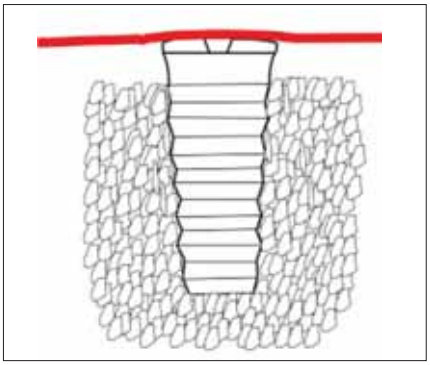
T: 01-856 1166
www.thinkmedia.ie

EDITORIAL
Ann-Marie Hardiman, Paul O'Grady

DESIGN AND LAYOUT
Tony Byrne, Tom Cullen, Ruth O'Sullivan

ADVERTISING
Paul O'Grady

The Journal of the Irish Dental Association:
- *is the only dental publication produced in Ireland;*
- *is Irish dentists' own Journal of record.*



Irish Dental Association Unit 2 Leopardstown Office Park, Sandyford, Dublin 18.
Tel: +353 1 295 0072 Fax: +353 1 295 0092 www.dentist.ie
Follow us on Facebook (Irish Dental Association) and Twitter (IrishDentists).

Magazines Ireland | abc

Total average net circulation 01/01/12 to 31/12/12: **3,366 copies** per issue. *Circulated to all registered dentists in the Republic of Ireland and Northern Ireland.*

Professional strength whitening

Visibly whiter teeth in 3 days

Now available from your dental wholesaler

Colgate

YOUR PARTNER IN ORAL HEALTH

www.colgateprofessional.ie

History and excellence

This edition of the *Journal* contains news about great dentists, vital information on teeth whitening, a history of Cork University Dental School and Hospital, and a superb peer-reviewed paper on implants, writes PROFESSOR LEO F.A. STASSEN, Honorary Editor.

Let's start with the good. And it is very good indeed. The increase in entries to over 1,000 patients praising their dentists for their treatment is a very welcome expansion of the Sensodyne Sensitive Dentist of the Year Awards. Staged for the fourth time in 2012, and with the winners announced at the RDS in Dublin in January, the Awards have provided a channel for the public to praise their dentists. And what a channel it has proved to be: the conviction with which patients write of their treatment, and the affection and respect which they evidently hold for their dentists, is a warm and refreshing change from much of the normal opinions offered anecdotally about dentists and dentistry.

The heartfelt thanks – and relief – felt by Mary Dhondt when she managed to have her autistic son successfully treated by Dr Gillian Smith and practice nurse Sharon Hogan were expressed beautifully in her winning entry. She wrote of the patience, care and professionalism of Dr Smith and nurse Hogan, and of the confidence that her son Neal developed in attending for dental treatment, and it impressed the judges enormously. All of the highly commended dentists are also worthy of acclaim in public and with their peers. You can read the report of the Awards in this edition of the *Journal* (pp14-15).

Whitening

If that is a high point and it is, the low point is the continuing operation of businesses offering teeth whitening that are, at best, not declaring the contents of their teeth-whitening products. There is an excellent article on the new legislation and all it entails in this edition by Dr Julia Densem of Dental Protection (pp46-47). Dr Tom Feeney addressed the recent Association Annual Practice Management Seminar on the same subject (pp26-28 – for IDA members only). He reported that there seemed to be some businesses offering teeth whitening that were not dentists, and he wondered what they were offering. The *Journal* followed this up through our journalist, Ann-Marie Hardiman, who contacted four businesses offering teeth whitening (p13). Of those, only one was prepared to say that dentists applied the first treatment and that their product contained the legal dose of hydrogen peroxide. The other three gave evasive answers such as "it is natural" or "it is non peroxide". This is a development that we hope the authorities will police very carefully.

Cork's centenary

Cork University Dental School and Hospital marks its centenary on March 2 next with a major conference on the theme '100 years of dental evolution'. We send our congratulations to Dean of the School, Professor Finbarr Allen, and all of the team and students in Cork. Our thanks too to Dr John Borgonovo and Professor Denis O'Mullane who have provided us with a superb article on the history of the school and hospital (pp16-22). The *Journal* is recording the centenary in two ways: with the article on the history in this edition; and, with the conference papers in our next edition. We understand that there is also an alumni dinner on March, 1 which is sure to be a great occasion.

Implants

The science underpinning implantology is very well articulated in our peer-reviewed paper in this edition (pp32-43). Dr Abdulhadi Warreth and his colleagues from Dublin Dental University Hospital have done an excellent job in presenting and reviewing a treatment option with a high success rate.

Pressures of space

Apart from all the other high quality material in this edition of the *Journal*, I feel obliged to report to you (and to our many authors) that we are suffering from a huge pressure on space in the *Journal*. It is a factor of the success of the *Journal* and of the high regard in which it is held by Irish and international dental authors, that we are holding peer-reviewed papers for some time. The Editorial Board is exploring innovative ways of meeting the demand for publication.

Leo F. A. Stassen

Prof. Leo F. A. Stassen
Honorary Editor

Off to a great start

IDA President DR ANDREW BOLAS highlights the impressive array of Association events and services on offer.

2013 started with bang for the IDA. The Practice Management Seminar in Croke Park proved a great success. Although the numbers attending may have been lower than previous years, the quality of the speakers did not let us down. Coming from Sligo, seminars like this are likely to be my only chance of getting to Croke Park. A full report of the day is in the Members' News section in this edition of the *Journal*.

The IDA has a busy few months ahead. Here are the main events coming up:

- round two of the CPD Roadshow starts on February 9 in Galway – Further dates are: February 16 (Cork); March 2 (Kilkenny); March 2 (Cork); March 23 (Dublin); and, March 23 (Limerick);
- the Annual Scientific Meeting of the Metro Branch takes place on February 9;
- the Annual Scientific Meeting of the South Eastern Branch takes place on February 22;
- the Annual Conference takes place in Galway From April 18 to 20;
- the Irish Dental Association hosts a meeting of the Council of European Dentists in Dublin from May 22 to 25; and,
- of course, branches continue to hold their own local events.

There have never been so many ways to get involved and feel connected to the Association and to colleagues.

I had the pleasure of attending the inauguration of the new President of the Northern Ireland Branch of the British Dental Association in January, a significant event in that both our organisations are having their 90th anniversary this year. I wish Dr Seamus Killough every success in his year ahead. Also significant is that their past President, Dr Barry McGonigle, will be installed as the President of the British Dental Association later this year. Given the local connections, it will be a good year to strengthen the links with our near neighbours.

The HSE Committee continues to work at the second phase of the consultations to reform and reconfigure the Public Dental Service, and they continue to represent members' interests at a tough time for the Service.

I am also pleased that the Association is investigating new benefits for members, such as:

- a mentoring scheme;
- a counselling helpline; and,
- insurance for expenses incurred during Revenue audits.

I would encourage all members to ensure that they are fully utilising their IDA membership.

Dr Andrew Bolas
President, Irish Dental Association

SENSODYNE

Sensitive Dentist of the Year™

IRELAND'S MOST SENSITIVE DENTIST

Congratulations to Dr Gillian Smith of Bray, Co. Wicklow, who was judged to be Ireland's Sensodyne Sensitive Dentist of the Year 2012. Dr Smith was nominated by the mother of a patient with special needs who received significant treatment over a period of months.

IDA
journal of the irish dental association
Iris Cumainn Déadach na hÉireann

IDA meets Minister

Association representatives recently met Minister of State for Primary Care, Alex White. The delegation was (from left): Fintan Hourihan, Chief Executive; Dr Ryan Hennessy, general practitioner group; Clare Dowling, Employment/Communications Officer; Dr Peter Gannon, Chair, general practitioner group; Dr Sean Malone, President Elect; and Ray McCarthy, Honorary Treasurer.

Record membership

The membership of the IDA/Irish Dental Union is set to exceed 1,600 members for the first time in our history, reflecting a very significant surge in membership levels in the past year. Membership at the end of 2011 stood at 1,337 and is set now to exceed 1,600, which would represent a 20% increase in little over a year.

Colgate Christmas Movie Quiz

We're delighted to announce that the winner of our special Christmas quiz, kindly supported by Colgate, is Regina Kenny, Avondale Dental Clinic, Vevay Road, Bray, Co. Wicklow. Congratulations to Regina, and our thanks to everyone who took the time to enter.

Trade union licence

The Irish Dental Union has begun the process of applying for a negotiating licence, having recently secured trade union status. The Union is obliged to submit an application to the Minister for Jobs Enterprise and Innovation, Richard Bruton TD, and to notify other trade unions concerned. A deposit with the High Court of €25,000 has also been arranged in accordance with the provisions of the trade union legislation, and it is expected that a decision on the application will be communicated to the Union later in the year.

Quiz

Submitted by CLARE DOWLING, IDA Employment and Communications Officer

1. How many public holidays are there in Ireland?
2. How long is maternity leave?
3. Are you obliged to pay employees while they are on sick leave?

Answers on page 29

THE FLOW COMPOSITE FOR ALL CLASSES OF CAVITY

GrandioSO Heavy Flow

Highest filler level of 83 % w/w
- Physical properties superior to those of various packable composites
- Also suitable for fillings bearing masticatory loads

Ideal stability
- Precise dosage without excess
- Simple restoration of cervical cavities, undercuts etc.

First-class aesthetics
- 12 shades, including new shade GA5 for cervical restorations
- Excellent polishability and permanent lustre

*Find all current offers on www.voco.com

For more information please contact:
John F. Fanning - Mobile: 085 725 6078 or
Claire Austin - Mobile: +44 7584200138

IDS 2013
Please visit us in Cologne
12.-16.03.2013
Stand R8/S9 + P10, Hall 10.2

VOCO
THE DENTALISTS

VOCO GmbH - Anton-Flettner-Straße 1-3 - 27472 Cuxhaven - Germany - Tel. +49 4721 719-0 - www.voco.com

New exclusive member benefits

The Irish Dental Union (IDU) is delighted to announce a range of new business advice, tax audit and counselling services available. These new services should provide peace of mind and security to dentists in these difficult times when membership of the IDU has never been more important, says Chief Executive FINTAN HOURIHAN.

Tax protection

The new IDU Tax Protection Policy will meet all reasonable professional costs incurred by dentists who are subject to an audit of their business accounts by the Revenue Commissioners, as well as for appeals regarding PAYE or PRSI compliance following an audit by the Revenue Commissioners or the Department of Social, Community and Family Affairs, or in relation to VAT liabilities. The cost of this insurance-based policy will be borne by the IDU (the policy holder is the IDU and the insured persons are members of the IDU). You or your accountant should contact DAS, Europe's leading tax and legal expenses insurer, at 1850 670 747, as soon as you are notified of a Revenue Commissioners audit of your business accounts. When the appropriate information is received, an accountant will be appointed to act for you – this can be your own accountant if agreeable to both DAS and your accountant. Please note that this policy only covers costs incurred after DAS has been authorised, so please ensure that you call as soon as you are made aware of an audit. The policy will cover any notifications received after March 1, 2013, and is subject to terms and conditions, which are available on request to IDU members. In addition, we are delighted to announce access to a range of new IDU helplines, which are free to members and their immediate family, and are available 24/7, 365 days a year. Confidentiality is assured, and users' details will not be provided to the IDU in any circumstance.

Counselling

The counselling helpline (1850 670 407) provides confidential access to a trained counsellor, based in Bristol, and presents an opportunity to talk about difficulties and assist in finding ways of dealing with them. The helpline provides two types of counselling: crisis and sequential call. A crisis call occurs when the caller has an issue they need to share immediately (usually a single, one-hour call). If a longer response is needed, sequential counselling can be arranged. This usually takes place between 9.00am and 4.00pm over a six-week period, with the caller spending an hour per week talking to the same counsellor. Both services are operated by counsellors who are trained to diploma level, and can be accessed as many times as needed. If telephone counselling is not sufficient, a face-to-face service can also be arranged. This high quality, independent, compassionate and non-judgemental advice is available absolutely free of charge to all IDU members together with any immediate family who live permanently with the IDU member.

Legal advice

This helpline is answered by Irish qualified lawyers who can give you advice on the whole range of commercial legal problems, including family law, property issues, wills and probate. The only area not covered is employment issues, which you should direct to IDA House. The legal advice helpline is restricted to IDU members only.

Business assistance

Should you as an IDU member experience an emergency affecting your business premises, for example flooding or a central heating breakage, the IDU Business Assistance Helpline (1850 670 747) is available. Helpline staff will source (but not pay for) an accredited tradesman, make an appropriate appointment, advise of the estimated cost, and ring to check on a timely arrival. After the emergency has been resolved, the helpline will ask for your feedback on the workmanship to ensure that only the very best service is offered to future callers.

Health and medical information

By calling the confidential Health and Medical Information Service (1890 254 164) you can receive information over the phone on health and fitness, and non-diagnostic advice on general matters.

54% OF ADULTS HAVE GINGIVAL BLEEDING.[1]

NEW COLGATE® TOTAL® PRO GUM HEALTH TOOTHPASTE IS MEDICALLY LICENSED TO **"IMPROVE GINGIVAL HEALTH AND REDUCE THE PROGRESSION OF PERIODONTITIS".**

Recommend Colgate Total Pro Gum Health Toothpaste as part of your treatment and maintenance of your patients' periodontal health.

Colgate® YOUR PARTNER IN ORAL HEALTH

www.colgateprofessional.ie

Name of the medicinal product: Colgate TOTAL Pro Gum Health Toothpaste. **Active ingredients:** Triclosan 0.30% w/w, Sodium Fluoride 0.32% w/w (1450ppm F). **Indications:** To reduce dental caries, to improve gingival health and to reduce the progression of periodontitis. **Dosage and administration:** Apply a 1 cm line of paste across the head of a toothbrush and brush the teeth thoroughly for one minute twice daily. Spit out after use. Children under 7, use a pea-sized amount for supervised brushing to minimise swallowing. If using fluoride supplements, consult your Dentist. **Contraindications:** None known. **Special warnings and precautions for use:** Children under 7, use a pea-sized amount for supervised brushing to minimise swallowing. If using fluoride supplements, consult your Dentist. **Undesirable effects:** None known. **Marketing authorisation number:** PA 320/5/1. **Marketing authorisation holder:** Colgate-Palmolive (U.K.) Ltd. Guildford Business Park, Middleton Road, Guildford, Surrey, GU2 8JZ. **Recommended selling price:** €4.59 (75ml tube). **Date of revision of text:** October 2011.

1 UK Adult Dental Health Survey 2009, NHS Information Centre for Health and Social Care.

GLENNON
Insurance Brokers & Consultants

We've given our figures a polish

Save up to 50%* on your **insurance premium** with **Glennon**

At Glennon, we're committed to giving dentists and their spouses the right cover at the right price. Our exclusive discounted IDA schemes for car, home and dental practice insurance have saved members up to 50%* on their premium! What's more, it's never been easier to make those savings.

Simply call **(01) 707 5999** for your quote today.

From January 2012, you'll be able to get a quick quote online at **http://ida.glennons.ie**

IDA
irish dental association

* Premium savings may vary depending on your risk profile and your present insurer.

Whiter than white?

In light of new laws on tooth whitening, what are Irish businesses offering? ANN-MARIE HARDIMAN reports.

At the recent IDA Practice Management Seminar, Dr Tom Feeney's presentation, 'Tooth Whitening: The Legal Position', updated delegates on new legislation regarding tooth-whitening products, which became law here on November 1, 2012.

Under Council Directive 2011/84/EU, tooth-whitening products that use between 0.1% and 6% hydrogen peroxide must have their first use within the dental office (by dental practitioners or under their direct supervision if an equivalent level of safety is ensured). Subsequent use can be performed by consumers themselves as long as access to the product is provided by dental practitioners or under their supervision. Products containing more than 6% hydrogen peroxide are not permitted, and treatment can only be carried out on persons aged 18 years or over.

This is the first regulation of its kind in the EU and is now Irish law, but are tooth-whitening clinics complying with the new regulations? Dr Feeney highlighted a number of businesses that perform tooth whitening, and a quick check online reveals a large number of clinics offering "expert" tooth whitening either in a designated clinic or in the client's own home. The *Journal of the Irish Dental Association* decided to contact four of these. In each case, we asked what was involved in the treatment, what was the content of the treatment gel used, and who would perform the treatment.

Business A

Business A offers customers tooth whitening in their own homes. The treatment is described as "SURROUND WHITE Cosmetic Teeth whitening … a cosmetic treatment which involves no elements of dentistry". We were informed that a non-peroxide gel is used, in accordance with the law, along with a cold blue LED light. Two 25-minute treatments are carried out during the same one-hour session. Business A's Facebook page clearly states that this is a non-peroxide treatment; however, the person we spoke to was unable to say what exactly was in the treatment gel, saying only that it was "natural" and "it's what everyone else is using".

Business B

Business B has clinics in Dublin, Galway, Cork and Belfast. The representative we spoke to explained that treatment involves a gel being placed on the teeth and then a cold blue laser light. The one-hour treatment involves a consultation and three 12-minute sessions one after the other.

When we asked what was in the treatment, we were told that up to a few months ago they were using hydrogen peroxide, but that this was now banned (because it causes sensitivity). They are now using a "completely natural" gel that produces the same whitening results with no sensitivity. The representative was unable to say exactly what was in the gel, saying that she did not have the information in front of her. When asked a second time she said that the technician at the consultation would be able to explain more fully.

She said that the clinic was staffed by dentists and dental nurses ("our technicians"), who perform all treatments, and emphasised that the company specialises in tooth whitening and does not carry out any other procedures.

Business C

Business C also has clinics around the country, with its head office in Dublin. They use 6% hydrogen peroxide gel with a high-intensity LED cold light. The person we spoke to said that clients would be seen by a dentist who specialised in teeth whitening, and emphasised the safety of the treatment, explaining that the equipment used was classified as a Class 1A medical device. He also explained that there was a possibility of short-term sensitivity with the gel, but no long-term side effects.

Business D

Finally, Business D, based in Dublin, carries out treatments on the upper and lower front teeth (the 'smile') with gel and light. We were assured that full information about the treatment was available on Business D's website, but we were unable to find any information about the exact components of the gel used. According to the website: "We use a very gentle whitening gel in three sessions and thereby ensuring client safety and comfort. It is very uncommon to experience any discomfort, however in rare cases some clients may experience slight discomfort. This will quickly pass. It is also recommended that clients avoid consuming extremely hot or cold food or beverages for the first 24 hours following the treatment." Treatment at Business D is carried out by dental technicians.

Dr Tom Feeney commented: "Council Directive 2011/84/EU states that each first cycle of use must be carried out by a dentist. Afterwards the product can be supplied to the consumer by the dentist. In the whitening 'shops' contacted by the *JIDA* the common denominator seems to be a reluctance to disclose the active ingredient. This, together with claims of rapid successful bleaching, would raise suspicions that higher concentration hydrogen peroxide is being used, although this remains to be proven. The competent authority for the regulation of tooth-whitening products is the Irish Medicines Board (IMB). If any member of the public, consumer or professional, has concerns about the possibility of illegal practice they should contact the IMB at cosmetics@imb.ie. The IMB's role is the protection of the public and they will follow up any complaint made to them".

Patients acclaim their dentists

After a huge entry, judges in the Sensodyne Sensitive Dentist of the Year came to a unanimous decision about the winner and the highly commended dentists. PAUL O'GRADY reports.

President-elect of the Irish Dental Association, Sean Malone, had no doubt when addressing the attendance at the Sensodyne Sensitive Dentist of the Year Awards ceremony: "The essence of the Awards is the testimony of more than 1,000 patients who saw fit to praise the treatment received from their dentist".

His remarks echoed those of Michelle Darlington, Marketing Manager for Oral Health products with GlaxoSmithKline (GSK), makers of Sensodyne and sponsors of the Awards. Michelle stated that the team at GSK was overwhelmed and delighted by the increase in entries this year. While the increased number of entries presented a challenge to the judging panel, it was evident from the remarks of the Chairman of the judging panel, Dr Barry Harrington, that he and his fellow judges (Dr Seton Menton and Dr Anne O'Neill), after some deliberation, had come to an agreed outcome. Dr Harrington read the citations for the winners in the Sensodyne Sensitive Dentist of the Year Competition for 2012.

Judges for the Awards, Dr Barry Harrington and Dr Anne O'Neill. Dr Seton Menton participated in the judging but was abroad for the ceremony.

Michelle Darlington, Paul Hutton and Rory Brennan of GSK.

Chief Executive, Fintan Hourihan, and President-elect, Dr Sean Malone, of the Irish Dental Association.

Overall Winner

Dr Gillian Smith

Dr Gillian Smith (centre) receives her award from the President-elect of the IDA, Dr Sean Malone, and her certificate from the Marketing Manager for Oral Health in GSK, Michelle Darlington.

Overall winner Dr Gillian Smith with her practice nurse, Sharon Hogan, and the JIDA's Paul O'Grady.

Judges' citation: "The oral health of patients with special needs has always been challenging. Progress in understanding the particular requirements of individuals has been significant. The success of Dr Gillian Smith in establishing a calm and trusting relationship with her patient, Neal Dhondt, was remarkable. Neal's autism meant that treatment of his oral health needs was even more challenging than usual. Dr Smith's human skills of patience, sensitivity and humour were allied to her clinical skills, especially her use of conscious sedation, to successfully achieve the appropriate treatment.

These skills were deployed initially over a four-month period to bring Neal's dental disease under control and ensured that hospitalisation and general anaesthesia – which would be terribly traumatic for Neal – were unnecessary. Neal continues to attend Dr Smith to this day and it was his mother, Mary, who made the winning nomination."

Highly Commended

Dr Hannah Flynn (left) receives her award from Claudia Long of GSK.

Dr Hannah Flynn

Judges' citation: "A new patient was being assessed by Dr Flynn. On the first appointment, Dr Flynn spotted a suspicious lesion on the tongue. It turned out to be malignant and while the patient required extensive surgery, he wrote that his consultant ENT surgeon stated that he would not be alive were it not for Dr Flynn.

The patient's partner also wrote in to support the nomination. She is also a patient of Dr Flynn's and stated that the kindness and care taken with her, and the understanding of the difficulties being faced by the couple, was outstanding throughout the lengthy period of their medical and surgical treatment."

Dr David Vard receives his award from Orla Sheehy of GSK.

Dr David Vard

Judges' citation: "A youth worker nominated Dr Vard. She is a patient of Dr Vard herself and when several vulnerable young people from a deprived background came into her care in the same area, she contacted Dr Vard to see if he would provide their oral healthcare. Not only did he accept, but she noted he treated them with exceptional respect and dignity. In doing so, he also dealt calmly and very effectively with behaviourial issues which initially threatened to make treatment difficult. His success is best illustrated by the fact that these young people continued to attend Dr Vard into their adulthood. He even assisted one of them to access funding for major dental work following a childhood of neglect."

Dr Alastair Wood receives his award from Orla Sheehy of GSK.

Dr Alistair Woods

Judges' citation: "Dr Woods has established a relationship with an extended family which goes to the heart of good oral healthcare. Grandparents, parents and children all attend the practice secure in the knowledge that their long-term dental health is receiving the highest level of care. That has now reached the point where one member of the family returns from Germany to receive his treatment. Additionally, Dr Woods came to the professional aid of a very frightened patient who had been hit in the face by the boom of a sailing boat at a regatta on a weekend. He carried out the necessary emergency dental treatment and supported her and the family, and referred her to a specialist who succeeded in fully restoring the damaged teeth."

Dr Robin Foyle receives his award from Claudia Long of GSK.

Dr Robin Foyle

Judges' citation: "One of the least common life-threatening emergencies in all healthcare services is anaphylactic shock. And although rare, it is the most serious, requiring immediate appropriate treatment by a highly-trained dentist and his dental team for the patient to survive. A worrying aspect of anaphylactic shock is that anyone who has suffered it once, is much more likely than the rest of the population to suffer another similar episode. In the light of that fact, accepting a patient with a history of anaphylactic shock requires careful consideration and then diligent preparation. Dr Foyle's treatment of his patient over many years is testament to his professionalism and care."

Sir Betram Windle, President of UCC 1904-1919.
(Photo courtesy of UCC College Archives).

Student treatment, circa 1940s.
(Photo courtesy of Gerald Fitzgerald.)

Old Dental Hospital entrance.
(Photo courtesy of PJ Byrne.)

A century of dental education: the Cork University Dental School and Hospital, 1913-2013

DR JOHN BORGONOVO and PROFESSOR DENIS O'MULLANE take us through the fascinating history of one of Ireland's great dental institutions.

The foundation of the Cork University Dental School and Hospital 100 years ago followed a confluence of related events. Internationally, dentistry was becoming professionalised, following similar advances in modern medicine across the industrial world. Nationally, health officials in Britain and Ireland (still governed as part of the United Kingdom) were creating formal dental education and credentials via third-level institutions. Locally, University College Cork was experiencing a remarkable period of growth under perhaps the most dynamic president in its history. Together these factors produced an enduring dental education institution that has made a significant contribution to the Irish dental profession and improved dental health in Munster.

The dental school at Cork followed similar trends in dentistry and medicine around Europe and Britain during the same period. Public health became a higher governing priority in newly industrialised societies. Medical practice required more sophisticated education, and those who possessed it wanted to differentiate themselves from untrained healers. This resulted in the creation of modern medical professional education at recognised third-level institutions, and the emergence of medical registers. In British and Irish dentistry, these programmes developed in the second half of the nineteenth century. In 1860, the Royal College of Surgeons created the License in Dental Surgery (LDS) qualification. The Dentists Act of 1878 established a register of qualified dental practitioners, and two years later the precursor to the University of Birmingham started offering Britain's first Bachelor in Dental Surgery (BDS) degrees. In Ireland, a dental school opened in Dublin during 1884, the same year the Royal College of Surgeons (Dublin) created a chair in dentistry. In 1904 Trinity College Dublin began to offer BDS degrees, followed in 1908 by University College Dublin. The clinical component of the school's dental degrees was hosted at the Dental Hospital of Ireland (later the Dublin Dental School and Hospital), which was purpose built in 1899. Through the intercession of University College Cork President Sir Betram Windle, Cork was not long in entering the new Irish dental scene.

Foundation of UCC Dental School and Hospital

Regarded as perhaps UCC's most influential president, in 1909 Windle oversaw the transition of Queen's College Cork into University College Cork, as a constituent school of the new National University of Ireland (NUI). Windle strongly preferred a so-called 'independent Munster university' model outside NUI governance, similar to the status given Queen's University Belfast. "Educational Home Rule" in Cork, as Windle described it, also complemented his commitment to Irish Home Rule, then the most pressing political issue in Ireland.

To strengthen his case for an independent Munster university, Windle rapidly expanded UCC. He established new chairs, schools and disciplines in such areas as archaeology, economics, education, German, hygiene, Irish, mathematical physics, medical jurisprudence, music, ophthalmology, pathology and natural history. Student

The 1959 graduating class and hospital staff (from left):
FRONT ROW (seated): Eric Scher; Sister Monica (matron); Ned Murphy; Jack Daunt (Dean); Dan O'Mahony; Michael Roach; and, Tony Hunt.
SECOND ROW: Paddy Hackett; John O'Sullivan; Breda Ryan; Kieran Nolan; Barry Collins; Dave O'Meara; Kay O'Leary (O'Driscoll); Angela Kearns (Philpott); Brenda Power (O'Regan); Vincent Allen; Tom Walsh; Sheila Downing; Joe Power; Aylmer Barrett; and, Tony McHale.
BACK ROW: Noel Power; Bob Fitzgerald; Don Coughlan; Billy Aherne; Mark Buckley; John Power; Brendan Murphy; and, Charlie Foley.
(Photo courtesy of Gerald Fitzgerald.)

numbers climbed rapidly. In the previous 15 years the average first-year student entry was 50 students, but by 1910-1911 that number had jumped to 181. Before arriving in Cork, Windle served as Professor of Anatomy and the first dean of the University of Birmingham Medical School. There he was exposed to Birmingham's successful Dental School and Hospital, which likely inspired his dental initiative at UCC. Although Windle ultimately failed to secure an independent Munster university, the new dental school was one of his many UCC legacies.

At this time Cork had a population of 75,000, and serviced many remote communities in the province of Munster. Qualified dentists in Cork (possessing either an LDS or BDS) competed with unregistered dentists, and were outnumbered by 20 to 14. In 1912 Windle asked the city's registered dentists to spearhead the proposed school and hospital. Twelve of Cork's 14 registered dentists joined the dental hospital as honorary staff, essentially running the school without pay for the next half century. Cork's early teaching staff seemed to have intended to strengthen dentistry in Cork as a scientific, ethical and respectable profession.

On March 7, 1913, the Medical Faculty of UCC approved the degree of Bachelor in Dental Surgery (BDS). Students would receive academic courses at UCC and clinical training at a newly established dental hospital. Two of the hospital staff held lectureships at UCC, which were part time and unpaid. Student clinical instruction was carried out under the auspices of the publicly financed North Charitable Infirmary (or 'North Infirmary), located in the impoverished Shandon neighbourhood on the city's north side. The dental hospital was situated across the road from the North Infirmary, in a converted butter warehouse (a remnant of the city's once global butter trade) that provided only about 1,600 square feet. For lectures, students commuted from the hospital to the university. Because of the part-time status of the 12 hospital staff, students attended some lectures in the waiting room of their teachers' private practices, of which seven were located in the South Mall in Cork.

Early years

The initial degree course offered a first year of pre-dental, consisting of physics, chemistry and anatomy; a second year consisting of anatomy, physiology and histology; a third year consisting of pathology, surgery, medicine, dental surgery, dental mechanics and anaesthetics; and, a fourth year to consist of dental mechanics, dental surgery, dental hospital practice, orthodontia and dental materia medica. A fifth year was added soon thereafter. Exams were held under the auspices of the NUI, under the external supervision of notable dental researchers from Britain. Initial students were admitted in 1913, and the first BDS qualifications awarded in 1915. Some of the early students were practising dentists seeking an LDS to join the Dental Register. The first woman qualified in 1918, while women joined the hospital teaching staff in 1925.

The dental school was founded amid the political turmoil of the 1916 to 1923 period, and shootings sometimes occurred near the hospital. Though the conflict did not directly touch the school, it did severely damage public funding options. During 1920-1922, local rate collections dropped by 50%, while economic damage caused by Crown forces and IRA guerrillas stretched Cork's public finances to breaking point. The new Irish Free State was essentially broke, which left Cork with very scanty resources to operate a new dental hospital. Fortunately, the Cork Dental Hospital was run effectively and inexpensively. Teaching staff were unpaid, which greatly reduced costs. A stream of paying patients generated enough income to cover supplies and maintenance, while technical services at the hospital provided revenue from dentists in private practice. However, throughout this period the school and hospital survived on slim margins. Describing the hospital as "charitable rather than semi-charitable", Dr Eric Scher noted that fees frequently went unpaid. Hospital equipment was limited, space was confined, and there was essentially no library. During the Great Depression, new enrolment dropped to an average of two students, and no students qualified between 1930 and 1932.

The new Cork University Dental School and Hospital at Wilton.
(Photo courtesy of Cork University Dental School and Hospital.)

Conservation Room in use.
(Photo courtesy of PJ Byrne.)

A loyal staff of volunteer teachers kept the school going, usually devoting one or two unpaid mornings to the hospital. Dental lecturers in the medical faculty at UCC also served on a part-time, unpaid basis. The teaching staff seemed attracted by the prestige of association with the school, professional interest in dentistry, and an enjoyment of passing on knowledge that recalled the old days of dental apprenticeships. The hospital was run on a co-operative model, with the school dean acting as a chairman answerable to his staff, as well as the Governing Authority of the North Infirmary Hospital and the President of University College Cork. There was very little interaction between UCC and the North Infirmary.

The dominant figure in this period was Israel Scher, a founding member of the hospital who served as dean from 1933 to 1949 and brought the first dental x-ray machine to Ireland in 1922. A member of Cork's small Jewish community, Scher established a dental dynasty. His four sons Eric, Gerald, Leslie and Ivor qualified at UCC, and three became respected dental educators in their own right.

Since few of the staff possessed advanced academic credentials, the school emphasised clinical skills, which were developed through abundant student chair time. Students were relatively weak on dental theory but quite strong on extractions, dentures, fillings and crowns. High Irish poverty produced endless patients seeking low-cost dental treatment. Extensive practical training made Cork graduates immediately employable abroad.

The establishment of the National Health Services (NHS) in Britain after the Second World War fundamentally changed the Cork University Dental School and Hospital. Free dental healthcare in Britain created a high demand for dentists. Cork's student numbers went up dramatically, with 12 first-year students registered in 1944, an increase of almost 400% from 1942. Space was found to expand the hospital to 3,500 square feet, barely enough to accommodate the ten chairs necessary for additional students.

Students who qualified throughout the late 1940s and 1950s essentially became an Irish export to Britain. A number of graduating classes saw all members emigrate. Pay in Britain was very high by Irish standards, and a number of Cork dentists earned enough to return to Ireland and set up their own practices. However, rising to the challenge of the new NHS, the 1944 'Teviot Report' called for standardised British dental education, including more rigorous screening of dental schools whose graduates were allowed to practise in Britain. British General Dental Council visitations tried to maintain dental teaching standards. One such visitation to Cork nearly brought the school to a premature end.

Saving the Dental School

In 1961 the British General Dental Council visitation committee produced a devastating report on the state of the Cork University Dental School and Hospital. It found that while hospital standards and professionalism were adequate, facilities were substandard. Equipment had become antiquated, there was not enough hospital space and students lacked support services. In addition, the absence of full-time, qualified lecturers was deemed unsatisfactory. The Council gave Cork four years to repair its deficiencies, or face the loss of recognition of its degree. That step would have prevented Cork graduates from practising in Britain and Northern Ireland, which would have resulted in a severe drop in student numbers and the probable closure of the school.

Staffing and facility issues at the Cork Dental School and Hospital reflected wider problems in Irish higher education. A visitation report for the Incorporated Dublin Dental Hospital during the same period also demanded the construction of a new hospital and the hiring of full-time staff. The lack of full-time staff differentiated Irish and British dental education – by 1961 no British dental school had fewer than 15 full-time teaching positions (either college lecturers or hospital instructors). The use of unpaid teaching staff was not unique to Irish dentistry, as UCC's Medical School likewise lacked full-time clinical instructors. By the late 1950s its qualification was no longer accepted in a number of states in America. Generally, Irish universities had been

woefully under-funded since the Second World War, although these deficiencies were slowly rectified in the 1960s.

In 1963 school dental staff, the UCC president, and the North Infirmary Committee of Management collaborated to save the school. Representatives convinced Minister for Education Dr Patrick Hillery to commit the government to:

(a) build a new dental hospital in Cork;
(b) finance four full-time chairs in dentistry at UCC, one of which was to be the hospital's director of dental studies; and,
(c) provide an immediate grant of £17,000 to update antiquated equipment.

Later that year Dr Hillery announced the proposed construction of a new regional hospital at Wilton, Cork (now Cork University Hospital, or CUH), which would include a new dental hospital. By 1965 the school had been further bolstered by the filling of three full-time dental chairs at UCC, and the receipt of a second government capital grant of £30,000. Much to the relief of staff and students, the critical 1965 General Dental Council visitation report recommended continued recognition of the Cork degree. However, it also warned, "the facilities for teaching dental surgery in Cork are insufficient", and added pointedly, "there is no accommodation which could possibly be regarded as belonging to a dental school". Future recognition would depend on the building of a new dental hospital, which, unfortunately, was still in the planning stages.

In the meantime, the school's staff and governance changed. Professor Brian Barrett assumed the position of dean, replacing Jack Daunt, who had first joined the staff in 1918. Barrett would combine foresight with decisiveness throughout his long tenure in Cork. University College Cork also took over governance of the hospital from the North Infirmary Governing Board, setting up the new Dental Hospital Advisory Committee.

Trouble reappeared in 1967 with the long-awaited Commission on Higher Education report, which questioned building two new dental hospitals in the State. It was followed by similar recommendations in the Economic and Social Institute's 'Kaim-Caudle' report. By 1972, the Higher Education Authority's (HEA) 'Report on University Reorganisation' had advised the Minister for Education to retain a single dental school in the state, to be located in Dublin.

The HEA report was prepared just as the Cork Hospital Board was about to invite tenders to build the Regional Hospital and Dental

Treating a patient, old hospital, circa 1982.
(Photo courtesy of PJ Byrne.)

Cork University Hospital, John Redmond Street.

School and Hospital in Wilton. Afraid that this step might commit the State to a dental hospital it did not want, the Department of Education asked the Cork Hospital Board to remove the dental component from its plans. It seemed as if the dental school was now living on borrowed time.

Fortunately, good leadership saw the school through the worst crisis in its history. University President Dr Donal McCarthy provided limited support to the dental school. However, a 'College Working Party', comprised of two dental staff members (Professor Brian Barrett and Finbarr Corkery), the university finance officer (Michael F Kelleher), and a member of the University Governing Body (FL Jacob) worked to refute the HEA recommendation on educational, financial and demographic grounds. Essentially, they argued that the decision was based on speculative cost estimates, would limit national dental intake to an inadequate number, and did not account for the school's professional and public health contributions to dental health in Munster. The Working Group's arguments were publicised, giving credible reasons to save the dental school.

Cork's past and present students rallied to the school's defence. Leaders of the Munster Branch of the Irish Dental Association formed the 'Dental Hospital Retention Committee' under the leadership of Tim O'Riordan. Dentists in Munster and elsewhere donated to a fighting fund that paid for a public relations campaign to save the hospital. Current dental students became the highly visible face of the 'save the dental school' campaign. In November 1973, Cork students joined Dublin dental students in a one-day strike that closed their respective hospitals, to protest the State's failure to provide new facilities. During the following months students leafleted Cork and collected signatures for a 'save the school' petition. Their lab coats became a familiar presence in Cork streets while gathering a remarkable 38,000 signatures.

The Cork Dental School enjoyed unique political leverage. Valuable assistance came from the colourful Fianna Fáil TD Gus Healy, a dental technician whose constituency included the Dental Hospital. Taoiseach Jack Lynch also represented the north side and had been born near the dental hospital. After Lynch's government fell in 1973, the critical Minister for Education portfolio eventually passed to Fine Gael's Peter Barry, another Cork City TD. These amenable politicians represented generations of constituents who had received low-cost dental care at the hospital.

In late 1974 Minister for Education Richard Burke announced that the State would retain two dental schools, and that a new Cork dental hospital would be constructed with the new regional hospital. Planning proceeded in 1975, despite a public letter issued by the Dublin Dental Hospital staff questioning the Minister's decision. The following year Minister Burke informed the Cork Hospital Board that construction could not begin owing to budgetary constraints. However, a new round of lobbying by school officials and students yielded a commitment from Minister of Education Peter Barry to finance the project. The building was ultimately completed in 1981, though a fire destroyed much of the structure during the moving in process, causing £375,000 in damages. After repairs, the new hospital at Wilton opened on March 5, 1982.

Making a modern dental school

The Cork University Dental School and Hospital used its Wilton facilities as a springboard into new areas of dental education and research. The single location allowed for the integration of different educational programmes, much to the benefit of each unit.

The training of dental nurses developed in Britain in the 1940s, but did not begin in Cork until Professor Louis Buckley initiated a programme in 1971. Over the next 20 years, Eilish O'Mahony expanded the dental nursing course, which now exists as an 18-month (part-time) diploma. Since 2004, the National Dental Nurse Training Programme of Ireland (NDNTP), jointly operated by the Cork and Dublin dental schools, has provided remote dental nursing education to facilitate students living outside Cork and Dublin. In 2009, Cork began a clinical training initiative to allow student dental

nurses to gain their clinical experience at the Cork Dental Hospital, rather than as trainee nurses in practice. Currently the school has 32 dental nursing students undertaking a diploma on site, and an additional 10 at the Waterford IT outreach centre. In 1993, Cork opened the School of Dental Hygiene, with Professor Buckley as its first director and Anne O'Keefe as tutor. The two-year full-time programme features both classroom and clinical components undertaken at University College Cork and the Cork Dental School. Today, 14 first-year hygiene students are enrolled at Cork.

Cork has served as a regional centre of professional development since the school's foundation. The school maintains an ambitious continuing professional development programme of forums, seminars and special clinics. The school uses both its facilities and personnel to provide educational services to dental practitioners across Munster.

Cutting-edge research conducted at Cork has improved the school's educational programmes, and dates back to the State's first fluoridation efforts. The Health (Fluoridation of Water Supplies) Act of 1960 directed local authorities to add fluoride to water supplies, but also mandated regular monitoring to detect any reduction of dental decay. In 1965 the Department of Health established the new 'Special Studies in Dental Caries and Fluorides' unit in the UCC Dental School and Hospital to undertake this monitoring. Headed by Dr Chris Collins, the 'Special Unit' started a tradition of important epidemiological dental research undertaken in Cork.

Epidemiological research advanced through the opening of the Oral Health Services Research Centre (OHSRC) in 1983, under the direction of Professor Denis O'Mullane, and now located in a separate structure adjoining the Dental Hospital. The OHSRC completed the Department of Health's 1982 National Survey of Children's Dental Health, to measure the long-term effectiveness of water fluoridation. The Centre also undertook the third National Survey of Children's Dental Health in 2002. From 1984 to 1994, the OHSRC engaged in several dental epidemiological studies on behalf of the EU, industry and individual heath boards throughout Ireland. Since 1987, the OHSRC has been designated a World Health Organisation Collaborating Centre, and is regarded as one of Europe's most successful dental research units. The current President of the International Association for Dental Research, Professor Helen Whelton, has served as the OHSRC Director since 2005.

In recent years Cork University Dental School and Hospital has developed a strong reputation for high-quality research in a number

Conservation Room, old hospital.
(Photo courtesy of PJ Byrne.)

New clinic.

New clinic chair.

of areas, including prosthodontics, dental materials, orthodontics, and paediatric dentistry. Much of this research has a clinical focus, with numerous randomised controlled clinical trials completed within the Dental Hospital. The school enjoys a particularly high international profile in geriatric oral research, based on significant grant income, high-quality publications, and multi-disciplinary and collaborative research conducted at the national and international level. Recent recognition includes Professor Finbarr Allen's 2011 Distinguished Scientist Award in Geriatric Oral Health, given by the International Association for Dental Research. In 2012, Dr Gerry McKenna won both the Senior Clinical Hatton Award from the International Association for Dental Research, and the GABA Research Prize from the European College of Gerodontology.

Advanced research has also bolstered Cork's postgraduate degree programmes. The school has developed the popular Masters Degree in Dental Public Health (MDPH), and opened the Postgraduate Orthodontic Centre in 2006. It also offers a taught Doctorate in Clinical Dentistry (Oral Surgery and Orthodontics), while the OHSRC currently hosts eight PhD students. Many former Cork researchers now occupy senior positions in the academic and services field in Ireland and overseas.

The next century

The current Cork University Dental School and Hospital would likely have exceeded the expectations of even the most optimistic of the school's founders. The school caters to 225 BDS students and 20 postgraduates. The hospital operates a 90-chair facility, and is equipped to deliver both advanced dental education curricula and specialised dental services. Entering its second century, the Cork University Dental School and Hospital faces a national crisis in public funding. However, like his predecessors, school dean Professor Finbarr Allen retains skilled part-time and full-time staff members who are devoted to the institution. The institution's history has demonstrated that with such material even the most serious challenges can be overcome, to ensure that Cork continues as a leader in Irish dental education.

Acknowledgements

This article was written with the assistance of Mary Harrington, Anne O'Keefe, Dr PJ Byrne and Dr Gerald McKenna.

Can you help?

The authors are currently writing a history of the Cork University Dental School and Hospital, to be released as part of its centenary celebrations. They ask that anyone possessing photos, documents or other material relevant to the history of the school, please contact the authors at uccdentalhistoryproject@gmail.com.

Bibliography

Commission on Higher Education. 1960-67 Report. Dublin: Stationery Office; 1967.

Gamble, R.G. *History of the Cork Dental Hospital and School from 1913-1982.* Private Publication; 1982.

Irish Dental Association. Fluoridation in Ireland. *Journal of the Irish Dental Association* 2012; 58 (Suppl.).

Kaim-Caudle, P.R. Dental Services in Ireland. Dublin: The Economic and Social Research Institute; 1969.

Keogh, A. *Betram Windle: The Honan Bequest and the Modernisation of University College Cork, 1904-1919*. Cork: Cork University Press; 2010.

Lee, J.B. *The Evolution of a Profession and of its Dental School in Dublin*. Dublin: Linden Publishing; 1992.

McCarthy, MD. Cork Dental School and Hospital. *Cork University Record* 1973; 48.

Murphy, J.A. *The College: A History of Queen's/University College Cork*. Cork: Cork University Press; 1995.

O'Sullivan, D.J. *The Cork School of Medicine, A History*. Cork: University College Cork; 2007.

Russell, J.G. Evolution of the Dental School. *Cork University Record* 1969; 44.

Scher, E. Dentistry. *Cork University Record* 1944; 2.

Keral® 25 mg granules for oral solution (dexketoprofen). Prescribing Information. Please consult the Summary of Product Characteristics (SPC) for full prescribing information.

Presentation: Sachets containing 25 mg Dexketoprofen, as dexketoprofen trometamol).

Use: Short term symptomatic treatment of acute mild to moderate pain.

Dosage: Adults: 25mg every 8 hours or 12.5mg every 4-6 hours. Maximum daily dose 75mg. Use lowest effective dose for the shortest duration necessary to control symptoms. For acute pain administer 15 minutes before meals. For short term use only. In the elderly or those with mild-moderate hepatic dysfunction or mild renal dysfunction, initial maximum daily dose of 50mg. Close monitoring advised in the elderly or those with hepatic dysfunction. Not recommended for children or adolescents.

Contra-indications: Hypersensitivity to dexketoprofen, the excipients or other NSAIDs, NSAID induced attacks of asthma, bronchospasm, acute rhinitis, or nasal polyps, urticaria or angioneurotic oedema. Known photoallergic or phototoxic reactions during treatment with ketoprofen or fibrates. History of gastrointestinal bleeding or perforation related to previous NSAIDs therapy. History of or active peptic ulcer/haemorrhage, chronic dyspepsia or suspected peptic ulcer/haemorrhage, other active bleeding or bleeding disorders, Crohn's disease or ulcerative colitis, severe heart failure, moderate-severe renal dysfunction, severe hepatic dysfunction, haemorrhagic diathesis and other coagulation disorders, severe dehydration, during the third trimester of pregnancy and lactation.

Warnings and precautions: Caution in allergic conditions. Avoid use with concomitant other NSAIDs including COX-2 selective inhibitors. Use lowest effective dose for the shortest duration necessary to control symptoms. Gastrointestinal bleeding, ulceration or perforation which can be fatal, have been reported with all NSAIDs at anytime during treatment, with or without warning symptoms or a previous history of serious gastrointestinal events. When gastrointestinal bleeding or ulceration occurs withdraw treatment. The risk of gastrointestinal bleeding, ulceration or perforation is higher with increasing NSAID doses, in patients with a history of ulcer, particularly if complicated with haemorrhage or perforation, and in the elderly. The elderly have an increased frequency of adverse reactions to NSAIDs especially gastrointestinal bleeding and perforation which may be fatal. Commence treatment in these patients on the lowest dose available. Ensure cure of oesophagitis, gastritis and/or peptic ulcer before starting treatment. Monitor patients with history of GI disease. Special care with NSAIDs in patients with a history of gastrointestinal disease (ulcerative colitis, Crohn's disease). Consider combination therapy with protective agents (e.g. misoprostol or proton pump inhibitors), and in patients requiring concomitant low dose aspirin, or other drugs likely to increase gastrointestinal risk. Monitor patients with a history of gastrointestinal toxicity, particularly when elderly, for unusual abdominal symptoms (especially gastrointestinal bleeding) particularly in the initial stages. Caution in patients receiving oral corticosteroids, anticoagulants, SSRIs or anti-platelet agents. Do not use with warfarin, other coumarins or heparin. Caution in patients with impaired renal function, receiving diuretic therapy or those who develop hypovolaemia. Ensure adequate fluid intake, may increase plasma urea nitrogen and creatinine. Caution in patients with impaired hepatic function. May increase some liver parameters. Monitor and advise patients with hypertension and/or mild to moderate heart failure. Special caution in patients with cardiac disease, especially episodes of previous heart failure. Monitor and advise patients with a history of hypertension and/or mild to moderate congestive heart failure as fluid retention and oedema have been reported. Some NSAIDs (particularly at high doses and long term treatment) may be associated with a small increased risk of arterial thrombotic events (e.g. myocardial infarction or stroke). Careful consideration before treating patients with uncontrolled hypertension, congestive heart failure, established ischaemic heart disease, peripheral arterial disease, and/or cerebrovascular disease. Similar consideration before initiating longer-term treatment of patients with risk factors for cardiovascular disease (e.g. hypertension, hyperlipidaemia, diabetes mellitus, smoking). Serious skin reactions (some of them fatal), including exfoliative dermatitis, Stevens-Johnson syndrome, and toxic epidermal necrolysis reported very rarely. Discontinue treatment at the first appearance of skin rash, mucosal lesions, or any other sign of hypersensitivity. Particular caution in patients with congenital disorder of porphyrin metabolism, dehydration, directly after major surgery. If long term use necessary, monitor hepatic and renal function and blood count. Stop treatment at first signs of severe hypersensitivity reactions. Avoid use with varicella. Caution in patients with haematopoietic disorders, systemic lupus erythematosus or mixed connective tissue disease. As other NSAIDs, dexketoprofen can mask the symptoms of infectious diseases. Contains sucrose.

Interactions: Other NSAIDs, anti-coagulants, heparins, corticosteroids, lithium, methotrexate, hydantoines and sulphonamides, diuretics, ACE inhibitors, antibacterial aminoglycosides and angiotensin II receptor antagonists, pentoxyfilline, zidovudine, sulfonylureas, beta-blockers, cyclosporin and tacrolimus, thrombolytics, anti-platelet agents and SSRIs, probenecid, cardiac glycosides, mifepristone, quinolone antibiotics.

Pregnancy and lactation: Do not use in pregnancy, lactation or in women attempting to conceive.

Undesirable effects: As with other NSAIDs, the most commonly observed adverse events are gastrointestinal. Peptic ulcers, perforation or gastrointestinal bleeding, sometimes fatal, particularly in the elderly may occur. Common (1-10%): Nausea and/or vomiting, abdominal pain, diarrhoea, dyspepsia. Uncommon (0.1-1%): insomnia, anxiety, headache, dizziness, somnolence, vertigo, palpitations, flushing, gastritis, constipation, dry mouth, flatulence, rash, fatigue, pain, asthenia, rigors, malaise. Rare (0.01-0.1%) anorexia, paraesthesia, syncope, hypertension, bradypnoea, peptic ulcer, peptic ulcer haemorrhage or peptic ulcer perforation, hepatic lesion, urticaria, acne, increased sweating, back pain, polyuria, menstrual disorder, prostatic disorders, peripheral oedema, liver function test abnormal. Very rare (<0.1%) neutropenia, thrombocytopenia, anaphylactic reaction including anaphylactic shock, blurred vision, tinnitus, tachycardia, hypotension, bronchospasm, dyspnoea, pancreatitis, hepatocellular injury, Stevens Johnson syndrome, toxic epidermal necrolysis (Lyell's syndrome), angioedema, facial oedema, photosensitivity reactions, pruritus, nephritis or nephrotic syndrome. Not known: laryngeal oedema, hepatitis, acute renal failure. As with other NSAIDs the following undesirable effects may appear: aseptic meningitis, which might predominantly occur in patients with systemic lupus erythematosus or mixed connective tissue disease; and haematological reactions (purpura, aplastic and haemolytic anaemia, and rarely agranulocytosis and medullar hypoplasia).

Pack size: 20 sachets. **Legal category:** POM.

Marketing authorisation number: PA 865/2/5

Marketing authorisation holder: Menarini International Operations Luxembourg S.A., 1 Avenue de la Gare, L-1611 Luxembourg.

Marketed by: A.Menarini Pharmaceuticals Ireland Ltd Further information is available on request to A.Menarini Pharmaceuticals Ireland Ltd, 2nd Floor, Castlecourt, Monkstown Farm, Monkstown, Co. Dublin, Ireland or may be found in the SPC.

Date of preparation: November 2011.

A.MENARINI
PHARMACEUTICALS IRELAND LTD
Healthcare for Life

Date of item: May 2012
12Keral016

Prevention of sports-related injuries

The Association recently adopted a policy on the use of mouthguards in sport.

The Irish Dental Association promotes the use of mouthguards (gumshields) in sports to prevent injury to the mouth and teeth, particularly in contact sports. The Association supports the mandatory use of properly fitting mouthguards in organised activities that carry a risk of orofacial injury. The Association also supports the education of the general public and sports personnel in the prevention of orofacial injuries in various sporting and recreational activities.

The majority of traumatic dental injuries occur to the upper front teeth in adults and children. The use of a properly fitting mouthguard can reduce the incidence of injuries to the teeth and surrounding tissues. A mouthguard should fit properly, adequately cover the teeth and stay in position during impact. Particularly for children who are actively growing, the fit of the mouthguard will need to be revised frequently to maintain good protection. Mouthguards should be worn during training as well as in competitive games.

Fitting mouthguards

There are three types of mouthguard:

- individualised mouthguards are custom fabricated following an accurate dental impression by your dentist. They are made to fit exactly to the shape, size and bite of each player. These mouthguards provide the best comfort, protection and design. The colour of the mouthguard can be customised. A full dental examination is advisable before making a custom-fitted mouthguard. They are less bulky and more comfortable to wear than other types of mouthguards;
- pre-formed or 'boil and bite' mouthguards. These are available in a limited range of sizes and can be moulded to the mouth when softened in hot water. These tend to be bulky, less retentive and offer limited protection to the teeth compared to a custom-fit mouthguard; and,
- stock mouthguards. These are also pre-formed mouthguards in a range of sizes. They fit over the dental arches and do not mould to the teeth. Their retention depends on biting the mouthguard to keep it in place, which means that the player cannot speak or breathe without being aware of the mouthguard position. These provide the least amount of protection.

Teams should have a dentist on call

Poorly fitting mouthguards are less likely to be worn, and can irritate tissues and reduce protection. Your mouthguard should be regularly examined for fit and retention. Your dentist can advise you of the best type of mouthguard that provides adequate protection in your situation, e.g., growing child, wearing braces, type of sport, etc.

Participants in organised sporting activities (players, team doctors, physiotherapists, parents and coaches) should also be aware of how to deal with unexpected dental trauma. Since sporting events and training often occur outside normal working hours, it is important that all teams have a dentist on call to help with injured players. Immediate attention is required to maximise the successful outcome of any dental injury.

For more information on mouthguards and traumatic injuries to the mouth, contact your local dentist and refer to www.dentaltraumaguide.com.

All hands together

The Association's Annual Conference takes place in April this year in Galway and its terrific content will attract all dental professionals.

Packed with world-renowned speakers from home and abroad, this year's Annual Conference offers a superb mix of science, education and social activities. Dentists are encouraged to book early for all aspects of the Conference, which opens with a series of hands-on pre-Conference courses on Thursday April 17. These courses are on adhesive dentistry (led by Dr John Kanca III); endodontics (led by Dr Hal Duncan); componeers (led by Dr Garry Heavey); and, medical emergencies (led by Mr Tevor McNulty).

Friday is Dental Team Day, with presentations ranging from head and neck cancer to leadership, communications, and what promises to be a fascinating session entitled 'The human symphony' with the well-known conductor David Brophy.

There are parallel sessions on the Saturday, which is deemed Dentists' Day. Both programmes operate from 9.00am to 5.00pm with the usual breaks, while nurses, hygienists and technicians all have dedicated programmes in adjoining rooms.

On the sporting front, the 5k Fun Run makes a welcome return at 8.30am on Saturday morning, while the golfers get to play the beautiful Oughterard course for the President's Prize on Sunday, with tee-times commencing 11.30am.

The Trade Show Party is on again on Friday at 5.30pm, while the Annual Dinner takes place on Saturday evening.

It's packed, it's educational and it's fun. So book now through IDA House. Telephone 01-2950072.

Dental Innovations in Cork

Henry Schein Ireland is hosting the Dental Innovations showcase on Thursday February 21 at the Moran Silver Springs Hotel, Cork. The event will take place from 10.00am to 9.00pm and will feature cutting edge technologies from dentistry's leading manufacturers, in conjunction with topical presentations given by keynote speakers from the dental profession. During the event special showcase deals will be offered.

Dentists are invited to call in to catch up on the very latest technology coming to the market, as well as to explore the range of products on show. The opening hours of the showcase are designed to allow dentists and their colleagues to call in at whatever time is convenient for them.

Better results with NSK

According to NSK, using its Ti-Max Z95L Series (1:5) speed increasing contra-angle, in combination with an electric micromotor, provides complete speed control, improves tactile sensation, and delivers an exceptionally smooth running bur. All of these advantages equate to more precise margins and potential for improved overall clinical results, states the company.

Well known dentist and trainer, Dr Paul Tipton, says: "The use of the Ti-Max Z95L speed-increasing handpiece is a must for the finesse of the preparation and for margin and retention features. With the support of NSK, I have been able to teach my delegates how to cut a more precise preparation. A high quality product offering superior performance and exceptional benefits".

The Ti-Max Z95L speed increasing contra-angle uses the same burs as a turbine; however, with the advantage of delivering greater speed control throughout all the processes; high speed, high torque for gross reduction; slow speed, high torque for fine margin preparation; all tooth preparation procedures with just one contra-angle, says the NSK statement.

High-viscosity composite for exceptional stability

GrandioSO Heavy Flow is a high-viscosity flowable universal restorative with a very high filler content (83 w/w%) and, according to its manufacturer Voco, exceptional stability in comparison to conventional flow composites. Thus, Voco recommends it for any type of treatment that relies particularly on these qualities, such as treatment of class V cavities, restorations in the upper jaw area, and splinting of teeth in orthodontics, periodontics and traumatology. For composite restorations that are directly modelled in the mouth, the increased viscosity results in simplified and stress-free placement of the composite layers, coinciding with excellent wetting properties.

Due to its reduced flowability, GrandioSO Heavy Flow is outstandingly suited for all fillings where elaborate sculpting is either not required or not wanted. Grandioso Heavy Flow is available both in the non-running, non-dripping NDT syringe in twelve shades, and as caps in six shades.

Application of GrandioSO Heavy Flow after conditioning and bonding. Voco is offering a special deal of 20% savings on the GrandioSO Heavy Flow set with syringes or the Heavy Flow set with syringes and caps. This offer will be available from April 1 until September 30, 2013.

Quiz answers (questions on page 8)

1. **How many public holidays are there in Ireland?**
   There are nine public holidays each year:
   1. New Year's Day (January 1)
   2. St Patrick's Day (March 17)
   3. Easter Monday
   4. First Monday in May, June, August
   5. Last Monday in October
   6. Christmas Day (December 25)
   7. St Stephen's Day (December 26)
2. **How long is maternity leave?**
   A pregnant employee is entitled to 26 weeks' basic maternity leave during which most employees are entitled to receive a social welfare payment. Employees are entitled to avail of 16 weeks' additional maternity leave during which there is no social welfare contribution. The total maternity leave entitlement is 42 weeks.
   There is no statutory obligation on employers to pay employees while they are on maternity leave. An obligation may however arise where the written contract of employment states that the employee will be paid on maternity or by operation of custom and practice, i.e., if the particular employee or her co-workers previously received pay for maternity leave.
3. **Are you obliged to pay employees while they are on sick leave?**
   There is no statutory obligation on employers to pay employees while they are on sick leave. Similar to maternity leave, an obligation may however be created by the written contract of employment providing to that effect, or where a custom and practice has arisen in the particular workplace.

Society promotes conscious sedation

The recently formed Irish Society of Conscious Sedation in Dentistry (ISCSD) will hold its inaugural meeting on Thursday February 28 in the Dublin Dental University Hospital. The aim of the Society is to provide a forum for all those who are interested in the provision of conscious sedation in dentistry, in addition to helping to promote and develop this area of dentistry in Ireland.

All those with an interest in conscious sedation in dentistry are invited to attend. The meeting is CDE accredited (admission fee: €5) and will be followed by a wine reception.

The speaker is Dr Shelagh Thompson, Honorary Consultant in Special Care Dentistry, Lecturer in Conscious Sedation and Special Care Dentistry, School of Dentistry, Cardiff University. Shelagh will speak on 'Sedation And The Not So Young' in the Large Lecture Theatre, Dublin Dental University Hospital, at 7.30pm.

The Committee of the new Society: foreground – Dr Marie O'Neill, Chairman; rear – from left: Dr Mary Clarke; Dr Eileen MacCarthy; Professor Leo F.A. Stassen, Hon. President; Dr Gillian Smith, Hon. Secretary; Dr Danielle Quinlivan, Hon. Treasurer; Dr Dermot Canavan; and, Dr Veronica Fisher. Dr Paul Brady is absent from the photograph.

Making implantology more accessible

Dentsply Friadent has bought Astra Tech Dental and merged the two to form a new company, Dentsply Implants.

Chris Meldrum, Managing Director UK and Ireland, Dentsply Implants.

Dentsply Implants combines the strengths of the two companies that were already major players in the dental implant business. The new company has stated that it offers a comprehensive product range including trusted implant systems backed by more than a quarter of a century of continuous development: Ankylos®, Astra Tech Implant System™ and Xive®. Its portfolio incorporates some of the latest clinical and prosthetic innovations for the replacement of missing natural teeth, not least Atlantis™ patient-specific CAD/CAM abutments and Atlantis Isus™ CAD/CAM superstructures.

Commenting on what the advent of Dentsply Implants means for those involved in implant dentistry in the UK and Ireland, Managing Director Chris Meldrum said: "We are intensifying our efforts to help dental practices and dental laboratories increase their implant business, by making this life-changing treatment more accessible for the millions of people with missing teeth. We have an unrivalled combination of people, products, education and practical support to help our customers succeed, whatever their ambitions in implant dentistry. Our aim is to become dental professionals' preferred partner for implantology, by constantly striving to exceed their expectations on the issues that matter most".

DENTSPLY IMPLANTS

THE NEW POWERHOUSE IN IMPLANT DENTISTRY™

Helping you succeed

Trusted implant systems

ANKYLOS® ASTRA TECH IMPLANT SYSTEM XiVE®

Practice growth support

RELAX dentists4implants.com

Prosthetic digital innovation

ATLANTIS™ ATLANTIS ISUS™

Clinical skills development

courses4implants.com

Why not join us? www.dentsplyimplants.ie +44 (0)845 450 0586 implants.uk@dentsply.com

Dental implants and single implant-supported restorations

Abstract: Replacing missing teeth using dental implants is a good treatment option with a high degree of success. As the dental implantology field develops and the number of implants placed worldwide increases, several terms and techniques have been formulated. Therefore, a basic knowledge of dental implants is necessary for every dental student and dentist. The current article sheds light on how the dental implant integrates with its surrounding bone and what factors can affect this integration. The relationship between the implant and its surrounding soft tissue, different types of the dental implants, and the restorative components and procedures, are all reviewed.

Key terms: osseointegration; single dental implant ; single implant abutment; screw-retained; restoration; cement-retained restoration.

Journal of the Irish Dental Association 2012; 59 (1): 32-43.

Abdulhadi Warreth
BDS MDS PhD MFDS (Ireland)
Clinical Supervisor, Division of Restorative Dentistry and Periodontology,
Dublin Dental University Hospital

Emma McAleese
Fifth-year undergraduate dental science,
Dublin Dental University Hospital

Peter McDonnell
Fifth-year undergraduate dental science,
Dublin Dental University Hospital

Roumaissa Slami
Third-year dental technology,
Dublin Dental University Hospital

Suna Marie Guray
Fourth-year undergraduate dental science,
Dublin Dental University Hospital

Address for correspondence:
Dr Abdulhadi Warreth,
Division of Restorative Dentistry and Periodontology,
Dublin Dental University Hospital,
Lincoln Place,
Dublin 2,
Ireland.
E: warrethab@dental.tcd.ie

Introduction

The use of dental implants in replacing single and multiple missing teeth is proven to be a valid treatment with a high success rate.[1] To achieve the best treatment outcome in all implant systems, the implant has to be able to integrate with its surrounding tissue.

Several clinical studies have reported that, under optimum circumstances, a long-term rigid union between the implant surface and the surrounding bone can be achieved and maintained for indefinite periods of time.[2,3] Therefore, to maintain the rigid union, continuous remodelling of the bone supporting the implant in the presence of functional loading is essential. However, this integration is highly affected by several factors, such as bone quality, quantity and the implant loading condition.[1,2]

In general, dental implants usually consist of the implant body and the abutment to which the restorations are attached. To attach the restorative counterpart to the implant, an impression has to be made. The impression technique here is similar to that used in conventional prosthodontics work.

There are a variety of dental implant systems, and several terms and techniques have emerged with the use of dental implants. Some of these terms are confusing and knowing all of the terms and techniques is not easy.

This article provides clarification of the terms used in dental implantology, as well as an overview of the subject area, both of which are vital for every dental student and dentist.

Background

Bone-implant contact and osseointegration

The connection between implant surfaces and bone can be mediated by either connective tissue fibres or by intimate contact of bone and implant surface. While the former indicates a failure of any implant system, the latter is the objective of the implant surgery and is known as osseointegration. Commencement of either mechanism is influenced by many factors, which will be discussed later.[4,5]

Light microscopy of histological studies on retrieved osseointegrated and failed implants in humans and some animals revealed that

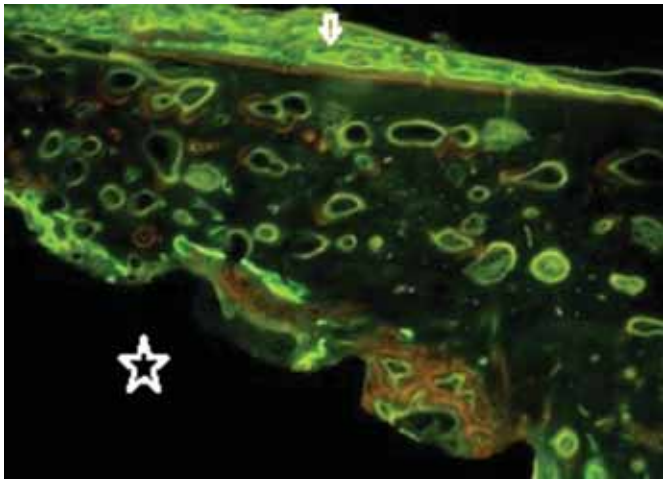


FIGURE 1: Fluoroscopy of a ground section three months after implant placement in a dog mandible. Bone remodelling and new bone formation can be seen, as indicated by the different chelating agents that were injected at different times during the three-month healing period. The implant is indicated by the white star and sub-periosteal new bone formation by the arrow.

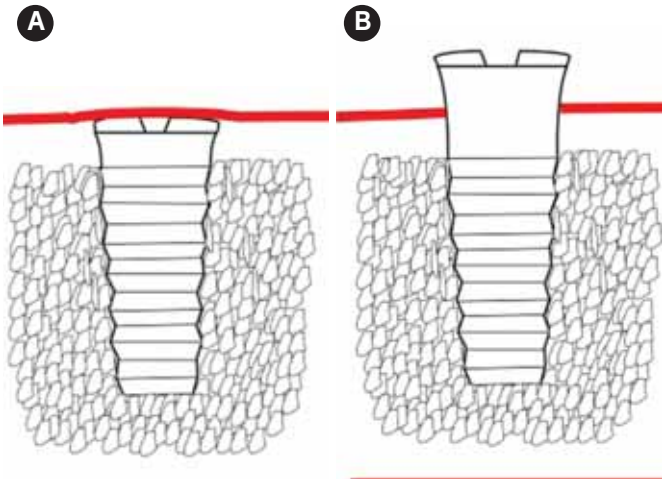


FIGURE 2: A schematic presentation of an implant placed according to the two-stage (a) and one-stage (b) implant placement methods. Note the trans-mucosal (the neck) part penetrating the overlying soft tissue in the one-stage method.

successful osseointegration shows direct apposition of bone on implant surface (**Figure 1**). However, Sennerby and co-workers[6] used an electron microscope to study the nature of the oral implant-bone interface of seven clinically stable "osseointegrated" titanium implants inserted in human jaws for one to 16 years, and concluded that the peri-implant bone was separated from the implant surface by an amorphous layer, 100-400nm in depth.[6] Bone is a load-bearing material that is able to adapt its inner structure and architecture to its mechanical environment.[7,8] This ability is controlled with a specific feedback mechanism that is not fully understood.[9] When the bone around the implant is loaded, its reaction to this load may take one of two routes depending on the load level. First, when the load is within the physiological limit, the bone will be stimulated to remodel and maintain its integrity, as continuous remodelling activity around the implant has been reported to occur. Second, when the loading level exceeds the physiological limit, excessive bone resorption occurs and consequently the implant fails.[10] Failure of oral implants as a result of occlusal overloading has been reported and experimentally demonstrated in animals. Excessive occlusal force on endosseous oral implants can result in complete or partial loss of osseointegration, with a narrow zone of soft tissue between them.[10] This may be attributed to microdamage in the bone surrounding the implant, which exceeds the repair potential of this bone and leads to the replacement of bone-implant interface with soft tissue. However, as the occlusal forces are difficult to quantify and most of the studies were conducted on animals, this makes drawing a strong conclusion on this matter difficult. Nevertheless, it is important to mention that generation of micro-cracks in the peri-implant bone was reported to occur during implant placement as well as during function. Therefore, in order to repair this damage and to maintain osseointegration, bone needs to constantly remodel.[11]

Implant-soft tissue interface

Several studies have reported that the soft tissue that surrounds an implant has similar features to the soft tissue that surrounds teeth.[12,13] Therefore, the peri-implant soft tissue consists of a junctional epithelium, which is attached to the implant or abutment surface through a hemi-desmosomal attachment. Apical to the junctional epithelium and coronal to the crest of alveolar bone, there is an area of connective tissue, which is in contact with the implant surface. Collagen fibres arise from the crest of alveolar bone and periosteum and are oriented parallel to the implant surface towards the oral epithelium. Circular and horizontal fibres, which run perpendicular to the implant surface, were also found in the area.[13] It seems that the implant-soft tissue interface makes a protective seal between the oral environment and the bone, which plays a vital role in the success of the implants.

Implant placement techniques and the placement time

Implant placement techniques can be classified as two- or one-stage procedures. In the two-stage technique (also known as the submerged technique) two surgical interventions are required. The first involves installing the implant body into the bone. A cover screw is then attached to the implant platform and covered by oral mucosa (**Figure 2a**). After three to six months, the second intervention occurs where the implant is exposed surgically and a healing abutment is attached. Thus, the abutment is completely separated from the implant body. The implant system used with this surgical method is usually a two-piece implant. This surgical approach allows the pre-implant tissue to heal without loading. It is suitable for use with most clinical situations, particularly when the implant placement is associated with bone grafting and when the quality of bone is not optimum. Examples of an implant system used for the two-stage

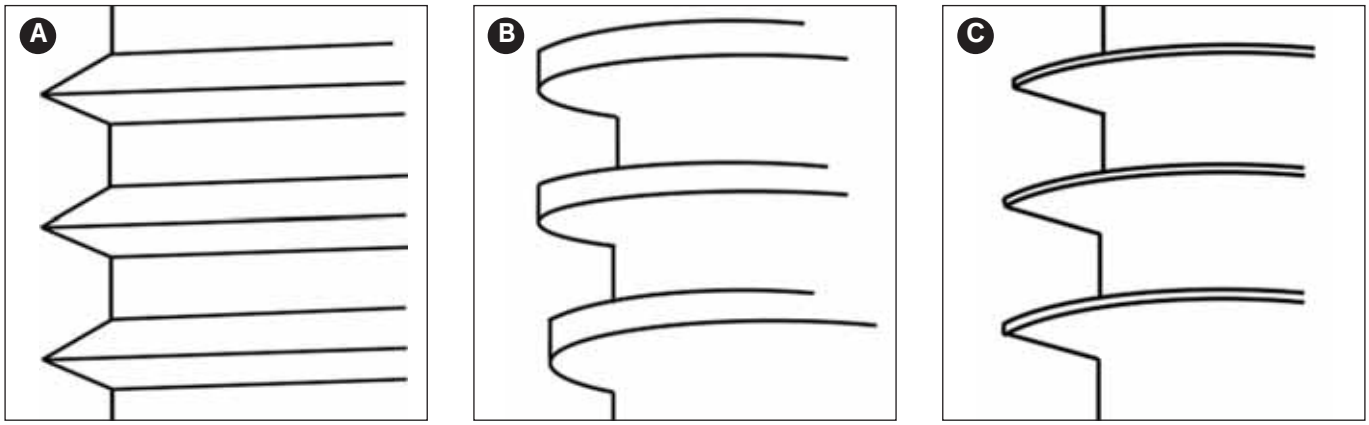


FIGURE 3: A representation of the most commonly used implant threads: a) v-shaped thread; b) square thread; and, c) a reverse buttress (modified from Todd et al.*, 1998).*[24]

procedure include the Fixture MK III® (Nobel Biocare), MAX 2.5® Implant (Bicon) and OSSEOTITE® 2 Certain Implant (Biomet 3i).

In the one-stage technique (also known as non-submerged), the coronal part of the implant is positioned above the crest of the alveolar bone, passed through the peri-implant soft tissue, and is left uncovered and exposed to the oral environment during the healing process (**Figure 2b**). In this technique, a restoration can be attached immediately to the implant or it may be attached later. With this surgery protocol, a one/two-piece implant system can be applied. Examples of the implants that can be placed using the one-stage technique include the Solid-Screw Implant® (Straumann), AdVent® Implant (Zimmer) and Single-stage Implant System® (BioHorizons).

Several studies have shown that the one-stage technique has some clinical advantages when compared with the two-stage method. These advantages include:

(i) the avoidance of a second surgical procedure;
(ii) the lack of a micro-gap at the bone crest level, resulting in a less crestal bone resorption;
(iii) the prosthetic procedure is simplified and less chair time per patient is required; and,
(iv) a non-loaded, immediate or delay-loaded protocol can be implemented.[12] Nevertheless, both surgical protocols can be clinically successful.[14]

The time at which the implant is placed after extraction of the tooth/teeth may be categorised as immediate, immediate-delayed and delayed.[15] Immediate is when the implant is inserted into a socket just after tooth extraction. Immediate-delayed placement is when the implant is placed weeks to a few months after tooth extraction, while delayed placement is when the implant is introduced thereafter.[15] With the immediate and immediate-delayed implant placement, the treatment time is shortened and the risk of bone resorption may be minimised. However, the risk of infection and its resulting implant failure cannot be overlooked.[15,16] Nevertheless, immediate implant placement may be the preferred choice for a good aesthetic outcome. When the implant is immediately placed after tooth extraction, a gap between the implant and the surrounding bone exists. This can be dealt with using bone augmentation techniques if required.

In conclusion, immediate implant placement may reduce bone resorption and preserve the crestal bone, which will improve the aesthetic outcome. However, factors such as a gingival tissue biotype, thin alveolar bone and the bucco-lingual position of the implant all have a strong effect on the potential bone resorption and gingival recession. Thus, good communication between the prosthodontist and the surgeon who will install the implant is important in order to achieve the best possible outcome.

Factors affecting osseointegration

Several factors have been found to affect osseointegration. These factors include: material biocompatibility; surface macrostructure (design) and microstructure (roughness); heat generation during the implant placement surgery; initial implant stability; bone quality; surgical technique; and, loading conditions.[2]

Material biocompatibility

Biocompatibility is the ability of a material to perform a suitable response in a specific environment.[17] Reaction of peri-implant bone, resulting in osseointegration, is an example of material compatibility. On the other hand, incompatible materials are usually encapsulated by a thick connective tissue and these materials will eventually be rejected by the body.

The most commonly used materials in dental implants are either bio-inert, such as commercially pure titanium (CP titanium) and titanium alloy, or bioactive ceramics such as hydroxyapatite (HA).[18]

Titanium is a non-noble metal that has the ability to form a very adherent self-repairing and protective surface oxide layer that prevents further titanium corrosion. It is used in oral implants in a pure form (99.75% pure) and as an alloy (Ti-6-AL-4V alloy) (90% Ti, 6% AL and 4%V). Available literature indicates that CP titanium has a successful long-term performance.

Ceramics are a compound made of a mixture of metals and non-metals. An example of a ceramic material is HA, a calcium phosphate.

It has been claimed that HA is capable of forming a direct biochemical bond with bone due to their similar chemical composition.[19] HA is used as an implant material to repair bone defects. It has also been used as an implant coating material due to its ability to accelerate bone healing and improve bone apposition around HA-coated implants as compared with titanium implants, resulting in better implant-bone integration.[20] Furthermore, the bone around the HA-coated implants was found to be more complete and more uniform than that formed around the CP titanium implant.[21] However, HA has poor mechanical properties and has therefore been used as a coating attached to the implant titanium substrate.[22] The possibility of its fragmentation and detachment from the substrate is a real problem that precludes its use in dental implants.

Implant design (surface macrostructure)

Implant design is one of three important reported factors on which implant primary stability depends.[23] Implant primary stability plays a major role in achieving osseointegration.[2,23] Currently, screw-shaped (threaded) implants are the most commonly used implant designs, while smooth cylinder implants (press-fit) are eliminated. In an experimental study on dogs, screw implants were found to have a better bone anchorage than the cylindrical implants.[24]

The most commonly cited thread shapes are v-shaped, square shaped or reverse buttress[25] (**Figure 3**). The threads are usually incorporated into the implant design to improve the initial stability and dissipate interfacial stress in a more favourable way. Thread features such as thread depth, thread thickness, face angle, pitch and helix angle are considered as factors that determine the functional thread surface and affect the biomechanical load distribution of the implant. The functional thread surface is that part of the thread which allows dissipation of compressive and tensile loads to the bone in a constructive manner.[26]

Implant surface texture

Implant surface texture is found to positively affect the healing of peri-implant tissue. The implant surface is usually roughened to increase its surface area, which is reported to encourage bone healing and provide long-term implant stability, particularly in areas with low bone density. In general, two methods for alteration of implant surface roughness (texture) have been described in the literature: additive or subtractive. In the former method, a biocompatible material such as titanium plasma-sprayed coating is added to the implant surface substrate,[27] while in the second some material is removed from the implant surface by blasting and/or acid etching.[27,28]

There is a general agreement that implants with rough surfaces exhibit an increase in implant bone contact when compared with the machined, smooth-surface implants. In one study by Lazzara and associates,[29] the amount of peri-implant bone for acid-etched implant rough surfaces and machined surfaces was estimated to be 72.96% and 33.98%, respectively.[29] However, exposure of the rough implant surface may facilitate plaque accumulation, which could be difficult to remove and will lead to infection and endanger the implant.[10]

Heat generation during the implant placement surgery

Controlling the heat generated during implant surgery is important in order to achieve uneventful healing and to allow osseointegration.[30] During the osteotomy preparation (surgically prepared implant site), heat-induced bone damage may occur due to overheating of surrounding bone. This may lead to bone necrosis, an inflammatory infiltrate and the formation of fibrous tissue between the implant and the bone. These events may ultimately result in implant failure.[31] The critical temperature that can damage bone was estimated to be 47ºC for one minute, as at this temperature the bone is unlikely to repair the damage.[31] However, heat is not only generated during the osteotomy preparation but also during implant placement.[31,32] Bone heating may be generated by excessive pressure on bone during the surgery and pressure applied was found to have more effect on heat generation than the speed of the drill.[33] Thus, heat as well as pressure control during the surgery is needed to achieve osseointegration. Furthermore, it was reported that bone density plays an important role in temperature elevation. These factors should be considered and efforts should be made to reduce and eliminate an increase in the surrounding bone temperature. The use of a coolant during implant surgery is recommended to minimise heat generation and its negative effect. A drill with efficient blades that ensures effective cutting with minimum adverse events is also required to optimise the outcome of the treatment.

Initial (primary) stability

Primary implant stability is the stability of an implant within the osteotomy at the time of implant placement. It is related to the level of the intimate contact between the implant and its surrounding bone.[34] It is an important factor in achieving osseointegration and is essential for early implant loading. Immediately after implant installation tips of threads are usually in close contact with bone, providing initial stability for the implant. However, the implant surface may not be completely in contact with the bone and spaces may exist. These spaces are initially filled with blood that comes from injured blood vessels forming a fibrin network.[35]

Micro-movement of the implant within the osteotomy has a negative effect on the osseointegration. The acceptable range of movement is reported to be between 50 and 150μm since beyond this range implant failure is more likely to occur.[36]

Implant length, diameter, design, surface roughness, bone quality and quantity, and surgical technique are reported to play a major role in implant primary stability.[23,37] All these factors should be considered when an implant is selected. Under-sizing the osteotomy and the use of self-tapping implants may help in achieving primary stability in certain situations such as when bone is soft (type iv). Furthermore, engaging the lower cortex of the mandible or the inferior cortical plate of the maxillary sinus or the nasal cavity may be used to aid implant stability.[38]

Bone quality

Bone is generally classified as either compact (cortical) or cancellous

(trabecular). Both types differ in their detailed configuration, but have the same basic histological structure. The microstructural unit of cortical bone is known as the osteon (Haversian system) and that of cancellous bone is known as a trabecular packet (hemi-osteon).[39]

In the dental implant field, the most commonly used bone quality assessment is that described by Lekholm and Zarb (1985).[40] This method is based on radiographic assessment as well as the resistance during the implant drilling procedure.[4] According to these authors, bone is categorised into four classes as follows:

- type I: almost the entire bone is composed of homogenous compact bone;
- type II: a thick layer of compact bone surrounds a core of dense trabecular bone;
- type III: a thin layer of cortical bone surrounds a core of dense trabecular bone; and,
- type IV: a thin layer of cortical bone surrounding a core of low-density trabecular bone.

Several long-term clinical studies have demonstrated that poor bone quality was accompanied by a higher risk of implant failure. A higher failure rate was reported to occur with implants placed in type IV bone compared with types I, II or III. Also, implants placed in the maxilla have a higher failure rate than implants placed in the mandible, which may reflect the difference in bone quality of the jaws. Jaffin and Berman (1991)[41] found that 35% of implants placed in type IV bone were lost after five years, while only 3% of those implants placed in type I, II or III bone were lost over the same period.

Surgical techniques

As already mentioned, selection of a proper implant system, a protocol that suits the clinical case, atraumatic surgery, control of heat generation, and the use of efficient implant instruments are all important measures required to achieve a satisfactory outcome. All these factors are the responsibility of the personnel who will install the implant.

Implant loading

Depending on the time at which an implant is loaded, implant loading may be classified as immediate, early or conventional loading.[42,43]

- Immediate implant loading: when the implant is exposed to loading earlier than one week following implant placement.
- Early implant loading: when loading is applied within one week to two months subsequent to implant placement.
- Conventional implant loading: when the load is applied after an unloaded healing period of at least two months subsequent to implant placement.

While an immediate and early loading protocol may be implemented when clinical situations are considered optimum, conventional loading is recommended under specific conditions such as alveolar ridge augmentation and compromised host status.

It has been suggested that conventionally loaded implants have a higher success rate than those implants that are immediately loaded. Yet the immediately loaded implants less commonly fail than those early loaded. This suggestion indicates that it may be more beneficial to load the implant immediately rather than delaying the loading process;[42] however, further investigation is required to validate this speculation.

Implant failure

Long-term retrospective and longitudinal studies have provided strong evidence to support high survival rates of osseointegrated implants.[2,44] However, despite the high survival rates, implant failures do occur. Consequently, implant failures are characterised into two classes: early and late failure. While early failure indicates that failure occurs before the implant is put to function, late failure denotes the failure that occurs months or even years after implant loading. Early failure indicates failure to establish osseointegration, whereas in late failure osseointegration has occurred but has later deteriorated.

Abutment-implant connections

In both implant placement methods (the one- or two-stage), the abutment is connected to the implant body in order to stabilise and prevent rotation of the abutment. The abutment-implant connection can be either external, when it protrudes above the implant platform, or internal, when it is projected down in the access hole in the implant platform. However, different implant producers designed a variety of geometric connection forms including a hexagon, triangle or a tapered cone. In order to improve the stability of the connections, other features may be incorporated.[45,46] A schematic representation of the external and internal connections is seen in **Figure 4**.

The connection between the mating surfaces of the implant components that are tightened together by a screw is known as the screw joint.[46,47] In general there are one or two screw joints, depending on whether a cemented or a screw-retained restoration is used. There is always one screw joint between the implant body and the abutment, and if a screw-retained restoration is used there may be another screw joint between the abutment and the restoration.

There are two different forces acting on any screw joint when the screw is tightened: one tries to keep the joint together and is known as the clamping force, and the other tries to disengage it and is referred to as the separating force. As a tightening torque is applied to the screw joint, a tension (pre-load) is generated in the screw. Consequently, the screw shank and threads are placed in tension and an elastic recovery is generated. This elastic recovery creates the clamping force between the mating surfaces.[46,47] The tension is effective if it is less than the elastic limit of the screw material as no permanent plastic deformation would occur. In order to hold the implant components together and to keep the screw tight, a maximum clamping force and a minimal separating force are required.

Implant components

Implant body

The implant body is the part of the implant that is buried in the peri-

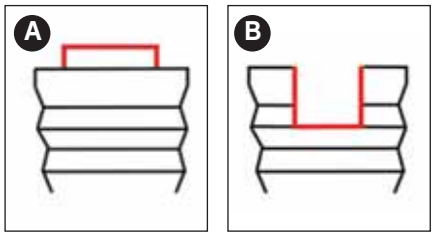


FIGURE 4: A schematic representation of abutment-implant connections: an external connection (a); and, an internal connection (b).

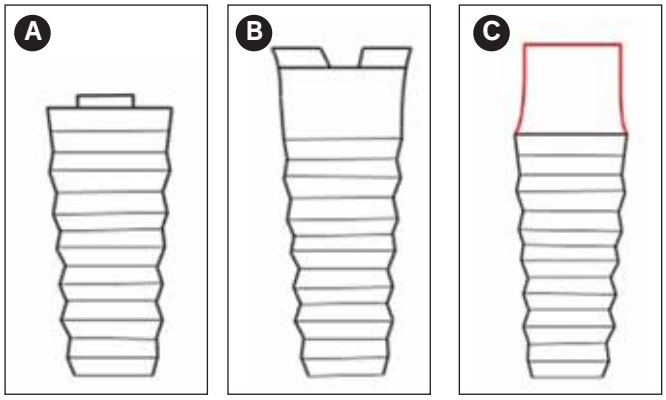


FIGURE 5: A schematic representation of implant types. a and b are examples of two-piece implants; while implant a is used with the two-stage implant placement method, implant b is used with the single-stage method. Implant c represents a one-piece implant system.

implant tissue. It is also known as the implant fixture.[48] The coronal part of the implant body, which is usually placed above the crest of the alveolar bone, is denoted as the neck. The surface of the neck is usually highly polished. Implants may be classified as one- or two-piece implants (**Figure 5**):

One-piece implant: consists of an implant body and abutment made as a single solid unit. Thus, the screw joint between implant body and the abutment is eliminated. It is used with the one-stage implant placement protocol (**Figure 5a**).

Two-piece implant: consists of an abutment that is attached to the implant body through a screw joint (**Figures 5b** and **c**). This is the most commonly used implant type. It is used with the one- and two-stage implant placement method.

Several factors should be considered when an implant is chosen (**Table 1**). These factors are:

Implant length: longer implants have a higher initial stability compared with shorter implants as they are in more contact with the surrounding bone. The selected length is determined by several factors such as the quantity and quality of bone. If the implant length is increased by three millimetres, there will be an increase in bone to implant contact by about 20%.[49]

It is reasonable to mention that earlier publications on implant length have revealed that short implants had a higher failure rate than long ones. This trend was attributed to the smooth surface implant, the surgical preparation and the poor quality of bone, rather than to the implant length itself. As implant technology and surgical approaches improved, recently published studies have indicated that survival rates of short and long implants are comparable.[50]

Implant diameter: the selection of an implant with a suitable diameter is governed by the bucco-lingual and mesio-distal dimensions of the edentulous space. It is also determined by bone quality and quantity in the region to be restored. For instance, when the quality of bone is poor, the selected implant must be wide enough. When the height of the available bone is limited, a short and wide implant may be an alternative.[50] Moreover, the implant should be wide enough to avoid its fracture under loading. It is important to remember that in order to achieve a good outcome, the roots of the adjacent teeth should be protected. Furthermore, any additional bone resorption should not expose the implant body and the interproximal bone should be capable of maintaining the height of the gingival papilla.

The use of a wide implant allows building up of the optimal restorative emergence profile and reduces the stresses on the retained screws. The available bone should be adequate to accommodate this implant. Wide implants are also suitable when an implant is installed immediately after tooth extraction. Wide and short implants may be considered when the bone height is limited by some anatomical structure to avoid surgical interventions such as ridge augmentation,

Table 1: Factors that should be considered when an implant is selected and their indications.

1. **Implant length:** a long implant should be considered whenever the condition permits.

2. **Implant diameter:** ideally, the implant should be of approximately the same diameter as the tooth it is replacing.

   a. Narrow implant:
      i. used to replace maxillary lateral incisors or mandibular incisors;
      ii. limited edentulous space;
      iii. limited ridge width (to avoid ridge augmentation surgery);
      iv. when it is not possible to achieve good emergence profile with a wide implant body; and,
      v. converging adjacent tooth roots.

   b. Wide implant:
      i. limited ridge height with adequate bucco-lingual width; and,
      ii. immediate implant placement (after tooth extraction).

3. **Tapered implant:**
   a. in type IV bone, where primary stability is difficult to achieve;
   b. narrow or concave bone;
   c. converging adjacent tooth roots; and,
   d. immediate implant placement (after tooth extraction).

sinus lifting or nerve transposition.[49] It may also be advantageous to use a wide implant when the bucco-lingual width permits, as in the molar region, to reduce the stress on the retained screws. It may also enable the clinician to use a single implant instead of two. However, Ivanoff and associates[38] reported a higher failure rate (18%) for the 5mm diameter implants when compared with 5% and 3% for 3.75mm and 4mm diameters, respectively. This may be due to the fact that wide-diameter implants were frequently used in clinical situations that were not ideal for the use of the standard implants, or when initial implant stability is not achievable with the standard implant, such as when bone quality is poor.[38]

The use of an implant with a wide platform, when the bucco-lingual bone width is limited, may cause an exposure of the coronal portion of the implant and consequently gingival recession and decrease in the height of the papilla. So an implant with a smaller diameter may be a solution for this problem. Small-diameter implants are indicated in specific clinical situations, for example where there is a reduced inter-radicular bone or a thin alveolar crest, and for the replacement of teeth with small cervical diameters.[51] However, the use of small-diameter implants may be associated with biomechanical risk factors that should be evaluated before the use of such implants. Otherwise, alternative treatment options should be sought.

Taper

Tapered implants are indicated for use with immediate implant placement protocol after tooth extraction, as well as when the quality of bone is not good enough, i.e., type IV, as primary stability is not easy to achieve.[52] The use of tapered implants results in lateral compression of bone and increased stiffness of the interfacial bone, which is reported to increase the implant primary stability.[53]

Tapered implants are also used to avoid damage of converging roots of adjacent teeth that reduce the space available for placement of a parallel-sided implant. Likewise, they can be used in concave bone in which the use of the normal implants may result in implant exposure.[49]

Implant selection

There are a variety of dental implant systems available in the market worldwide, but only a few brands with an ADA seal of approval. Among these are Nobel Biocare, Straumann, Astratech, BioHorizon, Intralock, Bicon, Biomet 3i, and Zimmer. Although they differ in patented technology, materials, and historical case success rates, they are all based on the same basic concepts.

The selection of a dental implant for a specific situation, particularly in the aesthetic area, is challenging for the dentist. Thus, a careful selection of the prospective implant is important to avoid an unexpected outcome. This requires a comprehensive investigation that ensures the best possible result. The edentulous area should be viewed in three dimensions: mesio-distal, bucco-lingual, and crono-apical. Also, the mesio-distal dimension of the edentulous space should be considered as two interrelated spaces (restorative and inter-radicular). The restorative space extends between the two adjacent teeth and should accommodate the prospective restoration. The inter-radicular

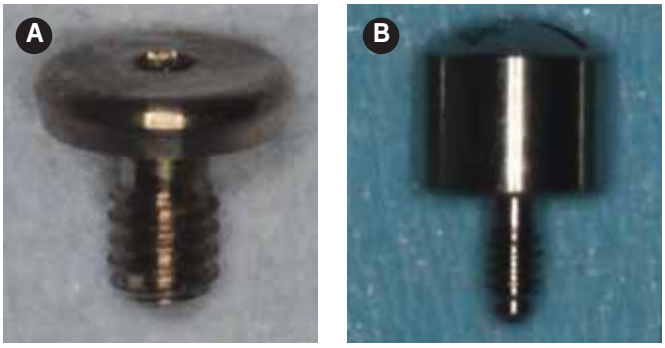


FIGURE 6: The cover screw (a) and the healing abutment (b).

space is located between the roots of the two adjacent teeth and will hold the implant body. The mesio-distal width of the restorative space depends on the width of the prospective restoration. The width of the roots of the teeth is usually estimated at 2mm apical to the cemento-enamel junction and according to this dimension the implant with a suitable diameter will be selected. In ideal situations the selected implant should have a diameter that approximates the diameter of the tooth being replaced. When the apico-coronal position of the implant is considered, the implant platform should be placed at approximately 2mm apical to the mid-labial gingival margin of the adjacent teeth. Thus an optimal emergence profile of the restoration will be achievable and the biologic width will be maintained.

It has been recommended that the implant should be placed at least 1.5mm mesio-distally from the root of the adjacent tooth with a minimum bone thickness of 1mm buccally and lingually. Therefore, a minimum mesio-distal inter-radicular space required to place an implant of 4mm would be 7mm or more. The bucco-lingual width of this edentulous space should not be less than 6mm to get at least 1mm of bone surrounding the implant. The facial bone height as well as width is important to maintain the peri-implant bone level at its optimal position. The inter-proximal bone height of the adjacent teeth is very important to maintain the height of the peri-implant papilla even in cases of bone resorption close to the implant surface. So encroachment on this bone by the implant platform will lead to inter-proximal bone resorption, which drastically leads to the reduction in the height of the papilla.

Cover screw

This is also known as a sealing screw. It is a part of the implant system that is screwed and attached to the implant platform during the healing stage after implant placement, thus preventing tissue growth into the implant. It is placed after the implant is inserted into the osteotomy that was prepared to receive the implant body (**Figure 6a**). The cover screw has a low profile in order to facilitate the suturing procedure and to allow approximating the two edges of the cut mucosa without excessive tension, which may deteriorate and preclude the healing.[54] The diameter of the cover screw is usually of similar dimension or may be slightly larger than the implant. The latter

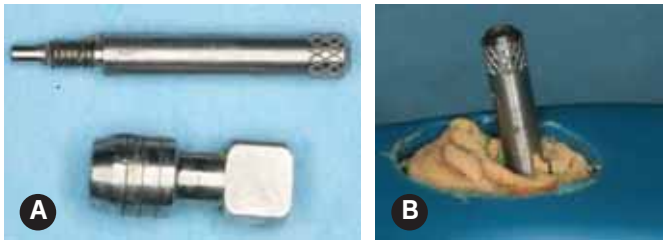


FIGURE 7: The impression of the implant platform using the pick-up method: the impression coping and the central screw used to fix the transfer coping to the implant (a). The screw is protruding through the tray to facilitate removal of the impression from the mouth (b).

FIGURE 8: The implant analogue.

is used to prevent formation of bone over the top surface of the cover screw, which has been reported to occur and may make removal of the screw troublesome. Bone is also difficult to remove without damaging the implant platform. The cover screw is screwed into the implant using a light finger force (5-10Ncm) and a screwdriver.

It is important to ensure that it is fully seated and no gap is left between the platform and the cover screw, which should remain *in situ* until it is removed in the second stage of surgery.

Early exposure of the cover screw and the breakdown of the peri-implant soft tissue may accelerate early peri-implant crestal bone resorption.[54]

Healing abutment

This is also known as a sulcus former. It is attached to the implant body via a screw and both the abutment and the screw form one single unit. In the second surgery stage, the cover screw is removed and replaced with this abutment. The healing abutment has a dome-shaped superior surface. It comes in different lengths, from which the surgeon chooses. When it is attached to the implant platform, it should be projecting into the oral cavity (**Figure 6b**). The healing abutment is then replaced with a provisional or a final restoration.

The restorative components and procedure

The technique used to fabricate the implant-retained restoration usually requires an intra-oral impression of the abutment or the implant platform using conventional impression materials. Final impression, an impression of the opposing dental arch, an inter-occlusal record and a transfer-bow (face-bow) record are all sent to a dental laboratory, where the final restoration will be fabricated.[36,49]

Impression techniques

The most common impression techniques used in the construction of single implant-supported restorations may be classified into two main headings:

- impression of the implant platform:
  - a pick-up method [an open-tray];
  - a transfer method [a closed-tray]; and,
- impression of the abutment.

Impression of the implant platform using either a pick-up or a transfer coping impression technique (Figure 7).

In both methods the impression coping must fit snugly into the implant platform, which should be verified using an intra-oral peri-apical radiograph and/or an audible and tactile 'click' feature that is incorporated into some implant systems to confirm the accuracy of the fit between the implant and the impression coping.

In the pick-up impression method (also known as the open tray), a perforated tray is used and the coping is secured to the implant body by a central screw. The screw should be protruding through the hole that the clinician makes in the roof of the tray when the impression is being made to enable the clinician to take the impression and the coping from the mouth at the same time when the impression material has set (**Figure 7b**). The coping is detached from the implant platform before removing the tray from the mouth.[36,49]

When the transfer coping is used, the impression is first removed from the mouth while the coping remains attached to the implant. The coping is then removed and replaced in its imprint within the impression. The coping usually has a flat side or an undercut, which allows the dentist to place it in its proper position within the impression imprint. This technique is also known as the closed tray technique. The implant analogue (**Figure 8**) will then be attached to the coping surface. This method is suitable when mouth opening is limited. The impression can be removed from the mouth easily if the patient cannot tolerate it. However, the replacement of the copings into their actual position in the impression is not always precise.

Second impression technique

In the second impression technique, the impression of the abutment is made using a manufacturer-made impression coping, which fits the abutment. This technique is frequently used with a ready-made prefabricated abutment.

Laboratory analogue

The laboratory analogue is the part of the implant system that allows the dental technician to build up the restoration. Thus, it may either be an implant or abutment analogue.

The implant analogue is used when the impression of the implant

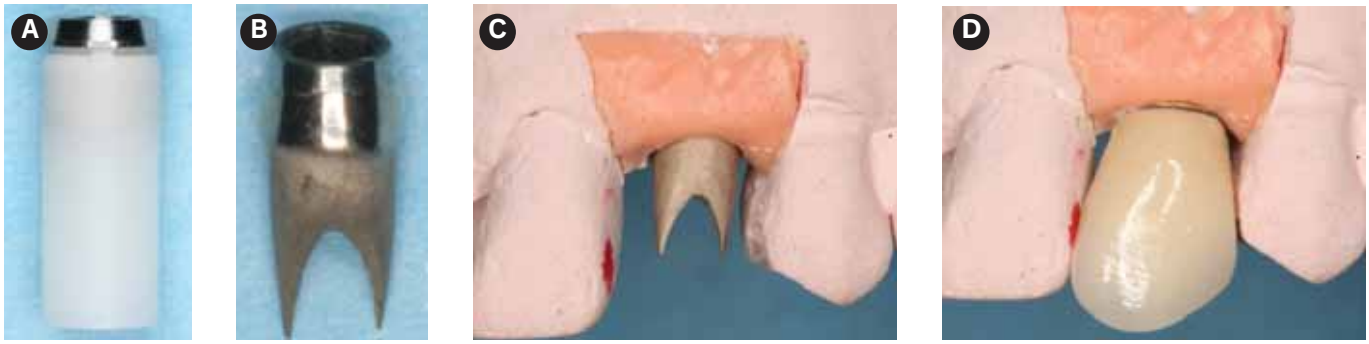


FIGURE 9: UCLA plastic pattern abutment with a machined interface before casting (a), and after modification and casting (b). The abutment is attached to the implant analogue on the cast (c) and the final restoration (porcelain fused to metal) (d).

platform was made (**Figure 8**), while the abutment analogue is used when the impression of the abutment itself was taken. The latter analogue is made to represent the exact configuration of the abutment.

In the laboratory, the implant or abutment analogue is attached to the impression coping and a soft-tissue cast is then made. The rest of the impression is made in dental stone in the usual way. The soft-tissue cast protects the peri-implant soft-tissue details, which are lost if they are made of stone as they will be trimmed away. The peri-implant soft-tissue details are required in order to accurately contour the final restoration. The methods by which the restorations are attached to the abutment are discussed later.

Abutments used for single implant restorations

The abutment is a part of the implant system that will accommodate the prospective restoration. They may be classified as follows:[55,56]

A. Custom-made abutments

These abutments consist of a plastic/wax pattern with/without a metal-machined interface ring. The metal-machined interface ensures a precise fit with the implant platform (**Figures 9a** and **9b**). The implant level impression is taken in the usual way.[56] In the laboratory the abutment plastic pattern is attached to the implant analogue on a working cast (**Figure 9c**). The plastic pattern is cut to the required form, shape and angle, then cast in metal alloy in a similar fashion to the conventional lost-wax technique. The restoration that fits the abutment is then fabricated (**Figure 9d**).

Custom-made abutments suit almost any clinical situation, regardless of whether the implant body is in the correct position or not, because they can be reduced as well as added to. UCLA plastic patterns are an example of these types of abutments (**Figure 9a**).

B. Ready-made (pre-machined) non-modifiable metal abutments

These abutments can be used without modification so that an abutment that is suitable for the specific clinical condition is selected and attached to the implant body. A manufacturer-made impression coping is used in making the abutment impression.[55] These abutments can be temporised using the clinical resources available as in the conventional crown and bridge procedures.

C. Ready-made (pre-machined) modifiable metal abutments

These types of abutments are ready-made metal abutments but can be adjusted and shaped to meet a specific clinical situation. These abutments can be prepared and modified intra-orally and/or extra-orally on a master cast. Reshaping and adjusting the abutment may be time consuming.[55] They are not suitable for many clinical situations, such as when the implant is severely angulated and a major alteration is required.

D. All-ceramic abutments

This, as the name indicates, is made of ceramic and is used when aesthetics are of paramount importance. In general, all ceramic abutments are available in ready-made or customisable forms such as alumina and zirconia abutments.[57,58] They are recommended for use in single tooth crown restorations (**Figure 10**). Furthermore, all-ceramic abutments may also be indicated in cases of thin biotype gingiva so the bluish colour of the gingival tissue, which may occur with the metal abutments, is avoided.

E. CAD/CAM milled abutments

CAD/CAM milled abutments are made from a block of titanium or ceramic. An implant platform level impression may be required depending on the manufacturers.[59,60] Commonly, the implant platform impression is made and a working cast is fabricated. The cast is then scanned optically to generate exact 3D images of the region. The information is sent to the milling machine to form the morphologically correct abutment from a block of titanium alloy.

CAD/CAM technology allows elimination of certain factors such as inferior accuracy of casting procedures that negatively affect the long-term success of the restorations. So the CAD/CAM milled abutments are more precise than those created using the traditional casting technique. They also have no porosity.

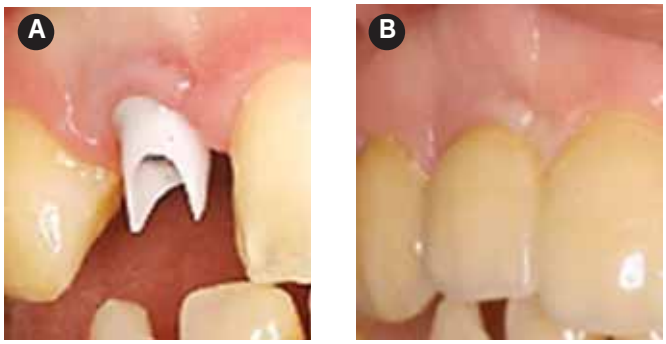


FIGURE 10: Zirconium abutment: after attachment to the implant (a); and, after cementation of the restoration (b) (courtesy of the Division of Restorative Dentistry and Periodontology, Dublin Dental University Hospital).

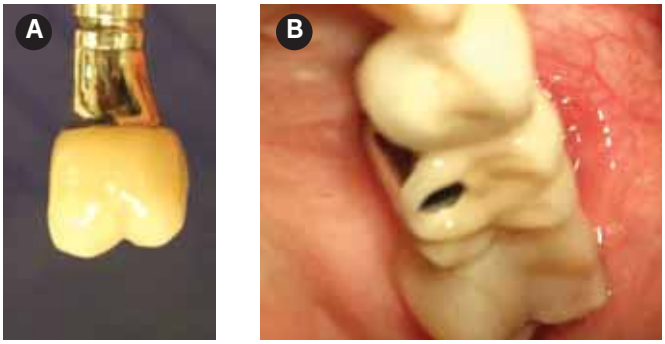


FIGURE 11: A screw-retained restoration; the abutment and the restoration are one integral part (a). A clinical picture; the screw hole can be seen in the occlusal surface of the restoration (b). This may interfere with the creation of the required occlusal morphology.

The CAD/CAM technique seems promising and may replace the conventional techniques for implants in the near future. However, the use of the CAD/CAM milled abutments is expensive, which may preclude their wide use at present.

Restoration

Implant-retained restorations may be divided into two types according to the method by which they are attached to the implant: screw- and cement-retained implant restorations. In the screw-retained implant restorations, the restoration is attached to the implant directly or to the abutment, while in the cement-retained ones, a cementing media is used to retain the restoration on the abutment.[61]

Cement-retained restoration

The cement-retained restoration can be used with minimum inter-occlusal restorative space and a restricted mouth opening is less problematic than with the use of the screw-retained restorations. It is suitable to use even when the implant angulation is not optimal as the restoration could still have good aesthetics.[56,61,62] A restoration with an ideal occlusal morphology can be created in the normal way as in conventional restorations. The materials and techniques used for the fabrication of conventional restorations can be used with the cement-retained restoration. It may be possible to retrieve them if weak cements were used, i.e., soft provisional cement; otherwise, restorations have to be cut in order to remove them.

However, the use of cement-retained restorations is associated with difficulty in removing the cement and the inferiority of margin adaptation between the restoration and the abutment, which may result in soft tissue problems.[56,61]

Screw-retained restorations

Screw-retained restorations usually consist of an abutment and a restoration as a single solid unit, which is attached to the implant body through a screw.[56,61,62]

They can be removed and/or replaced without damage or the need for a new restoration. The adaptation between the restoration and the underlying implant is significantly better than that in the case of its cement-retained counterpart. However, the implant should be placed in its optimal angulation to avoid interference with aesthetics. Furthermore, the screw hole in the posterior region may interfere with the creation of an ideal occlusal morphology (**Figure 11**). Nevertheless, clinical experience indicates that the hole within the abutment should be adequately wide to accommodate the retained screw without impinging on the axial walls of the hole, allowing screwing and torqueing of the retained screw fully.

Screw-retained restorations are not suitable to use when mouth opening is limited, as the mouth opening should be adequate for the use of the different tools required for screwing and torqueing the screws.

Conclusion

Dental implantology has become one of the branches that dominates the dental field. There is an extensive market of dental implant systems available worldwide. The two-piece implants have well-documented long-term success and survival rates. Implant selection is governed by many factors, which may not necessarily be under the clinician's control. Examples of this are the available bone height and width, the mesio-distal dimension of the edentulous spaces, the relationship between the roots of adjacent teeth, and the soft tissue phenotype.

The implementation of one of the loading protocols should be decided during the treatment planning process and after all investigations have been studied in depth to avoid disappointment and unexpected results.

Several abutment types are available and it is not possible to identify an abutment that is considered ideal for all clinical situations, as it may be suitable for use in one clinical situation but not for another. Selection of an abutment is governed by several factors such as aesthetics, implant angle and the available facilities, as well as the operator/laboratory technician's preference. Furthermore, custom-made abutments are easy to use, cheaper, and can be adjusted and modified as required. Also, the laboratory procedure is similar to the

conventional crown and bridge procedure. Yet, one disadvantage is that it is made of metal and in many clinical situations, such as when a high aesthetic demand is required, an optimal result may be difficult to achieve. The use of CAD/CAM abutments seems promising and is more likely to be widely used in the future. They are expensive; however, they have a potential of shortening the laboratory procedure and minimising human error, which in turn saves time.

Regarding restorations, the cement-retained method is a flexible technique suitable for most clinical situations. The cement-retained restoration is difficult to retrieve as the restoration has to be cut and a new one made. The materials and techniques used for the fabrication of conventional restorations can be used with the cement-retained restoration.

The screw-retained restoration has some advantages, such as retrieveability and good adaptation between the restoration and the implant platform. It also has some disadvantages, which have been mentioned previously in this paper.

We would like to thank Mrs Rosaleen Glackin, Division 2, Dublin Dental University Hospital, Dublin, Ireland, for her help.

References

1. **Zupnik, J., Kim, S.-W., Ravens, D., Karimbux, N., Guze K.** Factors associated with dental implant survival: a 4-year retrospective analysis. *Journal of Periodontology* 2011; 82: 1390-1395.
2. **Albrektsson, T., Brånemark, P.-I., Hansson, H.A., Lindstrom, J.** Osseointegrated titanium implants. Requirements for ensuring a long-lasting, direct bone-to-implant anchorage in man. *Acta Orthopaedica Scandinavica* 1981; 52: 155-170.
3. **Garetto, L.P., Chen, J., Parr, J.A., Roberts, W.E.** Remodelling dynamics of bone supporting rigidily fixed titanium implants: a histomorphometric comparison in four species including humans. *Implant Dentistry* 1995; 4: 235-243.
4. **Albrektsson, T., Isidor, F.** Consensus report of session IV. In: **Lang, N.P., Karring, T.** Proceedings of the First European workshop on Periodontology. Quintessence Publishing Co.: London; 1994: 365-369.
5. **Brånemark, P.-I.** Osseointegration and its experimental studies. *Journal of Prosthetic Dentistry* 1983; 50: 399-410.
6. **Sennerby, L., Ericson, L.E., Thomsen, P., Lekholm, U., Astrand, P.** Structure of the bone-titanium interface in retrieved clinical oral implants. *Clinical Oral Implants Research* 1991; 2: 103-111.
7. **Frost, H.M.** Wolf's law and bone's structural adaptations to mechanical usage: an overview for clinicians. *The Angle Orthodontist* 1994; 64: 175-188.
8. **Huiskes, R., Ruimerman, R., van Lenthe, G.H., Janssen, J.D**. Effects of mechanical forces on maintenance and adaptation of form in trabecular bone. *Nature* 2000; 405: 704-706.
9. **Mosley, J.R**. Osteoporosis and bone functional adaptation: mechanobiological regulation of bone architecture in growing and adult bone, a review. *Journal of Rehabilitation Research and Development* 2000; 37: 189-199.
10. **Isidor, F**. Loss of osseointegration caused by occlusal load of oral implants. A clinical and radiographic study in monkeys. *Clinical Oral Implants Research* 1996; 7: 143-152.
11. **Warreth, A., Polyzois, I., Lee, C.T., Claffey, N.** Generation of microdamage around endosseous implants. *Clinical Oral Implants Research* 2009; 2: 1300-1306.
12. **Buser, D., Weber, H.P., Donath, K., Fiorellini, J.P., Paquette, D.W., Williams, R.C.** Soft tissue reactions to non-submerged unloaded titanium implants in beagle dogs. *Journal of Periodontology* 1992; 63: 225-235.
13. **Abrahamsson, I., Berglundh, T., Glantz, P.O., Lindhe, J.** The mucosal attachment at different abutments. An experimental study in dogs. *Journal of Clinical Periodontology* 1998; 25: 721-727.
14. **Ericsson, I., Randow, K., Nilner, K., Petersson, A.** Some clinical and radiographical features of submerged and non-submerged titanium implants. A 5-year follow-up study. *Clinical Oral Implants Research* 1997; 8: 422-426.
15. **Esposito, M., Grusovin, M.G., Polyzos, I.P., Felice, P., Worthington, H.V.** Timing of implant placement after tooth extraction: immediate, immediate-delayed or delayed implants? A Cochrane systematic review. *European Journal of Implantology* 2010; 3: 189-205.
16. **Kesting, M.R., Thurmüller, P., Ebsen, M., Wolff, K.D.** Severe osteomyelitis following immediate placement of a dental implant. *The International Journal of Oral and Maxillofacial Implants* 2008; 23: 137-142.
17. **Equivel-Upshaw, J.** Dental implants. In: **Anusavice, K.J.** *Phillips Science of Dental Materials (11th ed.).* Philadelphia: WB Saunders; 2003: 759-781.
18. **Sykaras, N., Iacopino, A.M., Marker, V.A., Triplett, R.G., Woody, R.D.** Implant materials, designs, and surface topographies: their effect on osseointegration. A literature review. *International Journal of Oral and Maxillofacial Implants* 2000; 15: 675-690.
19. **Thomas, K.A.** Hydroxyapatite coatings. *Orthopaedics* 1994; 17: 267-278.
20. **Weinlaender, M., Beumer, J. 3rd, Kenney, E.B., Lekovic, V., Holmes, R., Moy, P.K., *et al*.** Histomorphometric and fluorescence microscopic evaluation of interfacial bone healing around 3 different dental implants before and after radiation therapy. *International Journal of Oral and Maxillofacial Implants* 2006; 21: 212-224.
21. **Wie, H., Herø, H., Solheim, T.** Hot isostatic pressing-processed hydroxyapatite-coated titanium implants: light microscopic and scanning electron microscopy investigations. *International Journal of Oral and Maxillofacial Implants* 1998; 13: 837-844.
22. **Gross, K.A., Brendt, C.C., Iacono, V.J.** Variability of hydroxyapatite-coated dental implants. *International Journal of Oral and Maxillofacial Implants* 1998; 13: 601-610.
23. **Martinez, H., Davarpanah, M., Missika, P., Celletti, R., Lazzara, R.** Optimal implant stabilisation in low density bone. *Clinical Oral Implants Research* 2001; 12: 423-432.
24. **Gotfredsen, K., Nimb, L., Hjörting-Hansen, E., Jensen, J.S., Holmén A.** Histomorphometric and removal torque analysis for TiO2-blasted titanium implants. An experimental study on dogs. *Clinical Oral Implants Research* 2002; 3: 77-84.
25. **Misch, C.E., Qu, M., Bidez, M.W.** Mechanical properties of trabecular bone in the human mandible: implications for dental implant treatment planning and surgical placement. *Journal of Oral and Maxillofacial Surgery* 1999; 57: 700-706.

26. **Todd, J., Misch, C.E., Bidez, M.W., Nulluri, P.** Functional surface area: thread-form parameter optimisation for implant body design. *Compendium special issue* 1998; 19 (3): 4-10.
27. **Klokkevold, P.R., Johnson, P., Dadgostari, S., Caputo, A., Davies, J.E., Nishimura, R.D.** Early endosseous integration enhanced by dual acid etching of titanium: a torque removal study in the rabbit femur. *Clinical Oral Implants Research* 2001; 12: 350-357.
28. **Wong, M., Eulenberger, J., Schenk, R., Hunziker, E.** Effects of surface topology on the osseointegration of implant in trabecular bone. *Journal of Biomedical Materials Research* 1995; 29: 1567-1575.
29. **Lazzara, R.J., Testori, T., Trisi, P., Porter, S.S., Weinstein, R.L.** A human histologic analysis of osseotite and machined surface using implants with two opposing surfaces. *International Journal of Periodontics and Restorative Dentistry* 1999; 19: 117-129.
30. **Tehemar, S.H.** Factors affecting heat generation during implant site preparation: a review of biologic observations and future considerations. *International Journal of Oral and Maxillofacial Implants* 1999; 14: 127-136.
31. **Eriksson, A.R., Albrektsson, T.** Temperature threshold levels for heat-induced bone tissue injury: a vital-microscopic study in the rabbit. *Journal of Prosthetic Dentistry* 1983; 50: 101-107.
32. **Eriksson, R.A., Albrektsson, T.** The effect of heat on bone regeneration: an experimental study in the rabbit using the bone growth chamber. *Journal of Oral and Maxillofacial Surgery* 1984; 42: 705-711.
33. **Matthews, L., Hirsch, C.** Temperatures measured in human cortical bone when drilling. *Journal of Bone and Joint Surgery* 1972; 54: 297-308.
34. **Cavallaro, J. Jr, Greenstein, B., Greenstein, G.** Clinical methodologies for achieving primary dental implant stability: the effects of alveolar bone density. *Journal of the American Dental Association* 2009; 140: 1366-1372.
35. **Watzek, G., Gruber, R.** Morphologic and cellular parameters of bone quality. *Applied Osseointegration Research* 2002; 3: 3-8.
36. **Drago, C.** *Implant Restorations: A Step-by-Step Guide (2nd ed.).* Blackwell: Munksgaard; 2007.
37. **Sennerby, L., Roos, J.** Surgical determinants of clinical success of osseointegrated oral implants: a review of the literature. *The International Journal of Prosthodontics* 1998; 11: 408-420.
38. **Ivanoff, C.J., Gröndahl, K., Sennerby, L., Bergström, C., Lekholm, U.** Influence of variations in implant diameters: a 3- to 5-year retrospective clinical report. *The International Journal of Oral Maxillofacial Implants* 1999; 14: 173-180.
39. **Kiuru, M.** Magnetic resonance imaging of fatigue bone stress injury. Academic Dissertation, Helsinki University Central Hospital, Department of Diagnostic Radiology, Helsinki, Finland, 2002.
40. **Lekholm, U., Zarb, G.A.** Patient selection and preparation. In: **Brånemark, P., Zarb, G., Albrektsson, T.** *Tissue-Integrated Prostheses. Osseointegration in Clinical Dentistry (1st ed.).* Quintessence Publishing Co.; 1985: 195-205.
41. **Jaffin, R.A., Berman, C.L.** The excessive loss of Branemark fixtures in type IV bone: a 5-year analysis. *Journal of Periodontology* 1991; 62: 2-4.
42. **Esposito, M., Grusovin, M.G., Coulthard, P., Worthington, H.V.** Different loading strategies of dental implants: a Cochrane systematic review of randomised controlled clinical trials. *European Journal of Oral Implantology* 2008; 1: 259-276.
43. **Weber, H.-P., Morton, D., Gallucci, G.O., Roccuzzo, M., Cordaro, L., Grütter, L.** Consensus statements and recommended clinical procedures regarding loading protocols. *The International Journal of Oral and Maxillofacial Implants* 2009; 24: 180-183.
44. **Adell, R., Lekholm, U., Rockler, B., Brånemark, P.I.** A 15-year study of osseointegrated implants in the treatment of the edentulous jaw. *International Journal of Oral Surgery* 1981; 10: 387-416.
45. **Maeda, Y., Satoh, T., Sogo, M.** *In vitro* differences of stress concentrations for internal and external hex implant-abutment connections: a short communication. *Journal of Oral Rehabilitation* 2006; 33: 75-78.
46. **McGlumphy, E.A., Mendel, D.A., Holloway, J.A.** Implant screw mechanics. *Dental Clinics of North America* 1998; 42: 71-89.
47. **Keating, K.** Connecting abutments to dental implants: an engineer's perspective. *Irish Dentist* 2001; July: 43-46.
48. **Binon, P.P.** Implants and components: entering the new millennium. *The international Journal of Maxillofacial Implants* 2000; 15: 76-94.
49. **Jacobs, S.H., O'Connell, B.C.** *Dental Implant Restoration: Principles and Procedures (1st ed.).* Quintessence Publishing; 2011.
50. **Renouard, F., Nisand, D.** Impact of implant length and diameter on survival rates. *Clinical Oral Implants Research* 2006; 17 (Suppl. 2): 35-51.
51. **Davarpanah, M., Martinez, H., Tecuciana, J.-F., Celletti, R., Lazzara, R.** Small-diameter implants: indications and contraindications. *Journal of Esthetic Dentistry* 2000; 12: 186-194.
52. **Alves, C.C., Neves, M.** Tapered implants: from indications to advantages. *The International Journal of Periodontics and Restorative Dentistry* 2009; 29: 161-167.
53. **Sennerby, L.** Implant integration and stability. In: **Palacci, P. (ed.).** *Aesthetic Implant Dentistry: Soft and Hard Tissue Management.* Quintessence Books, 2001.
54. **Kim, T.H., Lee, D.W., Kim, C.K., Park, K.H., Moon, I.S.** Influence of early cover screw exposure on crestal bone loss around implants: intraindividual comparison of bone level at exposed and non-exposed implants. *Journal of Periodontology* 2009; 80: 933-939.
55. **Christensen, G.J.** Selecting the best abutment for a single implant. *Journal of American Dental Association* 2008; 139: 484-487.
56. **Warreth, A., Fesharaki, H., McConville, R., McReynolds, D.** An introduction to single implant abutments. *Dental Update 2013; 40: 7-17.*
57. **Kohal, R.-J., Att, W., Bächle, M., Butz, F.** Ceramic abutments and ceramic oral implants. An update. *Periodontology 2000* 2008; 47: 224-243.
58. **Watkin, A., Kerstein, R.B.** Improving darkened anterior peri-implant tissue colour with zirconia custom implant abutments. *Compendium of Continuing Education in Dentistry* 2008; 29: 238-240.
59. **Priest, G.** Virtual-designed and computer-milled implant abutments. *Journal of Oral and Maxillofacial Surgery* 2005; 63 (Suppl. 2): 22-32.
60. **Drago, C.J.** Two new clinical/laboratory protocols for CAD/CAM implant restorations. *Journal of American Dental Association* 2006; 137: 794-800.
61. **Newsome, P., Reaney, D., Owen, S.** Screw- versus cement-retained crowns. *Irish Dentist* 2011; March: 22-25.
62. **Hebel, K.S., Gajjar, R.C.** Cement-retained versus screw-retained implant restorations: achieving optimal occlusion and aesthetics in implant dentistry. *Journal of Prosthetic Dentistry* 1997; 77: 28-35.

Traumatic dental injuries and their association with malocclusion in the primary dentition of Irish children

Norton, E., O'Connell, A.C.

Aims: This study sought to establish the prevalence of traumatic dental injuries in the primary dentition of Irish children and to investigate the relationship between dental trauma and non-nutritive sucking habits.

Materials and methods: Following ethical approval, a variety of schools and crèches in an urban setting were identified and parents of over 1,000 children were contacted. Consent was obtained, and parental questionnaires were completed prior to a clinical examination of the children by one operator in a non-dental setting. Signs of previous dental trauma were noted, and overbite and overjet were measured.

Results: A total of 839 children were examined. The prevalence of dental trauma was 25.6%, with boys more frequently affected. The most commonly observed dental injury was fracture of enamel (39.4%), followed by crown discolouration (20.2%). Only 38.8% of the children with a reported history of trauma sought dental care. Non-nutritive sucking habits were reported in 63.5% of the sample, and these habits, if prolonged, were significantly associated with anterior open bites and increased overjet ($p<0.001$). Using regression analysis, it was established that the risk of dental injury is 2.99 times greater if the child has an overjet >6mm and 2.02 times greater if the child has an anterior open bite.

Conclusions: Non-nutritive sucking habits are associated with the establishment of anterior open bite and increased overjet in the primary dentition. These malocclusions are, in turn, significantly associated with an increased prevalence of dental trauma in the primary dentition.

Dent Traumatol 2012; 28 (1): 81-86.

Electronic dental record use and clinical information management patterns among practitioner-investigators in The Dental Practice-Based Research Network

Schleyer, T., Song, M., Gilbert, G.H., Rindal, D.B., Fellows, J.L., Gordan, V.V., et al.

Background: The growing availability of electronic data offers practitioners increased opportunities for reusing clinical data for research and quality improvement. However, relatively little is known about what clinical data practitioners keep on their computers regarding patients.

Methods: The authors conducted a web-based survey of 991 US and Scandinavian practitioner-investigators (P-Is) in The Dental Practice-Based Research Network to determine: the extent of their use of computers to manage clinical information; the type of patient information they kept on paper, a computer or both; and, their willingness to reuse electronic dental record (EDR) data for research.

Results: A total of 729 (73.6%) of 991 P-Is responded. A total of 73.8% of US solo practitioners and 78.7% of group practitioners used a computer to manage some patient information, and 14.3% and 15.9%, respectively, managed all patient information on a computer. US practitioners stored appointments, treatment plans, completed treatment and images electronically most frequently, and the periodontal charting, diagnosis, medical history, progress notes and the chief complaint least frequently. More than 90% of Scandinavian practitioners stored all information electronically. A total of 50.8% of all P-Is were willing to reuse EDR data for research, and 63.1% preferred electronic forms for data collection.

Conclusion: The results of this study show that the trend towards increased adoption of EDRs in the United States is continuing, potentially making more data in electronic form available for research. Participants appear to be willing to reuse EDR data for research and to collect data electronically.

Clinical implications: The rising rates of EDR adoption may offer increased opportunities for reusing electronic data for quality improvement and research.

Journal of the American Dental Association 2013; 144 (1): 49-58.

Inferior alveolar nerve injury associated with implant surgery

Juodzbalys, G., Wang, H.-L., Sabalys, G., Sidlauskas, A., Galindo-Moreno, P.

Objectives: The inferior alveolar nerve (IAN) is the most commonly injured nerve (64.4%) during implant treatment. At present, no standardised protocol exists for clinicians to manage IAN injury related to implant surgery. Therefore, the purposes of the present article were to analyse the reasons for nerve injury and to propose guidelines in managing IAN injury.

Material and methods: Patients with IAN sensory disturbances after implant treatment were recruited for the study. Sixteen patients, eight men and eight women, with a mean age of 52.2 ± 8.1 years participated in this study. Patient examination, treatment and IAN sensory function recovery monitoring were performed following a six-step IAN injury during dental implant surgery (IANIDIS) protocol. The control group was composed of 25 healthy volunteers who had never had IAN sensory disturbances or any trauma in the maxillofacial region.

Results: The IAN sensory disturbances were scored as following: five (31.25%) had hyperalgesia and 11 (68.75%) expressed hypoalgesia. The mean asymmetry index (AI) was calculated for each patient and varied from 0.6 to 3.2. Overall, 31.3% of nerve injury patients were classified as mild, 31.3% as moderate, and the remaining 37.5% as severe injury. All patients were successfully treated with the proposed IANIDIS protocol.

Conclusion: The most frequent (50%) risk factor for IAN injury was intraoperative bleeding during bone preparation. The most common (56.3%) aetiological risk factor of nerve injury was dental implant. A six-step protocol aimed at managing patients with IAN injury, during dental implant surgery, was a useful tool that could provide successful treatment outcome.

Clinical Oral Implants Research 2013; 24 (2): 183-190.

In-office treatment for dentin hypersensitivity: a systematic review and network meta-analysis

Lin, P.-Y., Cheng, Y.-W., Chu, C.-Y., Chien, K.-L., Lin, C.-P., Tu, Y-K.

Aim: Dentin hypersensitivity caused by the exposure and patency of dentinal tubules can affect patients' quality of life. The aim of this study was to undertake a systematic review and a network meta-analysis, comparing the effectiveness in resolving dentin hypersensitivity among different in-office desensitising treatments.

Materials and methods: A literature search was performed with electronic databases and by hand until December 2011. The included trials were divided into six treatment groups as: placebo; physical occlusion; chemical occlusion; nerve desensitisation; laser therapy; and, combined treatments. The treatment effects between groups were estimated with standardised mean differences by using a Bayesian network meta-analysis.

Results: Forty studies were included. The standardised mean difference between placebo and physical occlusion was −2.57 [95% credible interval (CI): −4.24 to −0.94]; in placebo versus chemical occlusion was −2.33 (95% CI: −3.65 to −1.04); in placebo versus nerve desensitisation was −1.72 (95% CI: −4.00 to 0.52); in placebo versus laser therapy was −2.81 (95% CI: −4.41 to −1.24); and, in placebo versus combined treatment was −3.47 (95% CI: −5.99 to −0.96). The comparisons of the five active treatments showed no significant differences.

Conclusions: The results from network meta-analysis showed that most active treatment options had significantly better treatment outcome than placebo.

Journal of Clinical Periodontology 2013; 40 (1): 53-64.

Brighten up

In the latest article in our ongoing series from Dental Protection, JULIA DENSEM considers the issues that dentists need to be aware of if they intend to offer tooth whitening to their patients.

The dark winter nights have been brightened by the new law on tooth whitening, which came into force on October 31, 2012. European dentists can now legally provide tooth whitening for their adult patients, using products containing or releasing up to 6% hydrogen peroxide, subject to various conditions outlined below. The change in the law arises from a change in the EU Directive concerning cosmetic products.

The Dental Council has published guidance entitled 'Tooth Whitening – Guidance to the Dental Profession' to reflect the change in the law. The new regulations allow the use of hydrogen peroxide and other compounds or mixtures that release hydrogen peroxide, including carbamide peroxide and zinc peroxide, for tooth whitening. The maximum concentration that may be used for tooth whitening under the regulations is 6% present or released. In very broad terms and as a general guide, a percentage expressed in terms of carbamide peroxide content will release one-third of that level of hydrogen peroxide. Thus, the commonly used products containing 16% carbamide peroxide would be permitted under the revised regulations because they would normally release less than 6% hydrogen peroxide.

The regulations with reference to Ireland set out that products containing or releasing up to 6% hydrogen peroxide can be used, subject to conditions:

- to only be sold to dental practitioners;
- for each cycle of use, first use by a dental practitioner;
- afterwards to be provided to the consumer to complete the cycle of use; and,
- not to be used on a person under 18 years of age.

To only be sold to dental practitioners

Under the regulations, only dental practitioners can purchase tooth-whitening products containing or releasing up to 6% hydrogen peroxide. Dentists should not provide tooth-whitening products containing or releasing more than 0.1% hydrogen peroxide to patients who are not under their care.

For each cycle of use, first use by a dental practitioner

The first use of each cycle must be by a dentist. The regulations do not set out how long the trays must remain in the mouth for the first use. This will be a clinical judgement for the dentist. Dental Protection advises members to make a detailed contemporaneous record of the instructions given to the patient at the first appointment, which becomes central to demonstrating their compliance with the law.

The requirement that the first use of each cycle is by the dentist means that tooth-whitening products containing or releasing more than 0.1% hydrogen peroxide cannot be sold to patients at reception or by post.

Hygienists

The conditions under which hygienists are permitted to work are laid down by the Dentists Act 1985 and a scope of practice providing more detail as to the tasks that hygienists are entitled to carry out was published by the Dental Council in September 2005. Tooth whitening is not listed in the code of practice as a task that hygienists are permitted to undertake.

In its recent guidance on tooth whitening, the Dental Council has clarified that in Ireland tooth whitening can only be carried out by a registered dentist and as the regulatory framework currently stands, dental hygienists or orthodontic therapists are not permitted to perform tooth whitening.

Afterwards to be provided to the consumer to complete the cycle of use

After the first in-surgery application, the patient can be provided with the tooth-whitening product for home use. If the patient requires additional product for that course of treatment, the product should be dispensed by the dentist, who is trained and competent to provide tooth whitening.

Medical Devices Directive

Some manufacturers in Europe are marketing tooth-whitening products containing or releasing more than 6% hydrogen peroxide as medical devices. Even if a tooth-whitening product is marketed as a medical device it falls within the regulations and the EU Directive. This means that it is not possible to circumvent the regulations by using a product that has a CE mark.

Under 18s

The regulations and EU Directive state that the product should not be used on patients under 18 years of age. The Irish Medicines Board and the Dental Council have said that it is only possible to use products containing or releasing up to 0.1% hydrogen peroxide on patients who are under 18.

As this may create a legal and ethical dilemma for dentists, the Irish Dental Council currently considers that some off label usage can be justified in certain limited circumstances. However, this interpretation is not necessarily supported in other European countries.

A dentist practising in Ireland may consider that it would be in the best interests of a particular patient less than 18 years of age, to provide tooth whitening to an isolated non-vital tooth. The dentist may consider that other treatments, for example crowns or veneers, would be unnecessarily destructive to the tooth/teeth. In this scenario it is an individual clinical decision for the dentist to provide the treatment they consider being in the best interests of the child, taking into account the legal status of the procedure and the published advice of your indemnifier.

Dental Protection advises:

- If a dentist wishes to provide treatment to a child in breach of the regulations, they are advised to have a detailed discussion with the patient/parents, as part of the consent process. Ensure that the patient/parents are fully informed as to the risks and benefits of both bleaching procedures, and the more interventive alternatives, including a discussion about the legal status of tooth-whitening procedures and whether it is appropriate to delay treatment until the patient is 18 years of age.
- Document all consultations carefully in the patient's clinical notes – this is essential in order to demonstrate that appropriate discussions have taken place with the patient, and their parent(s) where applicable – before the procedure is carried out.
- Dentists are advised to refer to the current Dental Council guidance regarding tooth whitening, as well as the joint Dental Council/Irish Medicines Board statement, which provides helpful advice on the treatment of patients under the age of 18.

In providing treatment in breach of the regulations, dentists should recognise that they could leave themselves vulnerable to a complaint being made to the Irish Medicines Board and/or Environmental Health Officers of the Health Service Executive (HSE) (see 'Breach of the Regulations'). Dentists should ensure that they discuss the case with their indemnity provider.

Over 6%

The use of products containing or releasing more than 6% hydrogen peroxide is a breach of the regulations. Dental Protection advises its members to comply with the law, where compliance is in the best interests of the patient.

The clinician needs to weigh the risks of using a product against the benefits of that product, when considering if a particular treatment is in the patient's best interests. If a dentist considers that on balance it is still in a patient's best interests to use a product containing or releasing more than 6% hydrogen peroxide, they may be challenged on the use of the product by Officers of the Irish Medicines Board and/or Environmental Health Officers of the HSE.

Dental Protection advises its members who are considering using products that release or contain more than 6% hydrogen peroxide, and thus breaching the Regulations, to:

- Take individual therapeutic decisions in respect of each patient.
- Avoid advertising the use of tooth-whitening products containing or releasing more than 6% hydrogen peroxide as this may constitute intent to supply the goods. It is also likely to attract unfavourable attention from the Irish Medicines Board and/or the HSE.
- Take advice if you have concerns or are approached by an Officer of the Irish Medicines Board or an Environmental Health Officer of the HSE.
- Ensure that patients are fully informed as to the risks and benefits of using a product containing or releasing more than 6% hydrogen peroxide as opposed to using a product using a lower concentration of hydrogen peroxide, including a discussion about the legal status of the tooth-whitening procedures. Such discussions should present a fair and balanced summary of the relative risks and benefits of alternative treatment approaches, and should not make any claims for the efficacy of one technique over another that cannot be substantiated.
- Document all consultations carefully in the patient's clinical notes – this is essential in order to demonstrate that appropriate discussions have taken place with the patient before the procedure is carried out, although it is worth remembering that the patient's consent does not alter the legality of the situation.

Breach of the regulations

Dentists who breach the regulations may be subject to fitness to practice proceedings under the Dentists Act 1985, in addition to any action taken by the Irish Medicines Board or Environmental Health Officers of the HSE. The maximum penalty for breaching the regulations is a sentence of imprisonment not exceeding six months or a fine not exceeding €3,000, or both.

If a dentist feels that he or she is at risk of being prosecuted for a breach of the regulations, he or she should contact his or her indemnity provider for advice.

Indemnity and assistance

The proposed relaxation in the regulations to permit the use of higher strength products containing or releasing hydrogen peroxide has significantly improved the unsatisfactory ethical and legal dilemmas that faced dental practitioners in recent years. There remain some unwelcome 'tooth-whitening' anomalies, including the eligibility of a hygienist to provide tooth whitening and situations where the patient is under 18. Dental Protection will consider requests for assistance in relation to bleaching and tooth-whitening procedures on their individual merits. Members of Dental Protection who carry out these procedures in accordance with the law can seek assistance in the usual way if facing any kind of complaint or challenge. An advantage of the flexible indemnity offered by Dental Protection is that discretion can be exercised to assist a member in difficulty. Contract-based insurance is restricted by the wording of the policy. Dentists should check with their indemnity provider on the level of assistance available in situations where it was in the patient's best interests to act in breach of the regulations by using a stronger concentration.

Conclusion

Dental Protection welcomes the new law as it allows dentists to act in the best interests of the majority of their patients, while remaining within the law. Some dentists may be frustrated by the residual ethical problems associated with higher concentrations and patients under 18, but the new legislation is a giant step forward. The long nights will be brightened by the whitened smiles of patients.

JULIA DENSEM *LLM PgDL LDSRCS BDS. Julia is a full-time dento-legal adviser with Dental Protection and has been responsible for monitoring the developments in the formulation of the latest European Directive on cosmetic products.*

Classified advert procedure

Please read these instructions prior to sending an advertisement. Below are the charges for placing an advertisement for both members and non-members. Advertisements will only be accepted in writing via fax (01- 295 0092), letter or email (fionnuala@irishdentalassoc.ie). Non-members must pre-pay for advertisements, which must arrive no later than Friday March 15, 2013, by cheque made payable to the Irish Dental Association. If a box number is required, please indicate this at the end of the ad (replies to box number X). Classified ads placed in the *Journal* are also published on our website www.dentist.ie for 12 weeks.

Advert size	Members	Non-members
up to 25 words	**€75**	**€150**
26 to 40 words	**€90**	**€180**

Non-members must send in a cheque in advance with their advert. The maximum number of words for classified ads is 40.

Only if the advert is in excess of 40 words, then please contact:
Think Media
The Malthouse, 537 North Circular Road, Dublin 1.
Tel: 01-856 1166 Fax: 01-856 1169 Email: paul@thinkmedia.ie

Please note that all classified adverts MUST come under one of the following headings:

- Positions Wanted
- Positions Vacant
- Practices for Sale/To Let
- Practices Wanted
- Unwanted/Second Hand Equipment for Sale

Classified adverts must not be of a commercial nature. All commercial adverts must be display advertisements, and these can be arranged by contacting Paul O'Grady at Think Media, Tel: 01 856 1166.

POSITIONS WANTED

Experienced female dental associate looking for one day in the North West. Cerec and Six Month Smiles provider. Email: associateireland@hotmail.com.

Experienced dentist available for part/full-time or locum position in the Munster area. Willing to travel. Tel: 087-992 3730, or Email: munsterdentist04@gmail.com.

POSITIONS VACANT

Exciting, modern clinic opening January in IFSC. Looking for motivated, flexible and professional full/part-time staff to help build and grow the practice. Email: docklandsdentaldublin@gmail.com.

South Dublin. Experienced associate to join a modern, private dental practice (no medical card) with a happy working environment. Fully computerised with digital x-rays, digital OPG and Cerec machine. Sessions available in early 2013. Please forward CVs to southdublindentist4@gmail.com.

Associate position (full time). 20 mins from Dublin. Start April. Busy, comfortable, four-surgery family practice. Fully computerised, OPG, etc. Orthodontist, periodontist, implants, IV sedation offered. Excellent opportunity to join our hardworking, happy team. Experience and references essential. Email: info@ratoathdental.ie.

Part-time associate wanted: Galway City Centre. Excellent area with large growth potential. Option to develop into full-time position. Strong potential to lease/buy in near term. Great opportunity for ambitious associate seeking next step to own business/independence. Email in confidence: galwaypractice091@gmail.com.

Modern multi-surgery practice requires experienced associate dentist part time with a view to full-time employment. Midlands area. Please Email: midlandsdentist@gmail.com.

Limerick City. Part-time, enthusiastic, gentle, friendly associate wanted for busy practice. Email CV with cover letter to: limerickdentistwanted@gmail.com.

Full-time dentist, New Plymouth, New Zealand. Full-time position is available in busy CBD practice. An opportunity to work in a great environment practising all aspects of dentistry and enjoying wonderful outdoors lifestyle. Contact Julie, Tel: 00646-757 3600, or Email: mxdental@xtra.co.nz.

Required for immediate start, dentist trained in all aspects of prosthetics/full oral rehab or prosthodontist. Full-time position, busy cosmetic and dental implant practice, Dublin, Ireland. Email: victoria@seapointclinic.ie.

South-East. Experienced, enthusiastic, friendly dentist required full time, very busy practice, full book. Modern practice, new equipment. Self-employed contract/great earning potential. Immediate interviews available. Email: SouthEastDentaljob@gmail.com.

Part-time dentist experienced RCT, crowns, required in busy Northside practice. Excellent remuneration. Email: drjjconneely@gmail.com.

We are looking for an outgoing dentist to join a vibrant new practice in Carlow town, 1.5 days, including Saturday. Bright modern surgery. All mod cons. Fantastic staff. Must be patient focused and able to work independently. Immediate start. Email: info@kiwidental.ie.

Dentist wanted to join our busy, well-established, two-surgery practice located in the sunny South-East. Immediate start possible. Great team. Email: susie@smiles.ie.

Dentist required to join our busy three-surgery dental practice in Drogheda. Great package and conditions. Immediate start possible. Email: Susie@smiles.ie.

Dentist required to join expanding, modern, computerised practice, part-time with a view to full-time employment. West Dublin area. Reply with CV to: westdublindentist@gmail.com.

Full-time dentist position available, salaried or associate, in Terenure, Dublin 6. Must have excellent interpersonal skills and be able to work with the elderly. Email CV to: jobs@elitedental.ie.

Dentist required to join busy practice. Located 20 mins from Dublin City Centre, close to bus and train services. High technology – OPG, intra-oral camera, laser, computerised, etc. Part-time required. Reply to: reception@rfdentalclinic.com.

Long-term, experienced dental practitioner required to 'care take' well run private dental practice in the south east. Position starts February/March 2013. Please reply for more details with CV to: southeastdentalpractice@gmail.com.

Locum dentist required for week starting February 12 for one week and March 25, also for a week, in Dublin 15. Please Tel: 086-821 8898.

Endodontist needed for sessions in Drogheda, great opportunity to build referrals. Email: wqdental@gmail.com.

Orthodontist required for busy, modern practice in Greystones. Part-time initially but huge potential. Friendly, helpful staff and spacious facilities. Tel: 085-147 3454, or Email: chris@thedentalstudio.ie.

Orthodontist required to replace departing colleague in a general practice approximately two days per month. OPG and ceph on premises and experienced chairside assistance provided. Email: 999eaw@gmail.com.

Visiting orthodontist required. Orthodontist required for busy, modern two-chair practice in Churchtown, Dublin 14. One/two sessions a month initially, further sessions will be required as per demand. Please send CV to dublindentist@gmail.com inserting orthodontist in the subject box.

Orthodontist required to replace departing colleague in busy, well-established Dublin 3 general practice. Please contact Margaret for details, Tel: 01-833 8985, or Email: reception@fairview dentalclinic.ie.

Part-time dental nurse required in busy Northside practice. Email: drjjconneely@gmail.com.

Part-time dental nurse, preferably qualified, required in Kilkenny City with some reception work. Contact Naomi, Tel: 087-298 9200, or Email: naomi@kilkennyendodontics.com.

Experienced dental nurse required for the specialist Harcourt Dental Clinic. Required to cover full-time six months' maternity leave – start date 20/02/2013. Experience working as a restorative dental nurse. Must be flexible, well presented and computer literate. Email: practiceadmin@woolfedwyer.com.

Experienced dental nurse required full time for practice south of Dublin, on Dart line. Communication skills important as may need to cover reception. Please reply by Email: interestedindentaljob@gmail.com.

Dental nurse required. We are looking for a new team member. Good organisational skills, flexibility and enthusiasm essential. Email CVs before Monday February 4 to info@dalkeyclinic.com.

Full-time (Tues-Sat) enthusiastic dental surgery assistant required for modern computerised practice in Dublin Docklands. Email CVs to: recruitment@shelbourneclinic.ie.

PRACTICES FOR SALE/TO RENT

For sale. Modern, fully computerised, three-chair surgery in Co. Galway town. Well-established practice (40 years) in central location with good amenities. Very busy full book with 90% private patients. Great opportunity if seeking own business/independence. Tel: 086-820 4740, or Email: dentalpractice4sale@gmail.com.

For sale. Two-surgery private practice in Lanzarote, Canary Islands, for sale due to retirement. Email: lanzadent12@gmail.com.

For sale – Co. Kildare. Long-established, excellent, high-profile practice. Well-equipped, three surgeries, including OPG. Strong hygienist service. Good private numbers/new patients. Low overheads. Large potential for growth. Area wide open. High profits. Tel: 086-807 5273, or Email: niall@innovativedental.com.

Cork suburb. Retirement sale, or locum/s or associate with view or lease. 130SqM. Two surgeries, room for expansion, computerised, sterilisation room, lab. Email: obrienandco@ymail.com.

Practice for sale West of Ireland. Very busy, long-established, modern, well-equipped, walkinable large practice. Digitalised/OPG. Hygienist. Excellent loyal staff. Immediate profits. Large potential for growth. Genuine reason for fast sale. Suits ambitious Associate. Tel: 086-807 5273, or Email: niall@innovativedental.com.

Practice for sale – South East. Two-surgery, modern walkinable premises, available in prime city centre location. Low overheads. Excellent equipment, tax allowances transferable. Bright premises. Very low entry price reflecting immediate sale. Tel: 086-807 5273, or Email: niall@innovativedental.com.

EQUIPMENT FOR SALE

Dental surgery cabinetry for sale. Tel: 057-912 0173, or Email: gerardhbrowne@gmail.com.

For sale: Two chairside delivery units (see boydindustries.com) Model number CSU-356. Corian worktop, unused, surplus to requirements. Please Tel: 087-065 4620 (Dublin), or Email: drmichaelryan@eircom.net.

OPG for sale. Competitively priced. Hardly used – modern unit. Surplus to needs. Email: surgeriesavailable@yahoo.ie.

Equipment for sale. Used CBCT (cone beam CT) scanner, four years old, still under full manufacturer's warranty. Top of the line i-CAT 17-19 with adjustable scan height and low radiation dose. Attractively priced for quick sale. Please Tel: 087-688 4094, or Email: farronmahon@hotmail.com.

Set of digital x-ray sensors (barely used, good as new) normally retail at €6,000 new for sale for only €2,500. Tel: 087-612 8847.

FEBRUARY

Irish Endodontic Society – Clinical Case Night
February 21 Small Lecture Theatre, Dublin Dental Hospital, 7.30pm

North Munster Branch Meeting
February 26 The Strand Hotel, Limerick, 8pm
Speaker is Dr Emily Clarke on 'The roll of mouth disinfection and antibiotics in the treatment of periodontal disease'.

MARCH

CPD Roadshow – Kilkenny
March 2 Ormonde Hotel, Kilkenny

CPD Roadshow – Sligo
March 2 Clarion Hotel, Sligo

Metropolitan Branch Meeting and AGM
March 7 Hilton Hotel, Charlemont Place, Dublin 2
Speakers are Drs Alison Dougall and Spencer Woolfe. This meeting will be followed by the Metropolitan Branch AGM.

Half-day hands-on endodontics course – 'Prepare for Success in Endodontics'
March 9 IDA House
Limited to 12 participants. Dr Pat Cleary will be running this course. For further information, contact Dario Gioe in IDA House, Tel: 01-295 0072.

Irish Endodontic Society – New Graduates Night
March 21 Small Lecture Theatre, Dublin Dental Hospital, 7.30pm

CPD Roadshow – Dublin
March 23 Bewleys Dublin Airport Hotel

CPD Roadshow – Limerick
March 23 Strand Hotel, Limerick

North Munster Branch Meeting
March 26 The Strand Hotel, Limerick
Speaker is Dr Padraig McAuliffe. Meeting starts at 8.00pm

APRIL

Dubai Implantarium, the first specialised dental implantology congress in the UAE
April 4-6 Armani Hotel, Burj Khalifa, Dubai, UAE.

IDA Annual Conference 2013
April 18-21 Radisson Hotel, Galway

North Munster Branch half-day hands-on endodontic course
April 30 The Strand Hotel, Limerick
Speaker is Dr Eoin Mullane. Course starts at 2.00pm

MAY

North Munster Branch Annual General Meeting
May 28 The Strand Hotel, Limerick, 8.00pm

European dental students making a difference in India

The Amchi are Buddhist nuns who provide healthcare in the Ladakh region of Northern India. The Amchi Programme is a collaboration between Wisdomtooth (http://www.wisdomtooth.org), the University of Manipal (http://www.manipal.edu) and the European Dental Students' Association (http://www.edsaweb.org), with the support of the Association for Dental Education in Europe (ADEE).

The Amchi programme has three goals: to train the Amchis in basic dental care; to educate the local population about oral health; and, to deliver direct care (this aspect will reduce as the project progresses).

In August 2012, 44 volunteers took part in an outreach mission to improve the dental health of the population of Ladakh and make a sustainable difference. Occupying an area the size of Britain, visitors to Ladakh have to deal with high altitude and mountainous terrain. Travel is almost impossible in winter and entire communities are cut off, so access to healthcare is limited. There are only four dentists in just one location.

The Amchi programme is run exclusively by students from four different continents. We aim to return to Ladakh in summer 2013 to continue the programme, and hope to send a second party out to train Amchis in the autumn.

This is a unique project, making a difference where it matters most. Our valuable work can only continue with the support of faculties, students and sponsors. Get involved!

Contact: Twitter: @Amchiprogramme
Facebook: Amchi Dental Volunteer Project - India
Email: amchi2012@gmail.com
Justgiving.com

THE PROTECTION YOU CAN TRUST.
THE QUALITY YOU DEMAND.

As the world leader in pain control, Septodont understands the increasing need for safe, simple product solutions for your local anaesthetic procedures. This commitment has made Ultra Safety Plus 50/50 the standard for needle stick protection.

- Simple to use
- Clinically proven safety*
- Easy aspiration
- Full range of needle sizes
- Choice of autoclavable or sterile single use handles
- Complies with Directive 2010/32/EU

www.septodont.ie
www.septodont.co.uk
Tel: +44 (0)1622 695520

septodont

Anaesthetics • Endodontics • Restorative Dentistry • Dental Surgery • Prosthetic Dentistry • Disinfection & Hygiene

Specialist in protecting enamel against the effects of Acid Wear.

With acid-rich foods and drinks an increasing part of modern diets[1,2], more patients than ever are at risk of Acid Wear. When enamel is under attack it is important to protect it.

Pronamel specialises in delivering protection against the effects of Acid Wear.

- ✓ Clinically proven *in situ* to re-harden acid-softened enamel[3]
- ✓ Builds protection against future acid challenges[3]
- ✓ Low abrasivity to help limit damage to acid-softened enamel
- ✓ SLS-free to help prevent damage to the protective smear layer of exposed dentine[4]
- ✓ Neutral pH

Make Pronamel your No.1 choice for patients at risk from the effects of Acid Wear

SENSODYNE PRONAMEL

References: 1. Lussi A. In: Lussi A (ed). Dental Erosion. Karger 2006: pp1-8.
2. Bartlett DW. Int Dent J 2005; 66: 273-284. 3. Hara AT et al. Caries Res 2009; 43: 57-63.
4. Parkinson CR. Joint Scientific Meeting of BDSR and NOF 2007. Abstract 0188.

GlaxoSmithKline Consumer Healthcare