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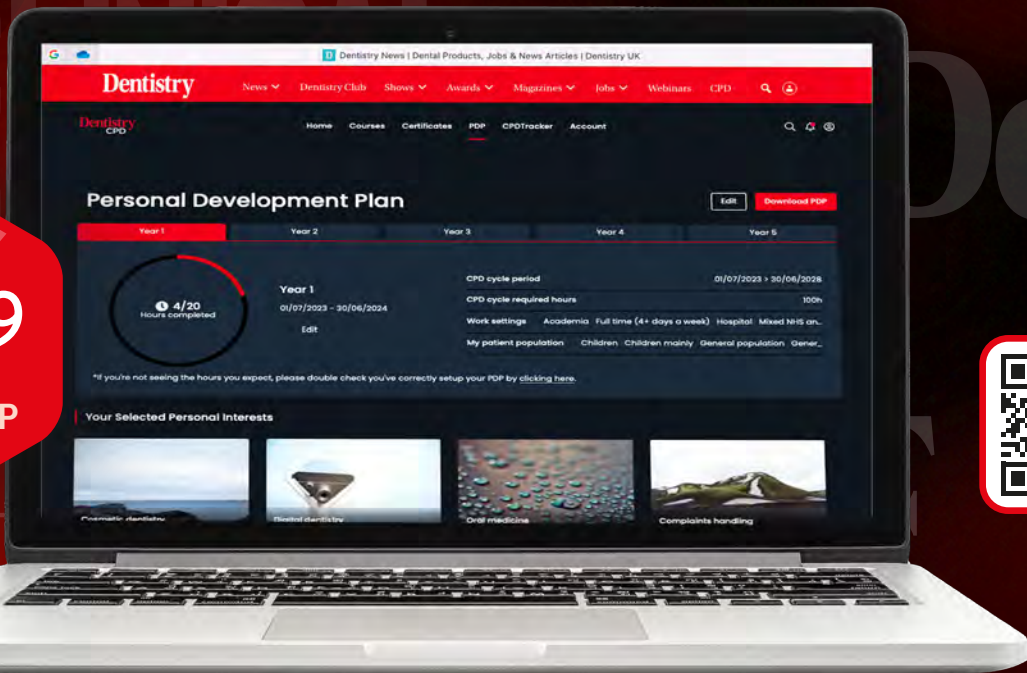
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# CLINICAL DENTISTRY

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**14 CLINICAL DENTISTRY AWARDS**  
Everything you need to know –  
Clinical Dentistry Awards 2024

**24 AESTHETIC DENTISTRY**  
Ceramic smile makeover –  
Edward Li

**37 DIGITAL DENTISTRY**  
Revolutionising smile design –  
Adam Nulty et al

**79 ORTHODONTICS**  
Retention and stability – Avan  
Mohammed and Yan Huang

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*Clinical Dentistry* is committed to the advancement of practical clinical skills in dentistry. Through its focus on inspirational clinical casework, its sole aim is to help general dental practitioners enhance their skills and techniques across every facet of dentistry in an easy-to-assimilate and practical way.

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# CARRY THE DAY



Welcome to the May issue of *Clinical Dentistry*!

As always, this edition is packed full of practical, yet inspiring, casework. The eagle-eyed readers amongst you may have noticed that we have been showcasing some of the winning entries from the 2023 Dentistry Clinical Case Awards over the last few issues of

*Clinical Dentistry*.

It has been a joy to be able to publish some of the clinical work that stopped the judges in their tracks.

And so, with the entry deadline for this year's Dentistry Clinical Case Awards just around the corner, I wanted to take this time to shine a light on these awards.

The Dentistry Clinical Case Awards are unlike many other UK dental awards in that they acknowledge clinical excellence in a number of clinical disciplines – we're talking orthodontics, facial aesthetics, restorative dentistry, periodontics, tooth whitening and endodontics.

So, if you've completed a beautiful smile makeover, had an endodontic retreatment success story or had a case that transformed a patient's life through treatment of trauma, facial disfigurements and/or lack of function/appearance profoundly affected by medical conditions then we want to hear from you!

Entry is straightforward. (After all, you've already done the hard work!)

You have 1,500 words and up to 26 images to detail the initial presentation, treatment options and agreed treatment plan (with a discussion as to how this plan was chosen). Describe the treatment journey – include any challenges and how you overcame them – before presenting the final result with a reflection on the case.

The judges aren't looking for all-singing, all-dancing Powerpoint presentations. The case write up should be supplied as a Word document (or similar) and the images as high-resolution .jpg files. Strip your entry back to its key clinical elements with a thorough explanation – show off your photography skills and let your clinical work do the talking. Remember to gain all relevant consent for publication, and where treatment was provided by multiple dental professionals ensure that you list all names and job titles.

Enter online at [dentistry.co.uk/dentistry-clinical-case-awards](http://dentistry.co.uk/dentistry-clinical-case-awards) by Friday 7 June to be in with a chance of victory!

I can't wait to announce the winners in the September issue of *Clinical Dentistry* and present all the outstanding clinical treatment being undertaken across the UK! Good luck!



**Siobhan Hiscott**  
Group Managing Editor

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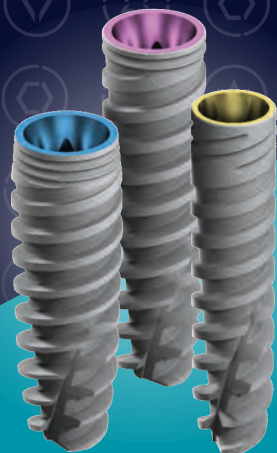
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# Dentistry Clinical Case Awards 2024


## Final call for entries for this year's Dentistry Clinical Case Awards

With the closing date for entries to the Dentistry Clinical Case Awards 2024 just around the corner (Friday 7 June to be exact), this is your last chance to polish those submissions!

These awards acknowledge clinical excellence in all clinical disciplines from facial aesthetics to orthodontics to tooth whitening. Entry to the awards is easy: select the categories you'd like to enter and, in up to 1,500 words (and a maximum of 26 images), present your clinical case. Your entry should detail the initial presentation, treatment options and agreed treatment plan (with a discussion as to how this plan was chosen). Describe the treatment journey – include any challenges and how you overcame them, before presenting the final result and your reflections on the case.

This year's categories for the Dentistry Clinical Case Awards are:

- Tooth Whitening
- Orthodontics: Child/Teenager Fixed
- Orthodontics: Adult Fixed
- Orthodontics: Clear Aligner
- Restorative: Single Tooth Composite
- Restorative: Single Tooth Ceramic
- Restorative: Dentures (Full/Partial)
- Restorative: Full Mouth Rehabilitation
- Restorative: Composite Smile Makeover
- Restorative: Ceramic Smile Makeover
- Facial Aesthetics: Botulinum Toxin
- Facial Aesthetics: Dermal Filler Perioral
- Facial Aesthetics: Full Facial Treatment (incl. thread lift)
- Endodontic Treatment
- Endodontic Retreatment
- Periodontics: Surgical
- Periodontics: Non-Surgical
- Transformative Treatment.

The implant categories can now be found in the Clinical Dentistry Awards – turn to page 50 for more details. 

**Dentistry  
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### DENTISTRY CLINICAL CASE AWARDS

Entries should be supplied as a Word document and images as high-resolution .jpg files with all relevant consent for publication attained. Where treatment was provided by multiple dental professionals, ensure to list all names and job title. Entry costs £60+VAT per submission. The closing date for entries is Friday 7 June. The full criteria for each category – and details on how to upload entries – can be found at [dentistry.co.uk/awards/dentistry-clinical-case-awards](https://dentistry.co.uk/awards/dentistry-clinical-case-awards), or by scanning the QR code.





# Dentistry CLINICAL CASE AWARDS

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**ENTRY NOW OPEN**

## CATEGORIES

Tooth Whitening

Orthodontics:  
Child/Teenager  
Fixed

Orthodontics: Adult Fixed  
Orthodontics: Clear Aligner

Restorative:  
Single Tooth Composite

Restorative:  
Single Tooth Ceramic

Restorative:  
Dentures (Full/Partial)

Restorative:  
Full Mouth Rehabilitation

Restorative:  
Composite Smile Makeover

Restorative:  
Ceramic Smile Makeover

Facial Aesthetics:  
Botulinum Toxin

Facial Aesthetics:  
Dermal Filler Perioral

Facial Aesthetics:  
Full Facial Treatment

Endodontic Treatment  
Endodontic Retreatment

Periodontics: Surgical  
Periodontics: Non-Surgical  
Transformative Treatment

**ENTRY DEADLINE 7 June 2024**



**SCAN FOR MORE INFORMATION**

[WWW.DENTISTRY.CO.UK/DENTISTRY-CLINICAL-CASE-AWARDS](http://WWW.DENTISTRY.CO.UK/DENTISTRY-CLINICAL-CASE-AWARDS)

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PRACTICE



May 2024 ■ Vol 4 No 5



FEATURES

GENERAL  
DENTISTRY  
13

**14 CLINICAL DENTISTRY AWARDS**  
Everything you need to know about this year's Clinical Dentistry Awards

**16 FELDSPAR CERAMICS IN THE AESTHETIC ZONE**  
Utilising feldspar ceramic in the aesthetic zone – Bárbara Calero



AESTHETIC  
DENTISTRY  
21

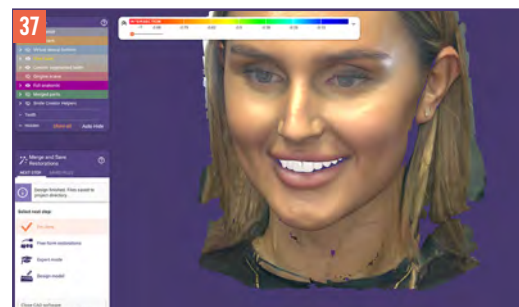
**22 CLINICAL DENTISTRY AWARDS**  
Introducing the aesthetic dentistry categories for the Clinical Dentistry Awards 2024

**24 RESTORATIVE: CERAMIC SMILE MAKEOVER**  
The winning ceramic smile makeover case from the Dentistry Clinical Case Awards 2023 – Edward Li

**29 TOOTH WHITENING: STEP-BY-STEP GUIDE**  
A recent tooth whitening case with guidance on patient engagement, examination insights, and optimal treatment plans for long-lasting and effective results – Kiran Shankla

DIGITAL  
DENTISTRY  
35

**37 REVOLUTIONISING SMILE DESIGN**  
The transformative impact of artificial intelligence on dentistry – Adam Nulty, Patrik Zachrisson, Chris Lefkaditis and Quintus Van Tonder



FEATURES

ENDODONTICS

41

42 CLINICAL DENTISTRY AWARDS

Introducing the endodontic categories for the Clinical Dentistry Awards 2024

44 SHAPING OF SIMULATED CANALS

The shaping ability of two reciprocating nickel titanium instruments in simulated curved canals – Ana Cecilia Boetto, Georgette Arce Brisson, Osvaldo Zmener and Cornelis Pameijer

IMPLANT DENTISTRY

49

50 CLINICAL DENTISTRY AWARDS

Introducing the implant dentistry categories for the Clinical Dentistry Awards 2024

59 MEDICATION-RELATED OSTEONECROSIS OF THE JAW AND IMPLANTS

Dental implants and medication-related osteonecrosis of the jaw – Inus Snyman, Vladimir Todorovic and Andre van Zyl

ORAL HEALTH

65

66 CLINICAL DENTISTRY AWARDS

Introducing the oral health categories for the Clinical Dentistry Awards 2024

68 INFANT NOURISHMENT: THE SUGAR RUSH

How to initiate good oral health from birth – Rohini Pancholi Bansal

71 WOMEN'S HORMONES AND ORAL HEALTH

From puberty to menopause: understanding the impact women's hormones have on oral health – Nina Garlo

ORTHODONTICS

75

76 CLINICAL DENTISTRY AWARDS

Introducing the orthodontic categories for the Clinical Dentistry Awards 2024

79 RETENTION AND STABILITY

Orthodontic treatment planning considerations and factors affecting stability in dental arch alignment – Avan Mohammed and Yan Huang

82 USING MANDIBULAR ADVANCEMENT DEVICES FOR OSA

Mandibular advancement devices as an alternative to continuous positive airway pressure for obstructive sleep apnoea patients – Arti Hindocha

MARKETPLACE

86

INDUSTRY INNOVATIONS

The latest product, services and equipment news from the industry

ENHANCED CPD

88

Q&A: ECPD

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# GENERAL DENTISTRY

## CLINICAL DENTISTRY AWARDS

The Clinical Dentistry Awards 2024:  
everything you need to know

# 14



## BÁRBARA CALERO

Feldspar ceramics in the aesthetic zone

# 16



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# CLINICAL DENTISTRY AWARDS 2024

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## CLINICAL DENTISTRY AWARDS CATEGORIES

### CLINICAL DENTISTRY AWARDS

The Clinical Dentistry Awards aim to acknowledge clinical excellence in practice. The ceremony takes place at Royal Garden Hotel in London on Friday 11 October. The closing date for entries is Wednesday 10 July. For the full list of categories and more information, visit [dentistry.co.uk/clinical-awards](https://dentistry.co.uk/clinical-awards), or scan the QR code to enter.



To acknowledge clinical excellence in practice, the Clinical Dentistry Awards bring together aesthetic dentistry, orthodontics, periodontics, endodontics, implant dentistry and oral health, showcasing the outstanding work being undertaken in dentistry.

The Clinical Dentistry Awards ceremony will take place at the Royal Garden Hotel in London on Friday 11 October 2024 and promises to be a prestigious and well-respected event for the UK and Ireland.

### HOW TO ENTER

Throughout this issue of *Clinical Dentistry*, you will find the criteria for the various categories, including:

- Aesthetic Treatment Practice
- Young Aesthetic Dentist
- Aesthetic Laboratory
- Facial Aesthetics Practice
- Orthodontic Practice
- Young Orthodontic Dentist
- Orthodontic Therapist
- Periodontic Practice
- Endodontic Practice
- Implant Dentistry Practice
- Young Implant Dentist
- Implant: Single Tooth
- Implant: Multiple Teeth
- Implant: Interdisciplinary Team
- Local Oral Health Initiative
- Hygienist of the Year
- Therapist of the Year
- Recently-Qualified Hygienist
- Recently-Qualified Therapist
- Philips Shine-On
- Multidisciplinary Practice.

Once you have decided which categories to enter, simply visit [dentistry.co.uk/clinical-dentistry-awards](https://dentistry.co.uk/clinical-dentistry-awards) to register your entry.

Next, it's time to start compiling your entries! Follow the guidelines in the category's criteria and include all of what is asked of you – if you don't include all the points and someone else does, then your entry is already at a disadvantage.

Think about getting the judges' attention, and making them want to read your submission. Your entry needs to be clear, creative and concise.

Entry is free and there is no limit to the number of categories you can enter. The closing date for entries is Wednesday 10 July. If you need any guidance, email [awards@fmc.co.uk](mailto:awards@fmc.co.uk) or call 01923 851777 – we're here to help!

### MULTIDISCIPLINARY PRACTICE

This category recognises the efforts of an entire team offering more than one discipline, from procedure to aftercare, focusing on the practice environment as well as clinical outcomes achieved and patient satisfaction.

To enter Multidisciplinary Practice, you must have entered at least one other category.

Entries will be accepted from practices only (not individuals) and judges will be looking at the submission in its entirety.

Entries should consist of a portfolio of information, including submission of at least one case and supporting notes.

Send up to 1,200 words explaining why your practice is a contender for Multidisciplinary Practice. Focus on the following:

**The practice:** tell the judges about the history, the location, the appearance, the feel and the branding. How is a practice culture of excellence attained, both clinically and organisationally? What technology do you use?

**The staff:** who makes up your team? Tell the judges who there is, what their area of interest is, what their training and experience is? How has practice investment in training and equipment benefited patients and outcomes?

**The marketing:** how do you attract patients? (Examples of marketing materials should be included if available)

**The patient experience:** what does your practice do to make the patient experience unique, from start to finish? How are people put at ease? How are treatment options explained?

**The team:** how does everyone work together to make sure that the patient receives the best results as efficiently as possible?

**Clinical before and after photos:** provide high-resolution before and after photographs to show excellent clinical results

**Additional photography:** the practice, the team etc.

Please also provide one exemplary case report (up to 1,000 words). This should detail the treatment carried out – the patient's presentation, diagnosis, treatment planning and treatment execution, and specifically include a discussion of how the case was treated as effectively as possible. [📷](#)



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**BÁRBARA CALERO**

Bárbara is a dental technician based in Málaga, Spain.

**ENHANCED CPD**

GDC anticipated outcome: C

CPD hours: one

Topic: General dentistry

**Educational aims and objectives:**

To present a case that utilises feldspar ceramic to achieve an aesthetic restoration in the aesthetic zone. This article qualifies for one hour of enhanced CPD; answer the questions on page 88.



For some, the developments in digital dentistry and dental technology seem to have come out of nowhere. For several years now, new technologies and materials have been pervasive, but CAD/CAM material Vitablocs (Vita Zahnfabrik) already has a 35-year success story.

Fine-structure feldspar ceramics are clinically reliable and highly aesthetic, establishing the restoration material as the gold standard worldwide (Labban et al, 2021; Morimoto et al, 2016a; Otto, 2017; Morimoto et al, 2016b; Kurbad, 2011).

In 2007, the polychromatic development of Vitablocs Triluxe forte came onto the market with a natural shade gradient from the neck to the incisal area. This enabled highly aesthetic restorations to be created even more efficiently and monolithically in the anterior region.

The following case report from myself and dentist Dr Bennani Salahadinne shows how the tried and tested feldspar ceramic enriches the material portfolio of a laboratory for the digital workflow.

**INITIAL CLINICAL SITUATION**

A patient presented in the dental practice because of trauma to teeth UR1 and UL1, which were treated with composite build-ups that were now several years old. She was dissatisfied with the aesthetics of both teeth, as she did not like their shade and shape. Because of this, she had wanted a new restoration for some time.

The initial photographs of this case show that the physiological rest position, the middle and the maximum expression of the smile line, represented an advantageous, restorative basis and only minor aesthetic defects could be detected (Figures 1 and 2).

After analysing the anterior teeth and the aesthetic zone, we suggested that the patient not only have the UR1 and UL1 restoratively replaced,

but also the UR2 and UL2, which were slightly tilted palatally, in order to achieve a better overall aesthetic result.

In view of the fundamentally advantageous tooth substance and the balanced relationship between the labial and gingival areas, we decided on four veneers on UR1, UR2, UL1 and UL2 made of the highly aesthetic fine-structure feldspar ceramic Vitablocs Triluxe forte, since a natural chroma gradient and fluorescent effects are already integrated.

The patient trusted the dental team and, after thorough consultation, agreed to the proposed treatment.

**FIGURE 1:** The physiological rest position**FIGURE 2:** The incisal edges harmonise with the line of the lower lip

Bárbara Calero highlights a digital success story of utilising feldspar ceramic in the aesthetic zone

# Feldspar ceramics in the aesthetic zone



### PLANNING WITH ANALOGUE MOCK-UP

Before the preparation, a mock-up should be produced in the first step in order to define and check the shape, aesthetics and final function. The mock-up should be produced on the basis of a wax-up. The focus was on the appropriate anatomical shape in order to be able to realistically simulate the natural proportions of the face and lips, and then reproduce them as a biogeneric copy as the basis for the virtual construction in the CAD software. In addition, care was taken to ensure that a functional dynamic occlusion was integrated into the four restorations for canine guidance, laterotrusion and protrusion, precisely because the line of the incisal edges in the anterior region of the lower jaw featured significant irregularities.

After the successful clinical try-in and control, we were able to continue with the treatment.

### TOOTH SHADE DETERMINATION AND PREPARATION

Before the preparation, the tried-and-tested mock-up was scanned intraorally as the construction basis.

After the guided mock-up preparation, a photo was taken with a polarisation filter to determine the shade of the tooth structure, and to be able to select the Vitablocs Triluxe forte blank in the corresponding shade (Figure 9). The choice fell on a block in shade 1M2C in the Vita System 3D-Master shade standard.

### DIGITAL WORKFLOW

The digital workflow began by scanning the upper and lower jaws and performing the bite registration with the Cerec Omnicam. The veneers were then constructed on this basis in the CAD software, the scan of the mock-up being copied with the Cerec software 4.4. The resulting reconstructions could then be manufactured with CAD/CAM support using the MC XL milling unit.

In the CAD design, the veneers were morphologically designed as planned in the analogue wax-up. The macrotexture was also taken into account, so that after the restorations had been milled, only small details of the microtexture had to be worked in and the final finishing had to be carried out in order to be able to glaze.

After the grinding process, the veneers were finished manually as planned. To do this, the grinding pin is first removed from the remaining Vitablocs Triluxe forte block using a diamond grinder or a coarse, flexible cutting disc.

### ELABORATION AND CHECKING THE FIT

The fit of the four veneers and the contact points were checked directly on the prepared teeth, and the proximal contact areas were polished. All irregularities were slowly and carefully removed with flexible discs.

Under no circumstances should the fine-structure feldspar ceramic Vitablocs be reworked with carbide burs, as this will cause microcracks in the ceramic. The contouring of the veneers should be done, whenever possible, with water cooling, with little pressure and only with fine-grain diamond grinders (40µm).

After adjusting and examining the surface, it can be analysed in more detail with a silver or gold surface marker. Such texture markers must then be completely removed with steam, in order to avoid changes in shade on the ceramic.

Once the morphological verification of the veneers has been completed, they can be finished. During a clinical try-in, it should be noted that, until the final adhesive cementation, the restorations can break if the patient clenches. This should be avoided at all costs. The restorations can be temporarily secured to the preparation with glycerine gel for try-in.

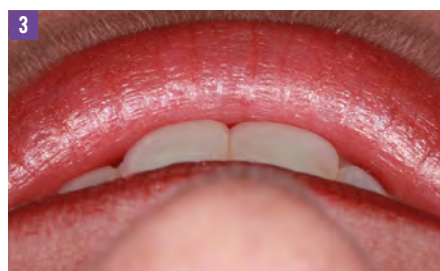
### STAINING AND GLAZING

The Vitablocs Triluxe forte blank consists of four layers of various shade intensity. The chroma decreases more and more from the intensive neck area to the enamel-like incisal layer. For this reason, it is usually not necessary to characterise with stains.

If specific areas absorb light, an incisal halo effect is to be achieved, or if areas are to be emphasised or a higher chroma intensity is to be established in the neck area, this can all be accomplished with the multifaceted ceramic stain system Vita Akzent Plus.

However, if the veneers made of Vitablocs Triluxe forte are to be characterised and/or glazed in the laboratory, this must be done using a resin dye material that reflects the shade of the tooth's hard substance.

In our case, the blue Vita Akzent Plus Effect Stains 11 (ES11) were used to establish small light-absorbing areas on the incisal edge, and at the same time, to contrast with the cream-coloured characterisations (ES02) on the mesial and distal flanks. Then the fixation firing took place at 850°C with four minutes of drying and a rise of 80°C/min without vacuum and one minute holding time.



**FIGURES 3 to 6:** Initial condition, integrated mock-up, functional control with protrusion, functional control with laterotrusion



**FIGURES 7 and 8:** Deep grooves were created in the mock-up and marked in pencil for controlled reduction





**FIGURE 9:** The shade situation after preparation, photographed with a polarization filter



**FIGURE 10:** Isolation of the neighboring teeth using a Teflon band



**FIGURE 11:** Etching of UR1 and UL1 with phosphoric acid



**FIGURE 12:** Adhesive bonding with composite



**FIGURE 13:** The integrated restorations made of Vitablocs Triluxe forte without polarization filter



**FIGURE 14:** The integrated restorations made of Vitablocs Triluxe forte with polarization filter



**FIGURES 15 and 16:** Posterior and anterior views of the highly aesthetic, monolithic restoration results



The final glazing was done with Vita Akzent Plus Glaze LT. The restorations were then tried on the resin dye to check whether the shade effect and the level of gloss achieved were as desired.

The final glaze firing took place with six minutes of drying, a rise of 80°C/min and a holding temperature of 950°C for one minute, without vacuum.

**ADHESIVE CEMENTING**


Flowable, light-curing or dual-curing luting composites, such as Vita Adiva F-Cem, should be used for the adhesive cementation of veneers made from Vitablocs (Figures 10 to 16).

**CONCLUSION**

If there is sufficient or very well-preserved enamel, I prefer to use Vitablocs feldspar ceramic in one of the three available material variants for my highly aesthetic ‘perfect match restorations’:

monochrome Mark II and polychrome Triluxe forte or Reallife. This is because natural chromatic properties and a high, tooth-like fluorescence are already integrated into these blanks.

In this way, the most highly aesthetic restorations can be created with minimal effort.

In combination with a functional, aesthetic mock-up, the precise shade fidelity of the Vitablocs blanks to the Vita shade standards and the simulation of the dye shade in the laboratory, the feldspar ceramic veneer restorations can be created in a predictable and efficient manner. 

*Acknowledgement*

*The dentist in the case was Dr Bennani Salahadinne from Morocco.*

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**PRODUCTS USED**

Vitablocs, Vitablocs Triluxe forte, Adiva F-Cem Vita Zahnfabrik Cerec Omnicam, MC XL Dentsply Sirona



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# AESTHETIC DENTISTRY

## CLINICAL DENTISTRY AWARDS

Presenting the aesthetic dentistry categories

22



## EDWARD LI

Restorative:  
ceramic smile makeover

24



## KIRAN SHANKLA

Tooth whitening:  
step-by-step guide

29



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## AESTHETIC DENTISTRY CATEGORIES: CRITERIA

### CLINICAL DENTISTRY AWARDS

The Clinical Dentistry Awards aim to acknowledge clinical excellence in practice. The ceremony takes place at Royal Garden Hotel in London on Friday 11 October. The closing date for entries is Wednesday 10 July. For the full list of categories and more information, visit [dentistry.co.uk/clinical-awards](http://dentistry.co.uk/clinical-awards), or scan the QR code to enter.



### AESTHETIC TREATMENT PRACTICE

This category recognises the efforts of an entire team, from procedure to aftercare, focusing on the practice environment as well as clinical outcomes achieved and patient satisfaction. Entries in this category will be accepted from practices only. Send up to 1,200 words on:

**The practice:** the history, location, tech, the appearance, feel and branding

**The staff:** who is there, what is their area of interest, what is their training and experience? How has investment in training and equipment benefited patients and aesthetic outcomes?

**The marketing:** how do you attract patients?

**The patient experience:** what does your practice do to make the patient experience unique, from start to finish? How are people put at ease?

**The team:** how does everyone work together to ensure the best results?

**Clinical before and after photos:** provide high-resolution before and after clinical photographs

**Additional photography:** the practice, the team etc.

Please also provide one case report (up to 1,000 words), detailing the treatment carried out – the patient's presentation, diagnosis, treatment planning and treatment execution, and a discussion of how the case was treated.

### YOUNG AESTHETIC DENTIST

This category is open to those born on or after 31 August 1988. Send up to 1,000 words covering the following:

- Demonstrate hard work and drive
- Explain how you set yourself apart from other young aesthetic dentists
- Present postgraduate training/development information if relevant
- Provide evidence of how you go beyond regular duty of care
- Provide relevant supporting evidence
- Provide before and after photos.

Please also provide one case report (up to 1,000 words) detailing the treatment carried out – the patient's presentation, diagnosis, treatment planning and treatment execution, and a discussion of how the case was treated.

### FACIAL AESTHETICS PRACTICE

To enter Facial Aesthetics Practice, the practice must have a strong interest in facial aesthetics and have adapted an element of the practice towards this

discipline. This category recognises the efforts of an entire team. Send up to 1,200 words focusing on:

**The practice:** the history, location, tech, the appearance, feel and branding

**The staff:** who is there, what is their area of interest, what is their training and experience? How has investment in training and equipment benefited patients and aesthetic outcomes?

**The marketing:** how do you attract patients?

**The patient experience:** what does your practice do to make the patient experience special, from start to finish?

**The team:** how does everyone work together to ensure the best results?

**Clinical before and after photos:** provide high-resolution before and after clinical photographs

**Additional photography:** the practice, the team etc.

Please also provide one case report (up to 1,000 words), detailing the treatment carried out – the patient's presentation, diagnosis, treatment planning and treatment execution, and include a discussion of how the case was treated as effectively as possible.

### AESTHETIC LABORATORY

This category recognises the efforts of an entire team. Entries in this category will be accepted from laboratories only (not individuals). Send up to 1,000 words on:

**The lab:** the history, location, the appearance, feel and branding. How is a culture of excellence attained, both clinically and organisationally? What technology do you use?

**The staff:** who is there, what specialist skills do you have at the laboratory, what is their training and experience? How has lab investment in training and equipment benefited outcomes?

**The marketing:** how do you attract patients and dentists?

**Customer satisfaction:** what makes your lab so successful in its communication?

**Additional photography:** the lab, the team etc.

Please also provide one case report (up to 1,000 words) detailing the treatment carried out, and a discussion of how calibre materials and technology were used to maximise work quality. Submit photographs of stages of lab work if appropriate. Provide any relevant supporting documentation, marketing information and pictures. [CD](https://www.clinicaldentistry.co.uk)



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SCAN ME



**EDWARD LI**

Edward practises at the a.b.c. smile practice in London. Whether it's rehabilitating tooth wear with composites or crafting new smiles in porcelain, his artful dentistry attracts a meticulous audience seeking contemporary cosmetic and functional makeovers.

**ENHANCED CPD**

GDC anticipated outcome: C

CPD hours: one

Topic: Aesthetic dentistry

**Educational aims and objectives:**

To present a ceramic smile makeover case that demonstrates creating beauty beyond the sum of its parts. This article qualifies for one hour of enhanced CPD; answer the questions on page 88.



**A** patient in their early 30s came across my clinic through a distant friend a few years ago where she began to follow my work on social media. Originally based abroad, the patient made plans to see me while she relocated to the UK for postgraduate studies. The headlining observation from the patient was that the teeth appeared very small and 'child-like' (Figure 1).

The patient was now seeking a solution with minimal maintenance, longevity and superior aesthetics, akin to what she often encounters on social media.

**INITIAL PRESENTATION**

The patient presented with a mostly unrestored healthy adult dentition. Her oral hygiene was slightly sub-optimal, which was associated with an overdue appointment since she relocated and smoking five to seven cigarettes per day.

Her dental history revealed she'd undergone fixed appliance orthodontics more than 15 years previous, and currently had no fixed or removable retainers.

The teeth present with mild lower labial crowding and a midline discrepancy of 1.5mm with class I classifications for incisal/canine/molar (Figure 2).

Assessing the patient's smile and dental anatomy, it is observed that at full smile, the lip line is moderate, with the lips showing around 2mm of gingivae beyond the zeniths of the upper incisors. However, it was also noted at this stage that the clinical crown heights appeared blunted by excessive free gingivae cervically without any papillae hypertrophy, suggesting altered passive eruption (APE).

The upper maxillary plane showed a slight cant, with the left lifting higher than the right and exacerbated by the gingival margins of the four incisors. The shade of the teeth had the base colour of Vita A2.



**FIGURE 1:** Preoperative smile



**FIGURE 2:** Preoperative retracted

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CASE AWARDS  
2023  
WINNER**  
Restorative: Ceramic  
Smile Makeover

Edward Li and Lukas Kebrle won the Restorative: ceramic smile makeover category at the Dentistry Clinical Case Awards 2023.

**Edward Li** presents his winning ceramic smile makeover case from the Dentistry Clinical Case Awards 2023, highlighting how to create beauty beyond the sum of its parts

# Restorative: ceramic smile makeover



**FIGURE 3A:** Laser gingivectomy



**FIGURE 3B:** Guided healing of gingivae – two-week review



**FIGURE 3C:** Healed appearance of gingivae – four-week review



**FIGURE 4A:** Visualising maxillary cant with grid lines



**FIGURE 4B:** Initial plaster model from immediate post-laser impression



**FIGURE 4C:** Aesthetic wax-up



**FIGURES 5A to 5C:** Wax-up process



**FIGURES 6A to 6C:** Comparing preoperative with the wax-up and with the intraoral trial smile



**FIGURES 7A to 7C:** Comparing preoperative with the crown lengthening and with the intraoral trial smile

**TREATMENT OPTIONS**

The following treatment options were considered and discussed with the patient:

- Stabilisation
  - Hygiene scale and polish and thorough oral hygiene instruction
  - Smoking cessation
- Pre-restorative orthodontics
  - Removable or fixed appliances
  - Single arch (lower) or both arches
- Crown lengthening
  - Gingivectomy
  - Surgical
  - Non-surgical
- Prescription tooth whitening
- Restorative
  - Composite veneers – six to 10 teeth upper arch
  - Direct – freehand or transferred via clear silicon stent off a wax-up
  - Semi-indirect – milled buccal surfaces to be bonded with heated or injectable composite
  - Porcelain veneers – six to 10 teeth upper arch
  - Lithium disilicate
  - Composite contouring – for worn lower incisors due to anterior guidance with mild-crowding.





**Orthodontics**

The mild rotations presented on the upper teeth were mild enough to allow a fully restorative journey and achieve well-designed anterior/lateral excursive movements should the patient not have the will or time to undergo the movements of teeth.

For the lower teeth, the patient agreed that orthodontics would be beneficial, however limited by the time she planned to be in the UK. This ultimately led to the compromise to focus on the upper teeth with the potential to align the lower teeth thereafter, which the patient understood as the opposite sequence to my clinical recommendation.

The clinical impact of this is manageable with

the mild crowding and a realistic compromise to accept for both the patient and myself.

**Crown lengthening**

Determining the type of APE is crucial for deciding which type of crown lengthening is suitable. With a periodontal probe and no LA at the consultation, I could determine that at the base of the sulcus, the CEJ could not be felt and more enamel was beyond that point on the upper incisors.

Preliminarily, a non-surgical approach using a laser diode to provide the gingivectomy was recommended with the understanding that once the patient was fully numb, an accurate measure of where the crestal bone/buccal plate began

relative to the CEJ would be the final check ahead of any laser gingivectomy.

**Veneers**

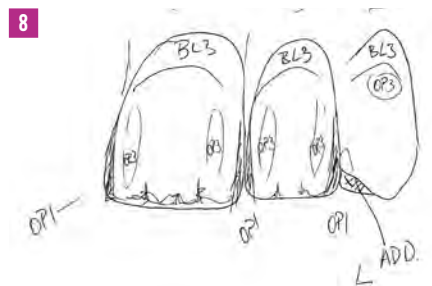
The patient had understood previous to our consultation that a direction involving porcelain would provide her the most long-term result with the least amount of maintenance, which suited her international lifestyle.

With the view to create larger teeth to fill her smile with fairly small natural teeth as the base, it was communicated to the patient that very little enamel removal would be required and more likely than not, I would be able to bond to greater-than 90% enamel surfaces by preparing through a trial smile in temporary composite.

**TREATMENT PLAN**

Following a thorough discussion, we decided on the following treatment plan:

- Stabilisation
  - Hygiene scale and polish and thorough OHI
  - Smoking cessation
- Crown lengthening
  - Gingivectomy – non-surgical with laser diode
- Prescription tooth whitening
- Restorative
  - Porcelain veneers – upper 10 teeth with lithium disilicate.



**FIGURE 8:** Diagram by Lukas of the proposed lithium disilicate composition



**FIGURE 9:** Viewing secondary and tertiary anatomy of the veneers



**FIGURES 10A to 10C:** Overview of the prep stages through the trial smile



**FIGURE 11A:** OO retraction cord in-situ ahead of the two-stage PVS

**FIGURE 11B:** Previewing the veneers on their separate die

**FIGURE 11C:** Immediate postoperative



**FIGURE 12A:** Preoperative

**FIGURE 12B:** Wax-up palatal surfaces preserving smooth and shared anterior guidance

**FIGURE 12C:** Immediate postoperative





FIGURES 13A to 13C: Comparison with the wax-up versus the porcelain veneers and their internal textures crafted



FIGURE 14: Before and after retracted

The case presented several clinical challenges, including:

- Masking maxillary cant combined with good anterior/lateral guidance
- Improving midline discrepancy
- Designing anatomy of teeth that reflect the aesthetics and genetics of the patient.

#### CLINICAL OVERVIEW

After the initial stabilisation for gingival health and lifestyle recommendations with smoking cessation, which the patient took well, the first clinical step was crown lengthening.

With the use of photos at full smile stacked with intraoral contrastor photos, I could visualise the ideal lengths to allow her upper lip to gently cover the zeniths of the gingival margin. The aim would also be to reduce the suggestion of the maxillary cant.

With the anaesthetic working, a diagnosis was made to determine a type 1A APE, which was very ideal for non-surgical crown lengthening.

The gingivectomy ranged between 0.5mm-2.5mm on the upper 3-3, performed freehand and guided healing with the use of a high-filler flowable composite applied in a crescent on each newly defined margin, held by lightly etched enamel collar (Figure 3).



FIGURE 15: Before and after smile

Two-stage PVS impressions were taken prior the guided healing supports to allow me to hand-design the smile in wax (Figure 4). Combined with a digital workflow, an intraoral scan is also taken for my orthodontic technician to fabricate the whitening trays that will now extend onto the newly exposed enamel surfaces.

Two weeks later, I reviewed the gums, removed the composites and fitted the whitening trays.

An analogue wax-up was chosen and created by myself as I wanted more creative input in this smile, expressing what I felt suited the patient's smile and genetics outside of the digital libraries.

This is a slow but rewarding process that lends me to listen to albums in full through a select choice of in-ear monitors, but that's a story for another day (Figure 5).

The trial smile helped us identify a few shortcomings to my design (Figure 6) and also helped us learn that the patient preferred tighter embrasures when transitioning from the lateral incisors to canines.

It successfully showed the restorative ability to camouflage the maxillary cant (Figure 7) and allowed the patient to have more time to take-in the significant changes around the corner. Many photos and videos were taken for myself and on the patient's phone for reference.

My artful ceramist technician Lukas Kebrle met the patient at our 'prep' appointment and brought to the table some thoughts on narrowing mesial/distal cervical surfaces, which gave these new larger teeth a bit more tightness and dimension.

As a collective, we decided to use a medium translucency BL3 disilicate base with subtle use of aesthetic porcelain and translucent incisal enamel without introducing optically blue/grey regions (Figures 8 and 9).

The ethos in the enamel preparation is simply to create 'just enough' space for the porcelain to deliver the desired optical and physical properties, while also being mindful of the challenges in crafting the veneers that I have learnt over the years with my relationship with Lukas (Figure 10).

A two-stage PVS with 00 cord along all the veneers margins is my preferred approach where Lukas and I feel 3D printed models still lack in tactile feel and precision compared to plaster/metal pins (Figure 11).

The Emax veneers are bonded with heated paste composite in a medium translucency BW shade and the immediate postoperative photos highlight the absent of soft-tissue trauma and initial integration of the restorative work (Figure 13).

Lukas's initiative is also observable, which looks to improve the midline of the patient smile by leaning the mesial lobe of the UR1 towards to left, a little further than my wax-up first designed for (Figure 12).

#### REFLECTION

In hindsight, the UL2 needed more cervical preparation, as Lukas could not obtain a suitable mesio-cervical embrasure while allowing a viable path of insertion, so the final result suggests a mesial tip to the root.

If the patient permanently relocates to the UK or extends her time here, I will shift my focus onto the lower arch to provide some orthodontic treatment.

I don't anticipate the need for porcelain veneers, and I will use composite to rebuild the worn incisal edges of the incisors and perhaps on the canines should I need to for occlusion. [C](#)

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# Tooth whitening: step-by-step guide

**Kiran Shankla** examines a recent tooth whitening case with guidance on patient engagement, examination insights, and optimal treatment plans for long-lasting and effective results

**A** 33-year-old female attended for a routine examination. Before carrying out an intraoral examination, the patient was asked if she had any dental concerns and if she was happy with the appearance and colour of her teeth (Figure 1).

Often, a patient attends a routine examination, sits in the chair, and leaves without being asked how they feel about their teeth. Asking these leading questions can help prompt a practitioner to discuss available treatment options depending on the patient's response.

In this case, the patient reported she did not like the colour of her teeth but was happy with her smile and the position of the teeth. This automatically led to a natural conversation regarding tooth whitening and if the patient had ever considered this.

It is vital at this stage to set the patient's expectations regarding

whitening. Patients must be informed that if they are looking for a fake, white, bleach-coloured smile, the whitening alone will not produce this.

They must also be informed that everyone's teeth will respond differently; there is no guarantee how long it will take for the teeth to appear whiter, and treatment can vary between two to four weeks. Sometimes, it may take even longer, which will incur further costs.

## EXAMINATION/TEST RESULTS

An intraoral examination should then take place. When carrying out an intraoral exam for whitening, the following areas should be assessed:

- Current shade – a prep shade using a Vita guide should be taken and confirmed in a mirror with the patient. This should be followed up with a high-resolution photograph with a shade tab held near the canine, which should then be uploaded to the patient records

- Oral hygiene – this must be optimum before starting whitening to get the best results and dental prophylaxis should be undertaken first before any impression taking
- Dark teeth – if any teeth are darker than the surrounding teeth, a periapical radiograph should be taken to establish the cause, eg post-RCT treatment/calcific metamorphosis
- Recession defects – patients should be informed that these areas will not change colour
- Signs of bruxism – these patients are much more likely to suffer from sensitivity during whitening, so they must be pre-warned
- Any current sensitivity issues – these patients are more likely to suffer from sensitivity during treatment; therefore, they may need to place a desensitising agent that contains potassium nitrate in the trays for an hour prior to bleaching or only carry out bleaching on alternative nights.

## TREATMENT PLANNING

Treatment options in this case included:

1. No treatment
2. A round of in-surgery whitening
3. At-home whitening
4. At-home plus in-surgery whitening.

A decision was made to whiten the teeth at home. The patient had a 3D digital scan taken, which was sent to a local lab to produce a set of whitening trays. The design of the trays must be specified; if the trays are too thin, they will flex more and cause more sensitivity issues. Generally, a 0.035" soft, flexible,



**DR KIRAN SHANKLA**  
Kiran is an award-winning dentist based in Reading. She completed a postgraduate restorative masters from UCL Eastman in 2020. She won Best Young Dentist at the Dentistry Awards 2022 and has lectured nationally on the benefits of tooth whitening and how to get the best results.



**FIGURE 1:** Preoperative





vacuum-formed, non-reservoir tray should be requested.

The patient was provided with an at-home kit of SDI Pola Night 10% carbamide peroxide gel. The take-home kits included 10 syringes, which last 30 days. 10% Pola Night is my whitening of choice due to being fluoride-releasing and having a high water content, which minimises sensitivity. In addition, the gel contains potassium nitrate, a known desensitising agent to help prevent any sensitivity. Using a lower concentration allows the teeth to gradually change colour, resulting in a longer shade satisfaction.

The patient carried out at-home whitening for a period of four weeks. She experienced some sensitivity and was recommended to use Pola Soothe for 45 minutes prior to whitening at night time to eliminate her sensitivity.

Figures 2 to 5 show how the colour of the teeth improves weekly. It is vital to inform patients they may see little change for the first week, and to get the best result, whitening should be carried out for a minimum of three weeks.

Once the teeth have reached their 'maximum whiteness', they will not change any more and the patient can stop treatment.

## RESULTS

Overall, the patient was pleased with the results and maintained the colour of her teeth with a single-night top-up once a month.

Tooth whitening can be a great practice builder and income generator for practices when done correctly. The biggest challenge is patient expectations; however, if explained correctly, the patient and dentist can both be confident in the process. [🔗](#)

## CONTACT

 @shanklasmiles

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## PRODUCTS USED

Pola Advanced Whitening System SDI



FIGURE 2: One week of whitening



FIGURE 3: Two weeks of whitening



FIGURE 4: Three weeks of whitening



FIGURE 5: Final result

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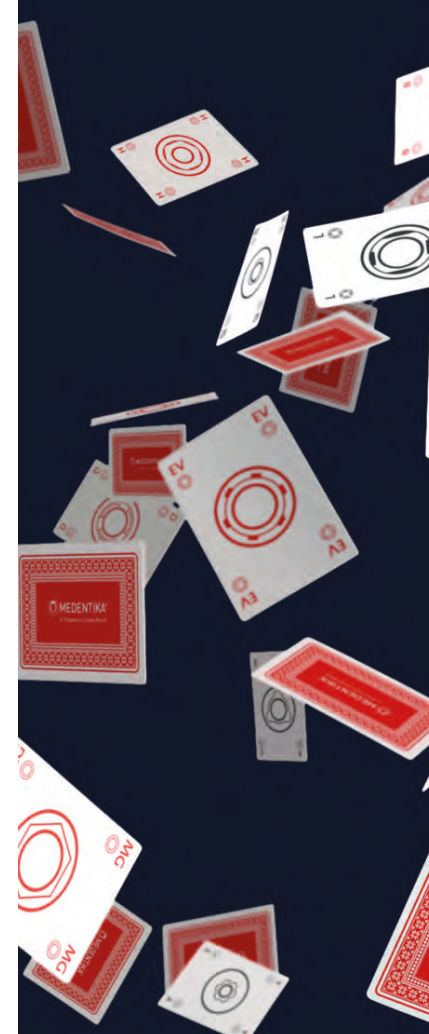
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**FIGURE 1:** Caninus, Zirkozahn's production facility overlooking the Dolomite Mountains



**FIGURE 2:** Zirconia blanks production. Each production batch is accurately checked after every step, via specific tests and measurements to control hardness, dimensions, density, milling, colour, translucency as well as the materials' shrinkage factor, using close-tolerance instruments



**FIGURE 3:** Bar-supported restoration made with Prettau® 3 Dispersive®, the latest zirconia material developed in-house, with Gradual-Triplex-Technology

# ZIRKONZAHN OPENS THE CANINUS DOORS

**A**fter Premolaris and Molaris I & II, Caninus is the company's most recent factory located in the heart of the Dolomite Mountains, built specifically to broaden their Prettau® zirconia production. As unique as these natural monoliths, Prettau® zirconia takes its name from the farthest village of the Aurina Valley in South Tyrol and was conceived for aesthetic restorations, from single crowns to monolithic full arches – the so-called Prettau® Bridges.

The Prettau® line includes different zirconia typologies, available in white blanks for further characterisation, pre-coloured, and with colour gradient for optimal aesthetics. Blanks are available in different heights (from 10 mm to 40 mm) and diameters – Ø95, Ø98 with step, Ø106 mm, as well as mini blanks to mill single crowns in hardly used colours.

Zirconia restorations are meant to stay in the mouth for long times, or in most cases permanently, which makes the matter of quality even more important. This is why Zirkozahn's work philosophy dictates that nothing has to be produced under economic or time constraints. Prettau® is manufactured with no compromises, using raw materials accurately selected from reliable suppliers. Upon arrival, the zirconia powder undergoes strict controls for quality assurance and much time is dedicated to the development of the most refined working processes, in close collaboration with the in-house R&D department.

In order to achieve high homogeneity, the raw material is pressed biaxially and/or isostatically, and the most advanced technologies are used to obtain the best aesthetic and mechanical properties.

In the last few years, the company's range of zirconia has embarked even more on the path of monolithic design with the new Dispersive® line, which includes materials that are already characterised with a natural colour gradient during the manufacturing process, making manual colouring no longer necessary. The gradient is provided through a specially

developed technique that does not blend colours into layers but disperses them evenly, lending restorations a beautiful and natural aesthetic. A perfect example of the company's constant strive for quality and sophistication is the innovative Gradual-Triplex-Technology, which provides the new Prettau® 3 Dispersive® material with a triple gradient of colour, flexural strength and translucency, achieving a perfect balance of resistance and aesthetics. Each production batch is checked after every step, via specific tests and measurements. In this way, the blanks' properties of hardness, dimensions, density, milling, colour and translucency are controlled, as well as the materials' shrinkage factor, using close-tolerance instruments. Once production is finished, final controls are run on each blank.

### A COMPLETE UNDERSTANDING

Being the sole process owners allows Zirkozahn to have a complete understanding of their products, ensuring that they form an optimum match in the complete workflow.

The in-house R&D team works to improve and fine-tune solutions to create a reliable planning and working environment, where hardware, software, tools and materials fit together according to a perfect dental-technical logic. The full control over testing and production procedures gives the company the possibility to react quickly to customers' needs, not only through constant product optimisation but also through their wide range of comprehensive education courses ('Die Zirkozahn Schule' – The Zirkozahn School), where participants are trained on the usage of equipment and materials with no knowledge gaps. [C](#)

### ZIRKONZAHN

Zirkozahn's doors are always open to visitors. To arrange a guided tour of the premises in South Tyrol, email [info@zirkozahn.com](mailto:info@zirkozahn.com), call +39 0474 066 660 or visit [www.zirkozahn.com](http://www.zirkozahn.com).



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# DIGITAL DENTISTRY

ADAM NULTY, PATRIK ZACHRISSON, CHRIS  
LEFKADITIS & QUINTUS VAN TONDER  
Revolutionising smile design

37



By enhancing diagnostic accuracy, enabling predictive treatment planning, and offering personalised patient care, AI is setting new standards in dental practice – Adam Nulty, Patrik Zachrisson, Chris Lefkaditis and Quintus Van Tonder, p37

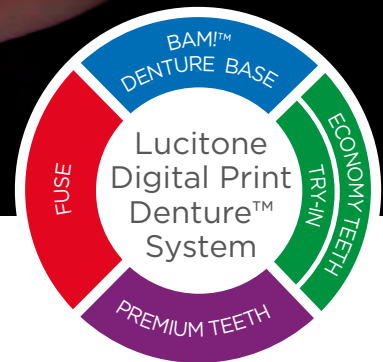
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**PATRIK ZACHRISSON**  
Patrik is vice president of the IDDA.



**CHRIS LEFKADITIS**  
Chris is vice president of the IDDA.



**QUINTUS VAN TONDER**  
Quintus is vice president of the IDDA.

#### ENHANCED CPD

GDC anticipated outcome: C  
CPD hours: one

Topic: Digital dentistry

#### Educational aims and objectives:

To examine the impact of artificial intelligence (AI) on dentistry, focusing on the advancements brought by 3D imaging technologies like the Shining 3D Metismile face scanner. This article qualifies for one hour of enhanced CPD; answer the questions on page 88.



**T**he integration of artificial intelligence (AI) into the field of dentistry represents one of the most significant technological advancements in recent history.

This fusion of technology and healthcare has opened new frontiers in diagnostic precision, treatment efficiency and personalised patient care.

AI, with its ability to process and analyse vast amounts of data at speeds and accuracies unattainable by human capabilities, is set to redefine the standards of dental practice.

This article will delve into the profound impact of AI on dentistry. It aims to highlight the innovative Shining 3D Metismile face scanner, explore the superiority of 3D imaging over traditional 2D methods, and speculate on the future trajectory of AI in dentistry, envisioning a landscape where technology and healthcare converge to offer unprecedented levels of care.

#### BACKGROUND TO AI IN DENTISTRY

The concept of AI, which dates back to the mid-20th century, has evolved from simple computational algorithms to complex machine learning and deep learning models capable of performing tasks that typically require human intelligence.

In dentistry, the application of AI was initially met with scepticism; however, the potential for improved diagnostic accuracy, treatment planning and patient outcomes quickly became apparent.

Today, AI in dentistry encompasses a wide range of applications, from image analysis and interpretation to predictive analytics for treatment outcomes and the automation of routine tasks.

The journey of AI in dentistry began with the digitisation of dental records and imaging. Digital X-rays and intraoral photographs provided the first datasets for AI algorithms to analyse. Early applications focused on automating the detection of common dental conditions, such as caries and periodontal disease, from these images.

As AI technology advanced, so did its applications in dentistry. Machine learning models, trained on vast datasets of dental images, began to outperform traditional diagnostic methods in both speed and accuracy.

The introduction of 3D imaging technologies marked a significant milestone in the application of AI in dentistry.

Three-dimensional cone beam computed tomography (CBCT) scans, 3D intraoral scans and 3D facial scans provided multidimensional data that allowed for a more comprehensive analysis of dental and facial structures.

AI algorithms were developed to interpret these complex datasets, offering insights that were previously unattainable with 2D imaging alone.

One of the most promising applications of AI in dentistry is in the field of orthodontics and smile design. The ability to accurately assess the dental and facial aesthetics of a patient, predict the outcomes of various treatment options, and design personalised treatment plans has transformed the practice of orthodontics.

In our opinion, the Shining 3D Metismile face scanner represents the pinnacle of this technological evolution, embodying the integration of AI with advanced 3D imaging to offer unparalleled precision in smile design.

#### A TECHNOLOGICAL MARVEL

The Shining 3D Metismile face scanner stands at the forefront of dental technology, offering a seamless integration of facial and intraoral scans.

This device utilises advanced AI algorithms to accurately merge 3D facial scans with intraoral scans, providing a comprehensive view of the patient's dental and facial aesthetics.

This capability is crucial for designing smiles that are not only aesthetically pleasing, but also harmonious with the patient's overall facial structure.

The scanner represents a significant leap from

Adam Nulty, Patrik Zachrisson, Chris Lefkaditis and Quintus Van Tonder examine the transformative impact of artificial intelligence on dentistry

# Revolutionising smile design



traditional dental imaging methods, which often relied on 2D photographs and manual measurements.

The AI within the scanner automates the merging process, as seen in Figures 1 and 2, ensuring precision and accuracy, thus laying a solid foundation for smile design and other dental procedures (Grippaudo et al, 2022).

### ADVANTAGES OF 3D OVER 2D IMAGING

The transition from 2D to 3D imaging in dentistry offers numerous advantages, particularly in the assessment of facial landmarks and aesthetics.

Unlike 2D photographs, which can distort perspectives and details, 3D scans provide a lifelike, three-dimensional representation of the patient's facial structure.

This level of detail and accuracy is indispensable for evaluating facial symmetry, proportions, and other aesthetic considerations crucial for successful smile design.

Furthermore, 3D imaging technology enables dental professionals to simulate various treatment outcomes, for example in Figure 3, where the 3D face scan taken into Exocad smile creator allows patients to visualise their post-treatment appearance. This not only aids in treatment planning, but also enhances patient communication, understanding and satisfaction (Gašparovic et al, 2023).

### DEEP DIVE INTO 3D IMAGING IN DENTISTRY

The advent of 3D imaging technology in dentistry, particularly with devices like the Shining 3D Metismile face scanner, has revolutionised the way we can approach diagnosis, treatment planning and patient care.

Let's explore the multifaceted advantages of 3D imaging over 2D imaging and its implications for the future of dental practice.

### ENHANCED DIAGNOSTIC ACCURACY

Three-dimensional imaging provides a comprehensive view of the dental and facial anatomy, offering details that are often missed in 2D images. This depth of information is critical for accurate diagnoses, especially in complex cases involving the temporomandibular joint (TMJ), impacted teeth, and subtle bone lesions.

The precision of 3D imaging aids in identifying the exact location and extent of pathology, which is crucial for formulating effective treatment plans (Normando, 2014).

### IMPROVED TREATMENT PLANNING AND OUTCOME PREDICTION

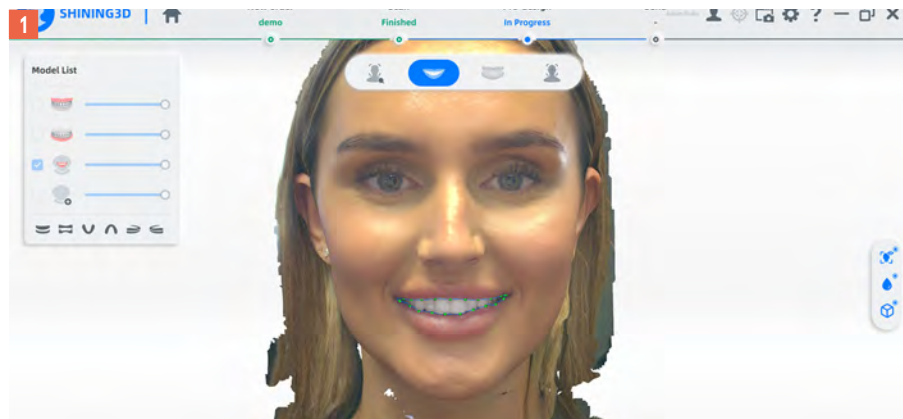
AI-enhanced 3D imaging allows for the simulation of treatment outcomes, enabling both the dentist and the patient to visualise the potential results of various treatment options.

This predictive capability is particularly beneficial in orthodontics, implant dentistry and cosmetic dentistry, where aesthetic outcomes are paramount. By providing a virtual preview of the treatment outcome, 3D imaging facilitates informed decision-making and enhances patient satisfaction (Grippaudo et al, 2022).

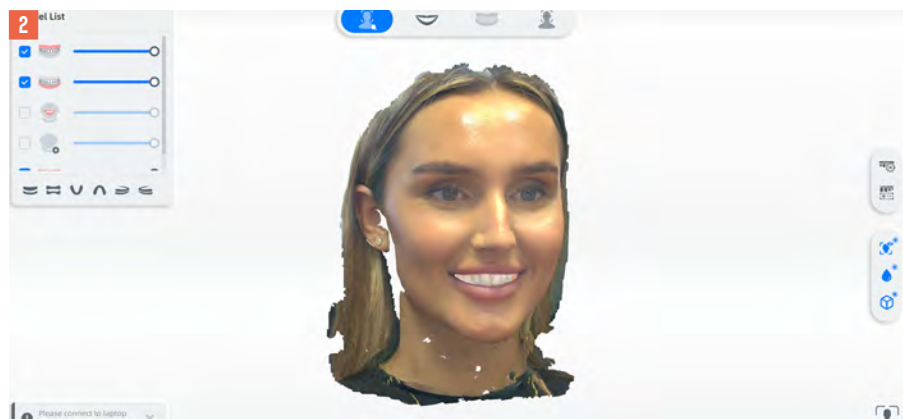
### CUSTOMISED PATIENT CARE

The integration of AI with 3D imaging technologies enables the customisation of dental treatments to fit the anatomical and aesthetic needs of each patient.

This personalised approach to dental care ensures that treatments are not only effective but also align with the patient's expectations and preferences.



**FIGURE 1:** The AI within the Facescan software automatically outlines the lips



**FIGURE 2:** Automatic AI teeth extraction to allow visualisation of the AI aligned scanned intraoral scan



**FIGURE 3:** The use of AI aligned face and intraoral scans allows dynamic facial profiles during digital smile design



Customised patient care leads to better compliance, improved outcomes and higher levels of patient satisfaction.

### DISCUSSION: THE FUTURE OF AI IN DENTISTRY

As we stand on the cusp of a new era in dentistry, propelled by advancements in AI and digital technologies, it is pertinent to speculate on the future directions of this integration.

The potential of AI to further transform dental practice is vast, with implications for all aspects of dental care, from diagnosis and treatment planning to patient management and education.

### PREDICTIVE ANALYTICS FOR PREVENTION

The future of dentistry lies in prevention rather than cure. AI's ability to analyse large datasets can lead to the development of predictive models that identify patients at risk of developing dental diseases.

By intervening early, dental professionals can prevent the progression of disease, reducing the need for invasive treatments and improving overall oral health outcomes.

### ROBOTIC ASSISTANCE IN DENTAL PROCEDURES

The precision and efficiency of artificial intelligence have paved the way for robotic assistance in dental procedures.

Future developments may see robots performing routine dental procedures under the supervision of a dentist. This could enhance treatment precision and reduce the margin for error.

Robotic assistance could revolutionise dental surgeries, making them less invasive and more predictable (Cai et al, 2020).

### ENHANCING DENTAL EDUCATION AND TRAINING

Artificial intelligence and 3D imaging technologies have the potential to transform dental education and training.

Virtual reality (VR) and augmented reality (AR) can provide immersive learning experiences, simulating real-life dental scenarios for students.

This hands-on approach to learning can improve the acquisition of clinical skills and prepare future dentists for the complexities of dental practice.

### CONCLUSION

The integration of AI into restoratively driven dental planning, exemplified by the Shining 3D Metismile face scanner and the integration of the associated AI algorithms within smile design, represents a significant leap forward in the field.

By enhancing diagnostic accuracy, enabling predictive treatment planning, and offering personalised patient care, AI is setting new standards in dental practice.

As we look to the future, the continued evolution of AI promises to further revolutionise dentistry, offering exciting possibilities for dental professionals and patients alike. [CD](#)

### REFERENCES

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### PRODUCTS USED

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## ENDODONTIC CATEGORY: CRITERIA

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The Clinical Dentistry Awards aim to acknowledge clinical excellence in practice. The ceremony takes place at Royal Garden Hotel in London on Friday 11 October. The closing date for entries is Wednesday 10 July. For the full list of categories and more information, visit [dentistry.co.uk/clinical-awards](http://dentistry.co.uk/clinical-awards), or scan the QR code to enter.



### ENDODONTIC PRACTICE

To enter this award the practice must have a strong interest in this discipline and have adapted an element of the practice towards endodontics.

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Entries in this category will be accepted from practices only (not individuals). Judges will be looking at the submission in its entirety and assessing the overall picture it paints of your practice rather than concentrating on individual elements. However, failure to address any of the criteria set out below may negatively impact your submission.

Entries should consist of a portfolio of information, including submission of at least one case and supporting notes. Send up to 1,200 words explaining why your practice is a contender for Endodontic Practice. Focus on the following:

**The practice:** the history, location, the appearance, feel and branding. How is a practice culture of excellence attained, both clinically and organisationally? What technology do you use?

**The staff:** who is there, what is their area of interest, what is their training and experience? How has practice investment in training and equipment benefited patients and outcomes?

**The marketing:** how do you attract patients? (Examples of marketing materials should be included if available)

**The patient experience:** what does your practice do to make the patient experience unique, from start to finish? How are people put at ease? How are treatment options explained?

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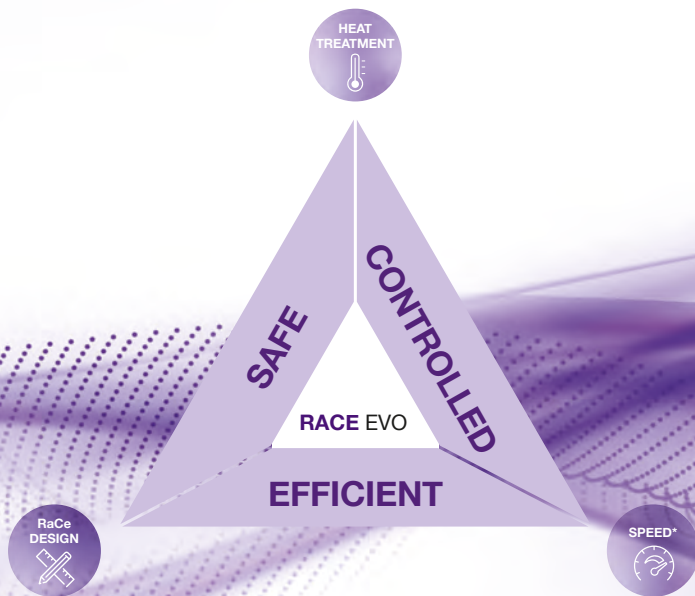
**Additional photography:** the practice, the team etc.

Please also provide one exemplary case report (up to 1,000 words). This should detail the treatment carried out – the patient’s presentation, diagnosis, treatment planning and treatment execution, and include a discussion of how the case was treated as effectively as possible. [CD](https://www.clinicaldentistry.co.uk)

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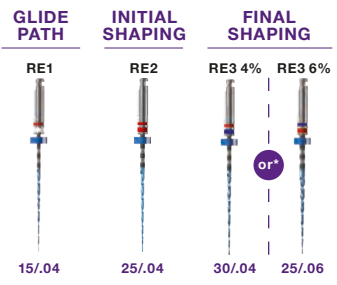
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#### ENHANCED CPD

GDC anticipated outcome: C

CPD hours: one

Topic: Endodontics

#### Educational aims and objectives:

To present a study comparing the efficacy of two reciprocating nickel titanium instruments in the preparation of simulated curved root canals. This article qualifies for one hour of enhanced CPD; answer the questions on page 88.



One of the reasons for endodontic failure is inadequate canal preparation, causing retention of bacteria and remnants of necrotic pulp tissue in the root canal system, which can lead to periapical pathosis (Siqueira and Rôças, 2008). Proper instrumentation and disinfection followed by complete obturation of the root canal is therefore essential for a successful outcome.

Historically, different instruments have been used for root canal preparation, including hand-operated and engine-driven rotary instruments (Schäfer and Florek, 2003; Calberson, 2004).

One of the inherent problems with the use of rotary instruments in curved root canals is transportation of canal space that occurs not only at the apical third but also along the entire length of the canal.

These instruments tend to remove more dentine on the outside of the curvature (Peters, 2004; Javaheri and Javaheri, 2007), and produce changes in the original geometry of the canals, ledges or lateral strip perforations.

To overcome this problem, two reciprocating root canal preparation systems, Reciproc Blue (VDW) and Wave One Gold (Dentsply Sirona) have been introduced.

The Reciproc Blue system is composed of three single-use instruments:

- R25 (25/.08)
- R40 (40/.06)
- R50 (50/.05).

Reciproc Blue instruments are produced with nickel titanium that undergoes an innovative heat treatment, changing its molecular structure to render increased resistance to cyclic fatigue, additional flexibility and the characteristic blue colour. They have an S-shaped cross section, a variable taper and a non-cutting tip (Yared, 2017).

The Wave One Gold system consists of four single-use instruments with a parallelogram-shaped cross section:

- Small (20/.07)
- Primary (25/.07)
- Medium (35/.06)
- Large (45/.05).

The Wave One Gold instruments were originally manufactured with the heat-treated M-wire alloy, however, this was recently changed to a gold alloy technology. Through the convergence of an advanced design, gold-wire technology, and a unique reciprocating movement, preparing canals is safer, easier and faster.

The metallurgical improvements in both Reciproc Blue and Wave One Gold instruments increase their flexibility and resistance to cyclic fatigue (Keskin et al, 2020).

The purpose of this study was to compare canal transportation (CT) of Reciproc Blue and Wave One Gold nickel titanium instruments in simulated curved root canals (SCRC).

The null hypothesis of the study was that there would be no significant difference in CT between the two systems. Furthermore, there would be no difference in the total time required to complete canal preparation.

#### MATERIALS AND METHODS

Twenty (n=20) Endo Training Resin Blocks (Dentsply Maillefer) with standardised simulated curved root canals (SCRC) being 16mm in length with a round cross-section, a 0.02 continuous taper and a curvature of 40° ± 0.5, were used in this study.

After the canals were explored with size 10 K-files (Dentsply Maillefer), the working length was established from the access opening to the end of the simulated canals (16mm). The endo training blocks were then randomly divided into two groups of 10 samples each (n=10).

Ana Cecilia Boetto, Georgette Arce Brisson, Osvaldo Zmener and Cornelis Pameijer discuss the shaping ability of two reciprocating nickel titanium instruments in simulated curved canals

# Shaping of simulated canals



### Canal preparation

The SCRC were prepared according to the procedures described in a previous report (Boetto et al, 2022).

Briefly, all samples were prepared by a single operator with an electric X-Smart IQ motor (Dentsply Sirona) using the predetermined programs for Reciproc Blue and Wave One Gold at 350rpm and according to the manufacturers' instructions.

The Endo Training Resin Blocks were mounted on a fixed custom attachment, simulating a standardised clinical position.

In group one, the canals were prepared with R25 Reciproc Blue in a reciprocating crown-down motion. The instruments were introduced into the canals until resistance was felt and then used with three in-and-out-pecking movements and light apical pressure. They were then removed and cleaned.

After irrigation with 3ml distilled water, they were used again with in-and-out-pecking movements until the working length (WL) had been reached. The canals were then irrigated with 3ml distilled water and dried with paper points. A new instrument was used for each canal preparation.

In group two, the SCRC were prepared with a Primary Wave One Gold instrument (PWOG) using the same operative procedures as described in group one. The total time required for canal preparation (including irrigation) was measured from the moment the canal was entered until preparation was finished. The effective operating time was recorded in minutes using a digital chronometer. If unwinding or instrument separation were to occur, it was also recorded.

### Evaluation of the prepared canals

After preparation, the SCRC were cross sectioned at the predetermined 2, 6 and 10mm from the WL. Next, 1mm thick sections were cut at low speed under constant irrigation with distilled

## Within the limitations of the present study on models with simulated curved root canals, both instruments were safe

water using a 0.3mm thick diamond wafering blade, mounted on a Precision Micro Disc NH-6P cutting machine (DHUC Ing). The cuts were perpendicularly to the long axis of the SCRC (Figure 1a). All sections were photographed under reflected light and at 10x magnification using a Sony Cybershot DSC-W180 digital camera coupled to a stereomicroscopic loupe (Axio Imager, Carl Zeiss). The photographs were made at a fixed focal distance of 5cm and transferred to a computer.

For each SCRC, the total surface area of the prepared canals at each predetermined distance from the WL were outlined and compared to the total surface area of the original unprepared SCRC, also measured at 2, 6 and 10mm from the WL, which had been determined in a pilot study (Zmener et al, 2020).

Measurements were performed using the Image J 1.38x image analysis software (NIH). The images were analysed by two trained examiners who were blind to group assignment. In cases of inter examiner disagreement, the sample in question was further discussed until an agreement was reached.

Using the digital images, the area of the prepared canal at each evaluation level

was calculated and expressed in mm<sup>2</sup>. The measurements were repeated three times and the mean value calculated. The tabulated values for the groups were analysed for statistical significance.

### Statistical analysis

The data were analysed using the SPSS version 21 (IBM Corp) at a 5% significance level. To identify any significant differences between groups a two-way analysis of variance for repeated measures was used.

The Student's t-test was used to analyse the time required by Reciproc Blue and PWOG instruments to complete the canal preparation.

### RESULTS

The mean values of surface area before and after canal preparation are shown in Table 1.

As expected, the size of the prepared canals was larger and had greater surface areas than the unprepared canals. The amount of increase in surface area after canal preparation (ie transportation) showed that at 2mm and 6mm from the WL no significant differences were found between Reciproc Blue and PWOG ( $P > 0.05$ ).

At 10mm from the WL, Reciproc Blue showed a significantly greater amount of surface area preparation than PWOG ( $P < 0.05$ ).

Regarding the time required to complete the canal preparation, significant differences ( $P < 0.01$ ) were found between the two groups:  $4.6 \pm 0.6$  and  $6.6 \pm 1.4$  minutes for subsequently Reciproc Blue and PWOG.

The most significant amount of surface preparation for both groups occurred at 10mm from the WL ( $P < 0.01$ ). No instrument unwinding or separation was noted throughout the experiment.

### DISCUSSION

In this study, the extent of canal transportation was determined by measuring and comparing the total surface area of the root canals before and after canal preparation.

For this experiment, resin blocks with standardised SCRC were used to eliminate the anatomic variations that are normally present in root canals of natural teeth (Boetto et al, 2022).

The degree of homogeneity (baseline) of SCRC with respect to canal volume, surface area and canal length before canal preparation allowed for the standardisation of the groups, thus enhancing the validity of the study (Schäfer and Florek, 2003; Calberson et al, 2004; Da Silva et al, 2009; Saleh et al, 2015).

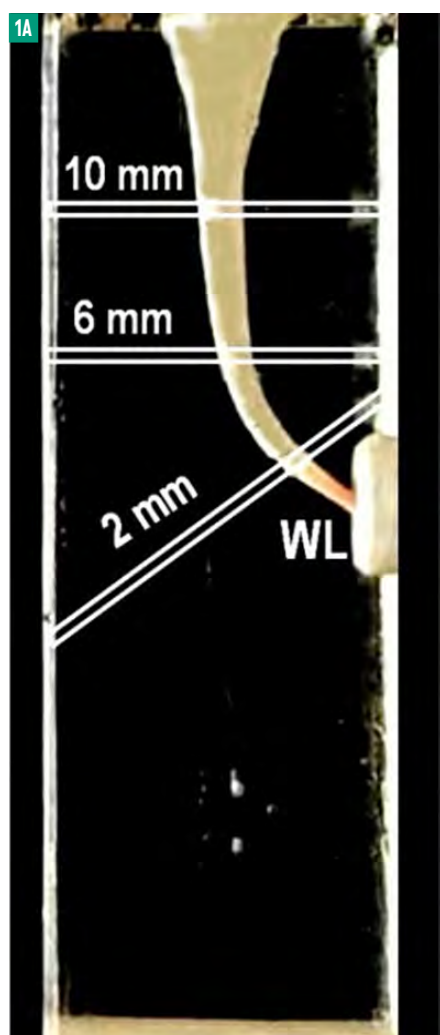
However, a correlation between the results of this study and clinical cases should be made with caution as in natural teeth we are dealing with multiple variables (Boetto et al, 2022).

Distance from WL	Before canal preparation	After canal preparation	
		Reciproc Blue	Wave One Gold
2mm	0.040 ± 0.001	0.075 ± 0.002 <sup>a</sup>	0.070 ± 0.002 <sup>a</sup>
6mm	0.052 ± 0.001	0.130 ± 0.001 <sup>b</sup>	0.125 ± 0.002 <sup>b</sup>
10mm	0.060 ± 0.001	0.285 ± 0.006 <sup>c</sup>	0.222 ± 0.003 <sup>d</sup>

Different superscript letters on the horizontal lines represent significant differences between groups, while the same superscript letters represent no significant difference. SD: standard deviation

**TABLE 1:** Means ± SD values of cross-sectional surface areas (in mm<sup>2</sup>) before and after canal preparation



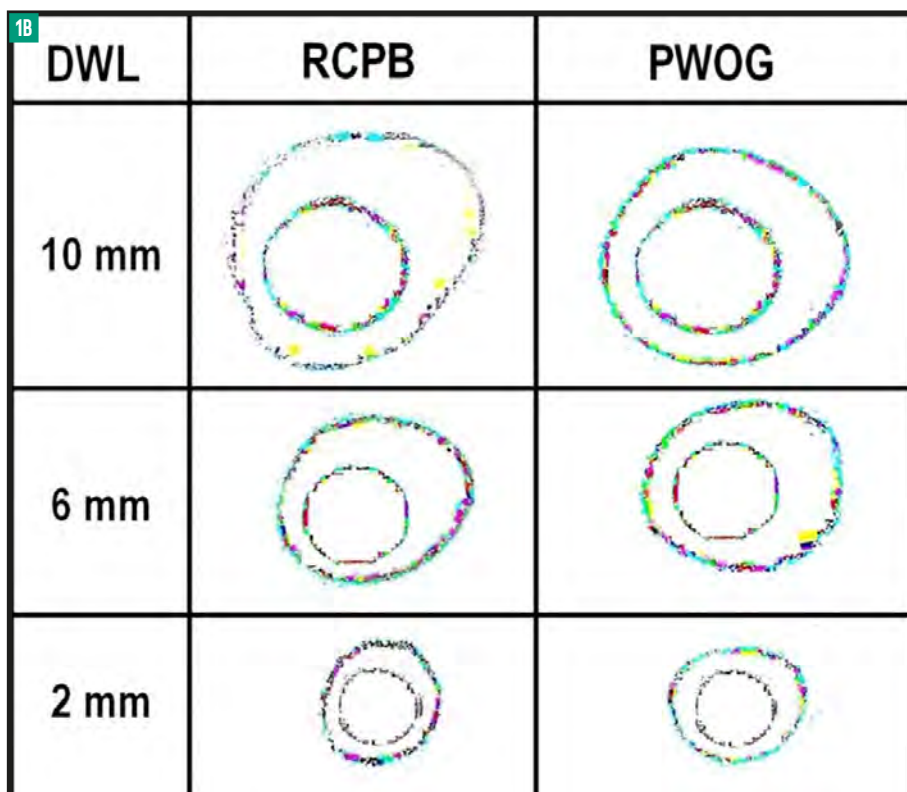


**FIGURE 1A:** Image of a resin block with simulated curved root canal after preparation showing the location of the cross sections at 2, 6 and 10mm from the WL

As per protocol, transportation after preparation was assessed by cross sectioning the canals at three different levels. Cross sections allow for visualisation of the entire circumference of the canal (Gordon et al, 2005), thus offering a comprehensive assessment of the surface areas before and after canal preparation. Of note is that no unwinding or instrument separation was observed during the experiment.

Our results agree with other authors (Keskin et al, 2017; Sarefoglul et al, 2020), who opined that the specific heat treatment of the nickel titanium alloy improves fatigue resistance and flexibility.

It has been theorised that the cross-section configuration of the Reciproc Blue and PWOG appears to provide sufficient space between the flutes and the canal walls to avoid engagement, while transportation of debris occurs in a coronal direction (Ruddle et al, 2013).



**FIGURE 1B:** Outlined surface areas measured at 2, 6 and 11mm from WL before (internal circle) and after canal preparation (outer circle) using the Image J program. DWL: distance from the working length. Original magnification x10

Our findings showed significantly greater amounts of canal preparation at 10mm from the WL. Our results agree with Khedmat et al (2016) who reported that similar results could be expected when treating or retreating root canals with nickel titanium instruments up to the WL.

Furthermore, the results of the study align with previous observations by Keskin et al (2018) who reported that there were no significant differences between Reciproc Blue and PWOG with respect to the surface areas prepared at 2mm and 6mm from the WL. However, the differences were significantly greater at 10mm.

There were also significant differences between Reciproc Blue and PWOG in the total time required to complete the canal preparation. Therefore, the null hypothesis was partially accepted.

Although standardised simulated canals in resin blocks are useful tools to compare the shaping ability of different instruments (Schäfer and Florek, 2003; Calberson et al, 2004; Da Silva et al, 2009; Saleh et al, 2015), one must consider that the hardness and stiffness of the resin and natural human dentine are quite different (Saleh et al, 2015). Therefore, the results of the study should be interpreted with caution. Further research on natural teeth is needed to

determine which instrument is more effective in maintaining the canal morphology with minimal canal transportation.

**CONCLUSIONS**

Within the limitations of the present lab study on models with simulated curved root canals, both instruments were safe and preserved the original canal anatomy at 2mm and 6mm from the WL.

At 10mm from the WL, PWOG preserved significantly more structure than Reciproc Blue while producing a slightly more conservative enlargement with less transportation at all evaluation levels. Reciproc Blue required significantly less time for instrumenting the root canal. [CD](#)

**REFERENCES**

[✉ siobhan.hiscott@fmc.co.uk](mailto:siobhan.hiscott@fmc.co.uk)

**PRODUCTS USED**

Reciproc Blue VDW  
 Axio Imager Carl Zeiss  
 Precision Micro Disc NH-6P DHUC Ing  
 Wave One Gold, X-Smart IQ Dentsply Sirona



ENTRY OPEN  
CLINICAL  
DENTISTRY AWARDS

# CLINICAL DENTISTRY AWARDS 2024

Deadline  
Wednesday 10 July 2024

Ceremony  
Friday 11 October 2024

## Acknowledging clinical excellence in practice

The Clinical Dentistry Awards combine key elements of dentistry including aesthetics, endodontics, perio, oral health, implants, orthodontics and digital dentistry. These awards celebrate and reflect clinical excellence in practice.

# Categories

Aesthetic Laboratory  
Aesthetic Treatment Practice  
Endodontic Practice  
Facial Aesthetics Practice  
Hygienist of the Year  
Implant Dentistry Practice  
Implant: Interdisciplinary Team

Implant: Multiple Teeth  
Implant: Single Tooth  
Local Oral Health Initiative  
Multidisciplinary Practice  
Orthodontic Practice  
Orthodontic Therapist  
Periodontic Practice

Philips Shine-On Award  
Recently-Qualified Hygienist  
Recently-Qualified Therapist  
Therapist of the Year  
Young Aesthetic Dentist  
Young Implant Dentist  
Young Orthodontist

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BEYOND PLATFORM-SWITCH

# Bone Growth Concept

The right combination of shape, surface characteristics and positioning of an implant leads to the growth of bone on the backtaper, as scientific research and daily clinical practice have shown.



Bone Growth Concept



**Backtaper -**

**The evolution of Platform-Switch**

The platform-switch has proven itself in modern implant systems. The Backtaper is now an additional element which gives the hard and soft tissue more space for attachment than the cylindrical and conical implant shapes as the following illustration clearly demonstrates.

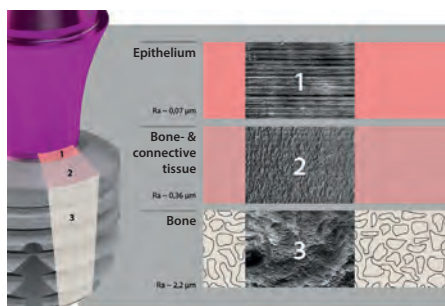


**Subcrestal positioning**

Clinical experience has shown that the additional space created by the backtaper, could be increased by subcrestal positioning of the copaSKY implant. The slim concave-shaped abutments provide more space for soft tissue attachment and bone growth on the backtaper. This has been confirmed in a recent multicenter clinical study.

**Microstructured surface**

The microstructured surface of the backtaper supports the attachment of bone and connective tissue. When the edge of the backtaper is positioned subcrestally, there is the possibility of depositing bone chips on it, thereby preventing the ingrowth of soft tissue and offering additional support for osseointegration. Thanks to the minimalist design of the cover screw, the peri-implant tissue around the backtaper is not irritated during re-opening. Any new bone formed on the anodized cover screw can be easily removed with a sharp excavator.



**Impressive clinical results**

The results observed by the clinicians are persuasive. Regardless of the clinical indication, new bone formation can be observed, from single-tooth restoration to the rehabilitation of edentulous jaws according to the SKY fast & fixed therapy. The vertical dimension of the alveolar ridge is preserved through the newly formed bone on the backtaper because there is reduced indica-

tion for bone levelling.

The Bone Growth Concept is precisely the further development of the Platform-Switch: the implant and abutment design, the microstructured backtaper and the subcrestal positioning of the copaSKY implants, synergistically not only prevent bone resorption but also reliably support the formation of new bone which completely encloses the implant.

Contact us today to find out more about the Bone Growth Concept.



## Bone Growth Concept

- **Backtaper** – gives more space to the bone and soft tissue
- **Microstructured surface** – supports osseointegration and the attachment of connective tissue
- **Subcrestal positioning** – promotes bone growth



Scan QR Code for more information!

# IMPLANT DENTISTRY

## CLINICAL DENTISTRY AWARDS

Presenting the implant dentistry categories

# 50



## INUS SNYMAN, VLADIMIR TODOROVIC & ANDRE VAN ZYL

Medication-related osteonecrosis of the jaw and implants

# 59



## ACCURACY AND EXCELLENCE IN IMPLANT DENTISTRY

Developing a deeper understanding of placing, restoring and maintaining dental implants for all practice teams

Practical Progressive Educational



# CLINICAL DENTISTRY AWARDS 2024

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## IMPLANT DENTISTRY CATEGORIES: CRITERIA

### CLINICAL DENTISTRY AWARDS

The Clinical Dentistry Awards aim to acknowledge clinical excellence in practice. The ceremony takes place at Royal Garden Hotel in London on Friday 11 October. The closing date for entries is Wednesday 10 July. For the full list of categories and more information, visit [dentistry.co.uk/clinical-awards](http://dentistry.co.uk/clinical-awards), or scan the QR code to enter.



### IMPLANT DENTISTRY PRACTICE

To enter this award the practice must have a strong interest in this discipline and have adapted an element of the practice towards dental implants.

This category recognises the efforts of an entire team, from procedure to aftercare, focusing on the practice environment as well as clinical outcomes achieved and patient satisfaction.

Entries in this category will be accepted from practices only (not individuals). Judges will be looking at the submission in its entirety and assessing the overall picture it paints of your practice rather than concentrating on individual elements. However, failure to address any of the criteria set out below may negatively impact your submission.

Entries should consist of a portfolio of information, including submission of at least one case and supporting notes. Send up to 1,200 words explaining why your practice is a contender for Implant Dentistry Practice. Focus on the following:

**The practice:** the history, location, the appearance, feel and branding. How is a practice culture of excellence attained, both clinically and organisationally? What technology do you use?

**The staff:** who is there, what is their area of interest, what is their training and experience? How has practice investment in training and equipment benefited patients and outcomes?

**The marketing:** how do you attract the patients? (Provide examples of marketing materials if available)

**The patient experience:** what does your practice do to make the patient experience unique, from start to finish? How are people put at ease? How are treatment options explained?

**The team:** how does everyone work together to make sure that the patient receives the best results as efficiently as possible?

**Clinical before and after photos:** provide high-resolution before and after clinical photographs to show clinically excellent results

**Additional photography:** the practice, the team etc.

Please also provide one report of a case that you feel is exemplary (up to 1,000 words). This should detail the treatment carried out – the patient’s presentation, diagnosis, treatment

planning and treatment execution, and specifically include a discussion of how the case was treated as effectively as possible.

### YOUNG IMPLANT DENTIST

This category is open to those born on or after 31 August 1988. Applicants should send up to 1,000 words explaining why they are a contender for an award through any, or a combination, of the following:

- Demonstrate hard work and drive; show achievement in your career to date
- Explain how you set yourself apart from other young implant dentists
- Present postgraduate training/development information if relevant
- Provide evidence of how you go beyond the regular duty of care
- Provide any other supporting evidence and pictures you feel are relevant
- Provide a portfolio of high-resolution outstanding before and after clinical photographs.

Please also provide one report of a case that you feel is exemplary (up to 1,000 words). This should detail the treatment carried out – the patient’s presentation, diagnosis, treatment planning and treatment execution, and specifically include a discussion of how the case was treated as effectively as possible.

### IMPLANT: SINGLE TOOTH

This category is for dentists and/or technicians. Please anonymise your entry for this category. Include a covering letter listing the names of all clinicians involved in treatment, such as the surgical and restorative stages.

If a dentist is entering alone, the technician should be named on the covering letter – both the dentist and technician will be awarded. Send up to 1,200 words detailing:

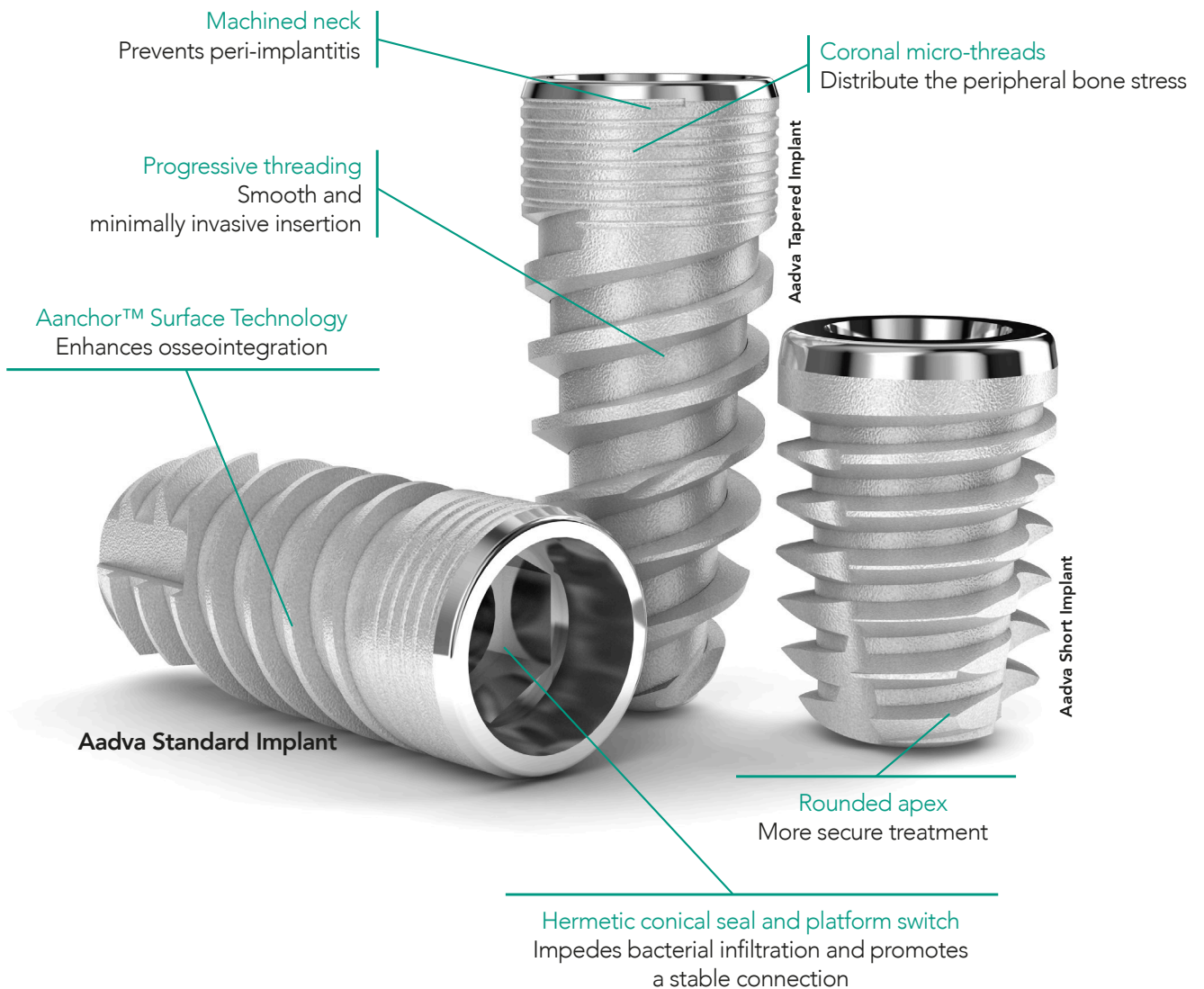
- The treatment, which involved replacement of one anterior tooth using implants to support the restoration
- This can include immediate/delayed placement and/or immediate/delayed loading
- Other treatment may have been carried out, but the major change will result from the implant therapy.







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Clinical Dentistry Awards 2023 ceremony

## IMPLANT: MULTIPLE TEETH

This category is for dentists and/or technicians. Please anonymise your entry for this category. Include a covering letter listing the names of all clinicians involved in treatment, such as the surgical and restorative stages.

If a dentist is entering alone, the technician should be named on the covering letter – both the dentist and technician will be awarded. Send up to 1,200 words detailing:

- The treatment, which involved replacement of multiple teeth using implants to support the restoration (this may be a small anterior bridge or two adjacent implants). Excludes full arches
- This can include immediate/delayed placement and/or immediate/delayed loading
- Other treatment may have been carried out, but the major change will result from the implant therapy.

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## IMPLANT: INTERDISCIPLINARY TEAM

This category is for all members of the team – dentists, surgeons, technicians and other clinicians as appropriate to the treatment undertaken. All team members included in the entry will be awarded.

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Please anonymise your entry for this category. Include a covering letter listing the names of all clinicians involved in treatment.

Send up to 1,200 words detailing:

- The treatment should be carried out by more than one clinician, working as a team. The implant surgeon and other clinicians must be different individuals
- The treatment must involve the placement of dental implant/s. Other treatment should also have been carried out, depending on the case. This can include (but is not limited to) orthodontics/orthognathic surgery or endodontic treatment – but the major change in the smile should be underpinned by the implant surgery and restoration.

### HOW TO ENTER

Highly inclusive and practice-based, the Clinical Dentistry Awards offer a wide range of categories, bringing together aesthetic dentistry, orthodontics, periodontics, endodontics, implant dentistry and oral health, to showcase the outstanding work being undertaken in dentistry.

The ceremony at the Royal Garden Hotel in London on Friday 11 October promises to be a prestigious and well-respected dental awards occasion for the United Kingdom.

Entering the Clinical Dentistry Awards 2024 is easy. Visit [dentistry.co.uk/clinical-awards](https://dentistry.co.uk/clinical-awards), click 'register now' and add your details, selecting the categories you wish to enter.

For this year's Clinical Dentistry Awards, please anonymise entries for the following implant categories:

- Implant: Single Tooth
- Implant: Multiple Teeth
- Implant: Interdisciplinary Team.

Remember to include a covering letter that lists the names of all the clinicians and technicians involved in treatment.

Once your entry has been written, polished and perfected, it's time to send it in! All you need to do is complete the online form at [dentistry.co.uk/clinical-awards](https://dentistry.co.uk/clinical-awards) and upload your entry.

The deadline for entries is Wednesday 10 July.

To be eligible for an award, you should not be subject to any ongoing fitness to practise investigation by the General Dental Council (GDC), or be practising under any conditions imposed as a result of such an investigation.

If you need any guidance, don't hesitate to contact the awards team by calling 01923 851 777 or emailing [awards@fmc.co.uk](mailto:awards@fmc.co.uk).

Good luck! 🍀



# SINUS LIFT & BLOCK GRAFTING CADAVER COURSE

[www.amardipkalsi.co.uk/cadavercourse](http://www.amardipkalsi.co.uk/cadavercourse)

4th-6th September 2024

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## Objectives:

- Overview of anatomy, treatment options and contra indications to sinus lift and block graft procedures
  - Avoid medico-legal pitfalls
  - Provide hands on practical experience of sinus lift and block grafting procedures
- Advise how to implement these procedures in practice

 **straumann**

# REFINING IMPLANT STRATEGIES PRACTICAL PLANNING WORKSHOP

[www.amardipkalsi.co.uk/refiningimplantstrategies](http://www.amardipkalsi.co.uk/refiningimplantstrategies)

6th-8th November 2024

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Ideal for beginner to intermediate implant clinicians  
**Includes Pig's Head Practical**

## Objectives:

- Discuss prosthodontic treatment indications within implant dentistry
- Develop a strategy to select hard and soft tissue grafting methods
- Build experience of implant placement in compromised sites and guided bone regeneration
- Consolidate and implement learning via case discussions and hands on practical work





## CONSULTANT-LED SINUS LIFT AND BLOCK GRAFTING CADAVER COURSE ANNOUNCED

# CADAVER COURSE: GET A HEAD START

**T**here is nothing like consultant-led cadaver teaching, according to Dr Amardip Kalsi – a specialist in restorative dentistry, prosthodontics and periodontics – who has assembled a multidisciplinary team of UK consultant specialists to deliver a three-day Sinus Lift and Block Grafting Cadaver course.

The practical elements have been augmented by a range of other elements to help dentists to boost their clinical implant skills and safely apply their learning in practice immediately, but also comprehend the medicolegal and business aspects needed.

Amardip stresses that consultants have themselves been taught how to teach and passed the most rigorous levels of UK examination, which adds an additional layer of quality assurance.

He also highlights the importance of having a broad skill set on the training team: ‘The cadaver course is unique as it is the only one to include a consultant in restorative dentistry and an ENT consultant on the teaching panel; if you’re doing a sinus lift procedure, and something goes wrong, your patient is likely to need an ENT specialist.

‘This course can help dentists to mitigate the risks, and because ENT consultants deal with so many, much more serious complications, delegates will have access to their in-depth and specialised knowledge.’

### REPRODUCIBLE SKILLS FOR IMMEDIATE PRACTICE

While Amardip acknowledges there are specialists worldwide who have developed, and are now teaching, novel techniques, he questions whether these are easily replicated at practice level.

‘There are techniques that people develop, and if they’re doing one specific technique all day, every day, they master it really well and get amazing outcomes,’ he says. ‘But the question is, how reproducible is it?’

‘At an international level, there’s some amazing work being done. But, in reality, a lot of it is performed under sedation or general anaesthetic and potentially by a team of clinicians. That’s not readily applicable to a general dentist in their everyday surgery,’ says Amardip, adding: ‘So, I’ve not created this course to focus on these types of cases, because I just don’t think that’s realistic or safe.’

### COMPREHENSIVE AND PRACTICAL CADAVER COURSE

Consultant-led teaching that focuses on tried and tested procedures and techniques is vital to ensure the delegates can easily transfer their newly acquired skills and knowledge to their own clinic. That’s the view of Dr Amardip Kalsi.

His comprehensive cadaver course is designed to give general dentists in-depth, theoretical, and practical insights into advanced implant treatment to enable them to practise safely, even if they have little experience of complex procedures.

The course includes a pre-course reading list and access to a day’s worth of tailored webinars, including one that covers the all-important medicolegal pitfalls that can arise from performing complex implant treatment.

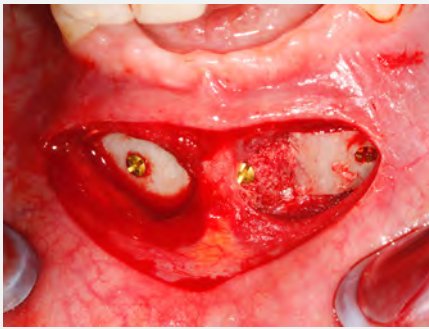
The first day of the course comprises group discussion drawing on the reading list, plus bespoke seminars. That’s followed by two days of demonstrations and hands-on experience with fresh, frozen human cadaver heads.

According to a previous course delegate, the course provided ‘a comprehensive guide to sinus lift surgery from the planning/clinical and non-clinical considerations and practising on a cadaver allowed me to build some dexterity and appreciate the nuances involved with the procedure. This will make me more confident preparing and providing this treatment in practice safely. The input from OMFS and ENT surgeons was invaluable’.

#### SINUS LIFT & BLOCK GRAFTING CADAVER

To find out more about the Sinus Lift & Block Grafting Cadaver course taking place at the Cambridge Surgical Training Centre over 4-6 September, and to secure one of 10 places, visit [www.amardipkalsi.co.uk/cadavercourse](http://www.amardipkalsi.co.uk/cadavercourse).





**FIGURES 1 to 4:** The three-day course will enable delegates to understand performing sinus lift and block grafting better

Says Amardip: 'The course is designed to be very comprehensive, and the teaching methods are designed around deep learning to enable people to really process the information and then be able to apply it, rather than being given one quick, superficial demonstration and expected to implement procedures from there.'

#### EXPERT TUITION

The consultants leading the course practise at Addenbrooke's Hospital in Cambridge where they work together on cases. Additional speakers with specialised knowledge specifically relevant to the course also provide teaching:

**Delegates can easily transfer their newly acquired skills and knowledge to their own clinic**

- Amardip Kalsi: consultant in restorative dentistry at Cambridge University Hospitals, where he leads the restorative dentistry service and is a specialist in restorative dentistry, prosthodontics, and periodontics. Amardip leads on all aspects of the course
- Viya Santhanam: consultant oral, maxillofacial and facial plastic surgeon at Cambridge University Hospitals. Vijay leads on the webinar, seminar, and practical content of the course
- Rishi Sharma: consultant ENT surgeon with specialist interests in sinus disease, sino-nasal oncology, and anterior skull base surgery. He is a member of the pituitary, skull base and head and neck multidisciplinary teams. Rishi provides seminar teaching, outlining the ENT considerations for sinus lift procedures
- Mike Williams: a dental adviser at MDDUS and specialist in oral surgery, Mike offers seminar teaching, outlining the medicolegal aspects of complex implant work
- Christine Marinc: with a doctorate in biology, Christine has worked at Botiss Biomaterials for 10 years. She provides the seminar teaching on a range of biomaterials relevant to dental implants. In addition, supporting seminars add context to the discussions and hands-on

procedures from a clinical and practical perspective to underpin the focus on surgical skills.

#### ACCURATELY SIMULATED PROCEDURES

Amardip stresses that the three-days of learning strongly focus on building surgical experience, which is the key to good outcomes for patients.

The course also covers case selection, timings for each step of treatment and why dentists might choose one type of treatment over another; essentially, all the things they need to consider prior to performing the augmentation procedures in their own practice.

The equipment they will need and appropriate fee levels are also covered in the course.

There are just 10 places on each course, ensuring plenty of time for almost one to one supervision, and delegates share a cadaver head and can assist each other with procedures. Working on real human heads, while not unique in dental teaching, is not common.

Stresses Amardip: 'There are few centres that offer human heads because there are not that many available. We offer them because it's the closest simulation you could get to performing a procedure on a real patient. Plus working on cadavers enables us to offer a course that mimics delegates having an expert mentor in their practice with them for a few days while they treat patients.'

If individual delegates would like to learn other techniques, the course usually allows time for them to try those under the supervision of the consultants – and on previous courses this has included soft tissue grafting and immediate implant placement.

Finally, Amardip says delegates are encouraged to self-reflect and consider their skill set at the end of the three days. 'Are they able to go off and do their first case by themselves, or do they need further support, possibly one-to-one mentoring to begin with? If this is the case, mentoring is an additional service we can provide, and of course delegates can email us about any case they're working on for a second opinion.

'Essentially, the 360° approach of the course is not only for delegates to learn new skills, but to be a little more self-aware and critical about their abilities and what they need to do to work safely,' Amardip concludes. [CD](#)

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## Course Overview

### Module DX4016 Clinical Implantology Year 1

MSc course introduction followed by 13 days of lectures and hands-on tutorials

**September:** MSc Course Induction. Remote.

**Sat. 12th Oct.:** Treatment planning and case selection. Face to face contact day with hands-on workshops.

**Sat. 2nd Nov.:** Basic sciences for Implant dentistry. End of Module Assessment. Pre-recorded lectures; live webinar discussions.

**Sat. 16th Nov.:** Implant Design. Pre-recorded lectures; live webinar discussions. End of Module Assessment.

**Sat. 7th Dec.:** Surgical skills for Implant dentistry. Face to face contact day with hands-on workshops.

**Sat. 11th Jan.:** Occlusion. Pre-recorded lectures; live webinar discussions. End of Module Assessment.

**Sat. 8th Feb.:** Restoring Implants. Pre-recorded lectures; face to face contact day with hands-on workshops.

**Sat. 1st Mar.:** Digital Workflow in Implant Dentistry. Pre-recorded lectures; face to face contact day with hands-on workshops.

**Sat. 29th Mar.:** Bone Defects. Pre-recorded lectures; live webinar discussions. End of module assessment.

**Sat. 26th Apr.:** Complications and their management & revision. Pre-recorded lectures; live webinar discussions. End of Module Assessment.

**28th Apr. - 5th May:** Formative Written Exam. Online using Maxinity.

**Sat. 17th May:** Cadaver course. Face to face contact day with hands-on surgical skills workshops. West Midlands Surgical Training Centre Coventry.

**25th May:** Case Report Presentations covering case selection & treatment planning – each delegate to present one case.

**3rd - 4th June:** End of Year Exam. Written Exam and Unseen Case oral presentation.

**CBCT Masterclass:** 2 days, consecutive to be completed before Feb. 28th 2025. Choose from a selection of dates.

**Module DX4017 Utilising the evidence base – completed online**

**Module DX4016 End of year Assessment**

**Complete 5 Clinical days - supervised clinical practice**

You will assess and plan appropriate treatment for patients. Includes: case assessment and treatment planning, including use of radiographic stents and CBCT.

### Module DX4026 Clinical Implantology Year 2

Complete 10 Clinical days - supervised clinical practice. Includes: case consultation, implant placement, GBR procedures, restoration, follow up.

**Module DX4027 Research Strategy.** Prepare and submit a 8,000-word clinically orientated research project, which may take the form of a mini systematic review.

**Final examinations.**

**PLEASE NOTE that all webinars are preceded by recorded lectures and long questions for discussion.**

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 MCHD FCD(SA) OMP  
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**VLADIMIR TODOROVIC**  
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**ANDRE VAN ZYL**  
 MCHD  
 Andre is in private practice in Hermanus, South Africa.

**ENHANCED CPD**

GDC anticipated outcome: C

CPD hours: one

Topic: Implant dentistry

**Educational aims and objectives:**

To discuss dental implants and medication-related osteonecrosis of the jaw. This article qualifies for one hour of enhanced CPD; answer the questions on page 88.



**M**edication-related osteonecrosis of the jaw (MRONJ) is a severe adverse drug reaction, consisting of progressive bone destruction in the maxillofacial region. In 2014, the nomenclature was changed from bisphosphonate-related osteonecrosis of the jaw (BRONJ) to MRONJ, to accommodate the growing number of osteonecrosis cases involving the maxilla and mandible associated with other antiresorptive and antiangiogenic therapies (Rosella et al, 2016).

Surgical trauma has been reported as one of the most important possible risk factors for the development of MRONJ. Therefore, the safety of dental implant placement in these patients has been the subject of controversial debate for several years and remains an ongoing source of uncertainty for dental practitioners (Otto et al, 2023).

**DEFINITION OF MRONJ**

A diagnosis of MRONJ is based on the following criteria:

- Current or previous treatment with antiresorptive therapy alone or in combination with immune modulators or antiangiogenic medications
- Exposed bone or bone that can be probed through an intraoral or extraoral fistula(e) in the maxillofacial region that has persisted for more than eight weeks
- No history of radiation therapy to the jaws or metastatic disease to the jaws (Ruggiero et al, 2022).

A case of MRONJ is shown in Figure 1. This 72-year-old female presented with an area of exposed bone on the left posterior lingual surface of the mandible for the past three months. Her medical history includes breast cancer, osteoarthritis, osteoporosis, back, hip and knee operations

and the patient was receiving intravenous bisphosphonate therapy.

A staging system (stages 0-3) has been developed for MRONJ based on the symptoms, clinical and radiological findings. Treatment strategies for MRONJ varies depending on the stage (Ruggiero et al, 2022).

Figures 2a and 2b show a case of MRONJ in a cancer patient who received intravenous bisphosphonates (BPs).

**ANTIRESORPTIVE AND ANTIANGIOGENIC MEDICATIONS: CLASSIFICATION OF DRUGS AND PATHOPHYSIOLOGY**

Antiresorptive medications – such as BPs, denosumab and angiogenesis inhibitors – have been widely used for treatment of osteoporosis, hypercalcemia caused by malignancies and skeletal-related events (bone pain and pathological fractures provoked by multiple myeloma and solid tumours).

These medications have a unique risk factor for surgical interventions, as they all can induce MRONJ. Recently introduced medications such as neutralising antibodies to TNF- $\alpha$ , CD20 and sclerostin, and other molecular targeted drugs have also shown risk of inducing MRONJ (King, Tanna and Patel, 2019), which implies that the number of MRONJ patients will increase due to more extensive use of antiresorptive medications for treatment of systemic diseases.

**BISPHOSPHONATES**

BPs are potent inhibitors of osteoclast-mediated bone resorption, mainly acting by inhibiting protein prenylation in osteoclasts. When attached to hydroxyapatite within the bone matrix, BPs are encountered by active osteoclasts, causing these cells to lose their ruffled border appearance,

Inus Snyman, Vladimir Todorovic and Andre van Zyl discuss dental implants and medication-related osteonecrosis of the jaw

# Medication-related osteonecrosis of the jaw and implants





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resulting in apoptosis of osteoclasts (Neville-Webbe and Coleman, 2010).

BPs have a wide therapeutical range, including the management of cancer-related conditions, prevention of osteoporosis-related fractures and other metabolic bone diseases such as Paget's disease and osteogenesis imperfecta (Ruggiero et al, 2022).

Regarding the risk of developing MRONJ, it may depend on the route of administration (greater for intravenous versus oral), duration of the exposure and lifetime cumulative dose. The most often BPs administered orally include alendronate (Fosamax), risedronate (Actonel) or, parenterally, zoledronic acid (Reclast) and ibandronate (Boniva).

### DENOSUMAB

Denosumab is a monoclonal antibody that binds the receptor activator of nuclear factor  $\kappa$ B ligand (RANKL), blocking attachment to the receptor activator of nuclear factor  $\kappa$ B (RANK), thus inhibiting osteoclast differentiation, which results in reduction of osteoclastic activity and bone resorption (Baron, Ferrari and Russell, 2011).

By preventing the activation of RANK, denosumab suppresses the increased osteoclast activity in solid tumours with osseous metastases. Additionally, it prevents osteolysis and tumour progression in giant cell tumours of the bone that express RANKL and osteoclast-like giant cells that express RANK receptor (Branstetter et al, 2012).

Unlike BPs, denosumab does not bind to the bone and its effects on bone modelling

mostly diminish within six months of treatment cessation (Ruggiero et al, 2022).

### ANGIOGENESIS INHIBITORS

Angiogenesis inhibitors have an impact on blood vessel formation and the signalling cascade. These agents bind to vascular endothelial growth factor (VEGF), leading to the interruption of vascular formation and, possibly, bone necrosis (Eguia, Bagan-Debon and Cardona, 2020).

This group of medications include tyrosine kinase inhibitors (ie sunitinib), monoclonal antibody targeting VEGF (ie bevacizumab), the mammalian target of rapamycin inhibitors (ie everolimus) and VEGF decoy receptors (ie aflibercept).

By interfering with tumour neoangiogenesis and consequent inhibition of collateral blood flow development, these medications cause the shrinkage of tumours. This antiangiogenic effect has similar consequences to the blood flow in jaws, resulting in MRONJ (Eguia, Bagan-Debon and Cardona, 2020).

### RISK FACTORS FOR MRONJ

To estimate the risk for medications associated with MRONJ, the primary parameter to be considered is the therapeutic indication for treatment (eg, malignancy or osteoporosis/osteopenia).

The risk of MRONJ is considerably higher in the malignancy group than in the osteoporosis group.

Regardless of indications for therapy, the duration of antiresorptive therapy is a risk factor for developing MRONJ (Ruggiero et al, 2022).

Dentoalveolar operations are the most common identifiable predisposing factor for developing MRONJ. Studies report that among patients with MRONJ, tooth extraction was identified as the predisposing event in 62 to 82% of cases (Ruggiero et al, 2022).

The risk of developing MRONJ among patients who have been exposed to antiresorptive medications for other dentoalveolar operations such as dental implant placement or periodontal procedures is unknown. The risk for MRONJ after implant placement among patients treated with denosumab has been reported to be 0.5%.

These procedures should therefore be performed with caution in cancer patients exposed to antiresorptive therapies and osteoporosis patients should be informed of potential risks, including development of MRONJ, early and late implant failure (Ruggiero et al, 2022).

MRONJ is more likely to appear in the mandible than the maxilla but can appear in both jaws. Furthermore, pre-existing inflammatory dental disease such as periodontal disease or periapical pathology is considered a risk factor. Age and sex are variably reported as risk factors for MRONJ, with advanced age at higher risk. The higher prevalence of MRONJ in the female population is likely a reflection of the underlying disease for which the agents are being prescribed (eg, osteoporosis, breast cancer) (Ruggiero et al, 2022).

Corticosteroids are associated with an increased risk for MRONJ. There are concerns that corticosteroids increase the risk for MRONJ when given in conjunction with antiresorptive agents. Comorbid conditions such as anaemia and diabetes are inconsistently reported to be associated with an increased risk for MRONJ. Cancer type and tobacco use are variably reported as risk factors (Ruggiero et al, 2022).

### PREVENTION OF MRONJ AND DENTAL IMPLANTS

Dental implants have become the standard of care for replacing missing teeth. The success of this is due to the predictable bone healing around titanium and zirconia implants.

Bone healing on dental implants is a process called osseointegration and refers to the direct healing of bone to the implant surface as seen under light microscopy. It therefore follows that anything interfering with bone healing may interfere with the osseointegration process. BPs may interfere with the process of osseointegration (Rebelo et al, 2023).

In a systematic review, it was shown that intravenous BPs versus oral treatment could have a higher failure rate of dental implants (almost 9% compared to 1%) (Gelazius et al, 2018). It is therefore important to obtain a detailed history



**FIGURE 1:** Clinical presentation of MRONJ after removal of a molar tooth





**FIGURE 2A:** Necrotic bone becoming exposed in a cancer patient with MRONJ after bisphosphonate treatment



**FIGURE 2B:** Palatal view of necrotic bone between central incisors in same patient

from the patient, alternatively from the treating oncologist in cancer patients as they tend to be treated with intravenous BPs.

Prevention of MRONJ has been shown to be possible in patients receiving BPs.

In their systematic review, Gelazius and colleagues (2018) showed that discontinuing BPs three months before implant placement and starting again three months post-surgery could prevent MRONJ. These patients were also covered with antibiotic treatment post-surgery (Gelazius et al, 2018).

Other studies have also shown treatment of dental implant patients on BPs is possible without complications (Bayani et al, 2011; Caicedo-Rubio, Ferres-Amat and Ferres-Padro, 2017).

There are, however, many variables/comorbidities – such as periodontal disease, smoking, uncontrolled diabetes, dental infections, corticosteroids and immunosuppressive conditions (Gelazius et al, 2018). A careful medical history and clinical examination is imperative for prevention of complications in patients taking BPs.

### PREDICTING MRONJ: AVOIDANCE STRATEGIES

Due to the severity of MRONJ and the lack of successful treatment regimens once MRONJ develops, it is important to understand the most successful avoidance strategies.

#### CTX (carboxy-terminal collagen crosslinks) test

Over the past decades, serum levels of C-terminal telopeptide cross-link (CTX), a bone remodelling by-product has been punted as a reliable test to predict MRONJ. There seems to be no consensus, however, that this test is conclusive in predicting MRONJ, although a figure above 0.150ng/ml is seen as safe with little to no risk and below 0.100ng/ml is high risk (AAOM, 2017; Peisker et al, 2018; Traboulsi-Garet et al, 2022).

The sensitivity of this has been shown to be 37.5% and specificity 57.7%, but most patients

who developed MRONJ had low CTX levels (Salgueiro et al, 2019).

In the absence of other more reliable tests, it is still being used. A figure well above 150ng/ml indicates close to normal levels and safe for dental surgery, whereas one well below 100ng/ml should serve as a contraindication for dental surgery.

#### Drug holiday

This has been shown to increase the CTX levels and may prevent MRONJ, especially if the drug holiday is three to six months or longer (Rebello et al, 2023; Gelazius et al, 2018).

BPs should be discontinued three to six months before surgery and started again three to six months after surgery. Others have found that a short drug holiday has no benefit (Salgueiro et al, 2019).

#### Antibiotic cover

Antibiotic cover before, during and after surgery (amoxicillin and clavulanic acid) has been shown to prevent MRONJ, especially if used with a drug holiday (Rebello et al, 2023).

### CONCLUSIONS

MRONJ is a serious complication after dental surgery, and especially so if the procedure was an elective one such as dental implant surgery. Clinicians should assess each case very carefully to identify comorbidities such as periodontal disease, smoking, diabetes, dental infections and immunosuppression.

It follows that factors such as bone type, presence and thickness of gingiva at implant site, healthy periodontium and smoking that may affect success rates in healthy individuals, will have so much more effect in patients on medication, making them susceptible to MRONJ.

Performing two-stage dental implant placement compared to one stage may also help, even if it is anecdotal. With the healing protected from oral bacteria in two-stage surgery, it may

just be the help that is needed for uneventful healing.

Using implants with a proven design to prevent peri-implant bone loss, such as a cone-in-cone abutment connection will lower chances of developing peri-implantitis, which would be a risk for MRONJ.

Clinicians should make use of the CTX test, but should caution patients that it is not a foolproof test, merely an indicator. If the value is below 150ng/ml, it is recommended not to perform elective dental implant surgery.

Should a patient request treatment with the full knowledge of potential complications, a drug holiday should be discussed with the treating physician, two-stage placement protocol followed and elimination of all comorbidities performed before surgery.

Antibiotic cover (amoxicillin and clavulanic acid) should be considered (unless a penicillin allergy is present), starting before surgery and continued post-surgery for a few days. Alternatives such as ciprofloxacin may be considered if a patient is allergic to penicillin.

Until such time that more definitive studies are done to provide guidance for this complex clinical dilemma, we will have to manage it as best possible with the knowledge set out above. Common sense should prevail. [C](#)

### REFERENCES

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#### Acknowledgement

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# ORALHEALTH

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**CLINICAL DENTISTRY AWARDS**  
Presenting the oral health  
categories

**66**



**ROHINI PANCHOLI BANSAL**  
Infant nourishment:  
the sugar rush

**68**



**NINA GARLO**  
Women's hormones and  
oral health

**71**



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## ORAL HEALTH CATEGORIES: CRITERIA

### CLINICAL DENTISTRY AWARDS

The Clinical Dentistry Awards aim to acknowledge clinical excellence in practice. The ceremony takes place at Royal Garden Hotel in London on Friday 11 October. The closing date for entries is Wednesday 10 July. For the full list of categories and more information, visit [dentistry.co.uk/clinical-awards](http://dentistry.co.uk/clinical-awards), or scan the QR code to enter.



### PERIODONTIC PRACTICE

To enter this award the practice must have a strong interest in this discipline and have adapted an element of the practice towards periodontics.

This category recognises the efforts of an entire team, from procedure to aftercare, focusing on the practice environment as well as clinical outcomes achieved and patient satisfaction.

Entries in this category will be accepted from practices only (not individuals). Judges will be looking at the submission in its entirety and assessing the overall picture it paints of your practice rather than concentrating on individual elements. However, failure to address any of the criteria set out below may negatively impact your submission.

Entries should consist of a portfolio of information, including submission of at least one case and supporting notes. Send up to 1,200 words explaining why your practice is a contender for Periodontic Practice. Focus on the following:

**The practice:** the history, location, tech, the appearance, feel and branding

**The staff:** who is there, what is their area of interest?

**The marketing:** how do you attract patients?

**The patient experience:** what does your practice do to make the patient experience unique, from start to finish?

**The team:** how does everyone work together to ensure the best results as efficiently as possible?

**Photography:** provide high-res before and after clinical photographs to show clinically excellent results, and photos of the practice, the team etc.

Please also provide one case report and supporting notes (up to 1,000 words).

### HYGIENIST OF THE YEAR

This award is for an individual dental hygienist working for a practice (or several practices). It is designed to recognise an empathetic, innovative and effective approach to clinical care and the promotion of oral health. Entrants to this category cannot enter both Hygienist of the Year and Therapist of the Year.

Applicants should send up to 1,000 words explaining why they are a contender for an award through any, or a combination, of the following:

- Demonstrate hard work and passion for prevention; show achievement in your career to date
- Explain how you set yourself apart from other dental hygienists
- Show innovation in educating patients
- Present postgraduate training/development information if relevant
- Provide evidence of how you go beyond the regular duty of care
- Demonstrate how you have carried the oral health message beyond the practice
- Provide any other supporting evidence and pictures you feel are relevant
- Provide a portfolio of high-resolution outstanding before and after clinical photographs.

Please also provide one report of a case that you feel is exemplary (up to 1,000 words). This should detail the treatment carried out – the patient's presentation, diagnosis, treatment planning and treatment execution, and specifically include a discussion of how the case was treated as effectively as possible.

### THERAPIST OF THE YEAR

This award is for an individual dental therapist working for a practice (or several practices). It is designed to recognise an empathetic, innovative and effective approach to clinical care and the promotion of oral health. Entrants to this category cannot enter both Hygienist of the Year and Therapist of the Year.

Applicants should send up to 1,000 words explaining why they are a contender for an award through any, or a combination, of the following:

- Demonstrate hard work and passion for prevention; show achievement in your career to date
- Explain how you set yourself apart from other dental therapists
- Show innovation in educating patients
- Present postgraduate training/development information if relevant
- Provide evidence of how you go beyond the regular duty of care
- Demonstrate how you have carried the oral health message beyond the practice
- Provide any other supporting evidence and pictures you feel are relevant
- Provide a portfolio of high-resolution outstanding before and after clinical photographs.

Please also provide one report of a case that you feel is exemplary (up to 1,000 words). This should detail the treatment carried out – the patient’s presentation, diagnosis, treatment planning and treatment execution, and specifically include a discussion of how the case was treated as effectively as possible.

**RECENTLY-QUALIFIED HYGIENIST**

This award is for an individual who is starting out in their hygiene career. Individual hygienists who have qualified within the last five years are eligible to enter. It is designed to recognise an empathetic, innovative and effective approach to clinical care and oral health promotion.

Entrants to this category cannot enter both Recently-Qualified Hygienist and Recently-Qualified Therapist.

Applicants should send up to 1,000 words explaining why they are a contender for an award through any, or a combination, of the following:

- Demonstrate hard work and passion for prevention; show achievement in your career to date
- Explain how you set yourself apart from other dental hygienists
- Show innovation in educating patients
- Present postgraduate training/development information if relevant
- Provide evidence of how you go beyond the regular duty of care
- Demonstrate how you have carried the oral health message beyond the practice
- Provide any other supporting evidence and pictures you feel are relevant
- Provide a portfolio of high-resolution outstanding before and after clinical photographs.

Please also provide one report of a case that you feel is exemplary (up to 1,000 words). This should detail the treatment carried out – the patient’s presentation, diagnosis, treatment planning and treatment execution, and specifically include a discussion of how the case was treated as effectively as possible.

**RECENTLY-QUALIFIED THERAPIST**

This award is for an individual who is starting out in their therapy career. Individual therapists who have qualified within the last five years are eligible to enter. It is designed to recognise an empathetic, innovative and effective approach to clinical care and the promotion of oral health.

Entrants to this category cannot enter both Recently-Qualified Hygienist and Recently-Qualified Therapist.

Applicants should send up to 1,000 words explaining why they are a contender for an award through any, or a combination, of the following:

- Demonstrate hard work and passion for

prevention; show achievement in your career to date

- Explain how you set yourself apart from other dental therapists
- Show innovation in educating patients
- Present postgraduate training/development information if relevant
- Provide evidence of how you go beyond the regular duty of care
- Demonstrate how you have carried the oral health message beyond the practice
- Provide any other supporting evidence and pictures you feel are relevant
- Provide a portfolio of high-resolution outstanding before and after clinical photographs.

Please also provide one report of a case that you feel is exemplary (up to 1,000 words). This should detail the treatment carried out – the patient’s presentation, diagnosis, treatment planning and treatment execution, and specifically include a discussion of how the case was treated as effectively as possible.

**LOCAL ORAL HEALTH INITIATIVE**

This award is designed to recognise the work being done to take oral health education outside the practice. Submissions are welcomed from all: individuals, practices, charities, local health teams etc.

Potential suitable projects include, but are not limited to, outreach work in care homes, education to local schools or spreading awareness of good oral health to the community.

Applicants should send up to 1,000 words explaining why they are a contender for Local Oral Health Initiative through any, or a combination, of the following:

- Describe the project and the intent behind it
- Explain how the initiative was put into action
- Highlight the impact that the work has had on the community.
- Include photographs, testimonials and other supporting evidence to help your entry stand out.

**PHILIPS SHINE-ON AWARD**

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The Philips Shine-On Award is designed to recognise and celebrate dental hygienists/therapists who are pushing the boundaries of the profession, creating their own career pathway and who demonstrate clear dedication to career development and success.

Applicants should send up to 1,000 words explaining why they are a contender for the Philips Shine-On Award through any, or a combination, of the following:

- Demonstrate passion for the profession
- Show how you have gone beyond the usual career boundaries
- Show your dedication to career development and progression
- Provide credible and relevant testimonials where relevant/possible.

While not essential, entries for the Philips Shine-On Award can include patient care cases.



Clinical Dentistry Awards 2023 ceremony



**ROHINI PANCHOLI BANSAL**

Rohini is a dental hygienist and therapist with a speciality in periodontal therapy.

#### ENHANCED CPD

GDC anticipated outcome: C

CPD hours: one

Topic: Oral health

#### Educational aims and objectives:

To discuss infant nourishment and how to initiate good oral health from birth. This article qualifies for one hour of enhanced CPD; answer the questions on page 88.

**S**ince being on maternity leave, I have had many questions circling my mind when it comes to feeding my baby:

- Will my baby's dental health be impacted through milk feeding?
- Are we exposing too much sugar too early on?
- Does formula milk provide all the necessary minerals and vitamins?
- Is breast milk too sweet for my baby?

I want to explore these in this article, and explain how to initiate good oral health from birth.

#### INFANT NOURISHMENT

Infant nourishment in the earlier stages of life is initially provided entirely through the consumption of milk. The milk comes in two forms, it may transcend from the mother through breast milk or through formula bottle feeding typically via dried milk powder. The significance and abundance of sugar in either of them is what needs to be understood better to improve and sustain good oral health amongst individuals.

#### Baby milk

Milk is rich in nutrients and calories that aid to fuel a baby's growth and development. It comprises all the essential nutrients, mineral and growth factors to aid initial development.

Milk content includes:

- Calcium for strength, bone density and dentition
- Protein for cell growth and energy
- Vitamin A for eye development and immune system functionality
- Iodine to regulate metabolism
- Magnesium for muscle function.

It also helps with hydration, which in turn keeps the baby energised and increases quality of health.

Due to their steady growth of multi-organ development, babies are not permitted to have full-fat cow's milk until 12 months of age. Specifically, the kidneys are still immature, so they cannot function to process the high volume of proteins/minerals from cow's milk. Exposure can put the infant at a high risk of internal bleeding.

#### Breastfeeding

Breast milk is derived from colostrum (thick yellow first milk produced by the mammary glands during pregnancy, containing high levels of immunoglobulins, antimicrobial peptides and growth factors). Breast milk's composition includes around 87% water, 7% lactose, 4% fat and 1% protein. As feeding progresses, the composition of the breast milk naturally changes to match the age and nutritional needs of the baby.

The predominant carbohydrate (sugar) in human milk is disaccharide lactose. The concentration of lactose begins to stabilise better around three weeks postpartum.

Lactose plays a role in calcium absorption, aiding nourishment in the gut, brain development and enhancing metabolic efficiency. Breast milk also contains lactoferrin, which helps to kill *Streptococcus mutans* (the tooth decay causing bacteria).

It is difficult to provide accurate analysis of breast milk from statistical data since the composition is variable within feeds (depending on the time of lactation, the mother's diet/age and the mother's hydration levels).

A higher sugary diet with mainly carbohydrates, in turn, will influence the sugar count broken down in the breast milk.

The stage of nursing will also influence the lactose content since the foremilk (first, thin milk expressed) has a higher lactose content to quench the baby's thirst in comparison to the hind milk (heavier and creamier mature milk).

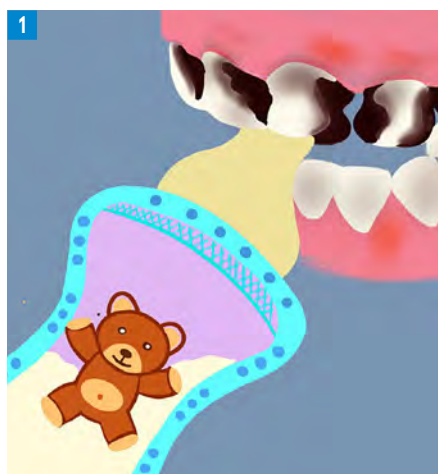
Another significant factor to consider is whether feeding occurs directly from the breasts through breastfeeding or through a bottle with expressed breast milk. There is a nutritional reduction and modification when it has been refrigerated or frozen. Nonetheless, there is still adequate activity of biomolecules but, due to its handling at differing temperatures, there is a minimal breakdown in some chemical bonds.

Breastfeeding does not directly cause tooth decay.

Rohini Pancholi Bansal discusses how to initiate good oral health from birth

# Infant nourishment: the sugar rush





**FIGURE 1:** Baby bottle decay

Research on breastfed babies has been ongoing for many years. Most of the studies deliberate on similar results, indicating there was no conclusive evidence that prolonged breastfeeding increased the risk of early cavities.

A study in 2020 from an analysis of 165 international women indicates ethnicity and breast size do not influence the composition of breast milk.

The 1999 Erickson study (where healthy teeth were immersed in different solutions) found breast milk alone was identical to water and did not cause tooth decay. When sugar was added to the breast milk, the mixture was worse than just a pure sugary solution in determining decay.

During breastfeeding, there is reduced pooling of the liquid in the baby's mouth in comparison to formula feeding. This is because the milk does not flow unless the baby is actively sucking through the mechanism of swallowing. Here the milk enters the mouth behind the baby's teeth.

#### Formula feeding

Formula milk is derived from soy or cow's milk and then treated to make it more suitable for babies to consume. The soy/cow milk as a base and both macronutrients (fats, proteins, carbohydrates) and micronutrients (vitamins and minerals) are added to achieve an optimal composition.

It comes as either a ready-to-feed liquid formula or a dry powder that you make up with

## A strategic oral care plan should be practised by both mother and infant

rested boiled water.

The main sugar type in formula milk is also lactose. In some formulas, corn syrup solids, maltodextrin or sucrose are used to replace some of the lactose to sustain a preferable carbohydrate level. These added sugars should be monitored meticulously since they may not necessarily provide the same nutritional benefits as naturally occurring sugars.

Formula alone does not actively cause decay, however the natural sugars (similar to breast milk) can initiate the beginning of the process. The main concern with formulas is when babies are being fed to sleep. This needs to be managed well to ensure reduced pooling of the milk hence reduced enamel dissolution from the sugars.

#### STRUCTURAL EFFECTS ON BABY DENTITION

Premature tooth loss should be avoided in all instances as it can cause dental issues within permanent dentition.

Recognising what effects each structural layer of the tooth has on different exposures/stimuli will help to identify dental problems earlier.

The tooth is made up of three essential layers:

1. Enamel (outer layer)
2. Dentine (middle-yellowish layer)
3. Dental pulp (inner live layer).

The pulp is what constitutes the tooth to be 'living' and the enamel and dentine function to provide resilience and protection.

With a high mineral content, enamel is robust but susceptible to dental caries and tooth wear. In infant dentition, the primary enamel is much thinner and softer in comparison to permanent dentition, thereby making it more vulnerable to decay. It is also important to consider if the baby has been exposed to genetic effects from birth, as this may influence the integrity of their dental structures. Especially the enamel, which may be softer/porous and will initiate the decay process quicker.

Feeding to sleep can promote a healthy sleep cycle and increase the production of serotonin, but, from a dental perspective, is not an advisable sleeping technique. This is mainly to avoid the constant pooling of milk that can progress to neglected dentition. The sugars will change the microbiome and initiate the decay process, leading to blackening and dissolution of the enamel (Figure 1).

Evidence and statistical results show early decay in infants will impact growth, functionality and strength in permanent dentition.

Rampant caries is a specific type of widespread dental decay that is present in more than 10 teeth. It is frequently found in infants who consume sweetened milk or low-pH fruit juice in a bottle or sippy cup just before their bedtime.

#### TOP TIPS

These are my top 10 tips to pass onto parents or caregivers for managing oral health during earlier stages of infant feeding:

1. Create an appropriate feeding/bedtime routine
2. Prevent any form of milk pooling around the mouth during feeds
3. Wipe the lip border and tongue with a warm/clean flannel in between feeds, especially before bedtime
4. Use a smear of fluoridated toothpaste (at least 1000ppm fluoride)
5. Brush as soon as the first tooth erupts and register your child for regular dental visits (this will help with familiarisation of the dental setting from an early age)
6. Brushing twice a day for two minutes, using a baby toothbrush to ensure correct splay in angulation of dental brush bristles
7. Encourage your baby to swish/sip water after having solid foods to aid metabolism
8. Encourage and establish a balanced food diet with reduced sugary intake (especially in the evenings)
9. Prevent the consumption of sugary liquids in baby bottles
10. Ensure a sufficient food/nutritional intake at regular times in the day, for the baby to sustain a good salivary flow.

#### CONCLUSION


In summary, sugar intake alone from breast milk or formula will not cause tooth decay. Research is continually being conducted and finding compelling and coherent results.

Other factors, including the infant's feeding routine, brushing routine, mother's diet and genetic makeup, will all contribute to the sugars that are being exposed to the infant so early on.

It's important to remember that some babies are predisposed to a higher risk of decay due to defects in their enamel.

The main natural sugar in formula milk and breast milk is lactose. Always check for the amount and type of sugar found in infant formulas. When considering baby formula, check the ingredient list on the back of the packaging, determine whether the sugars are naturally occurring or not, compare the sugar content of different formula products.

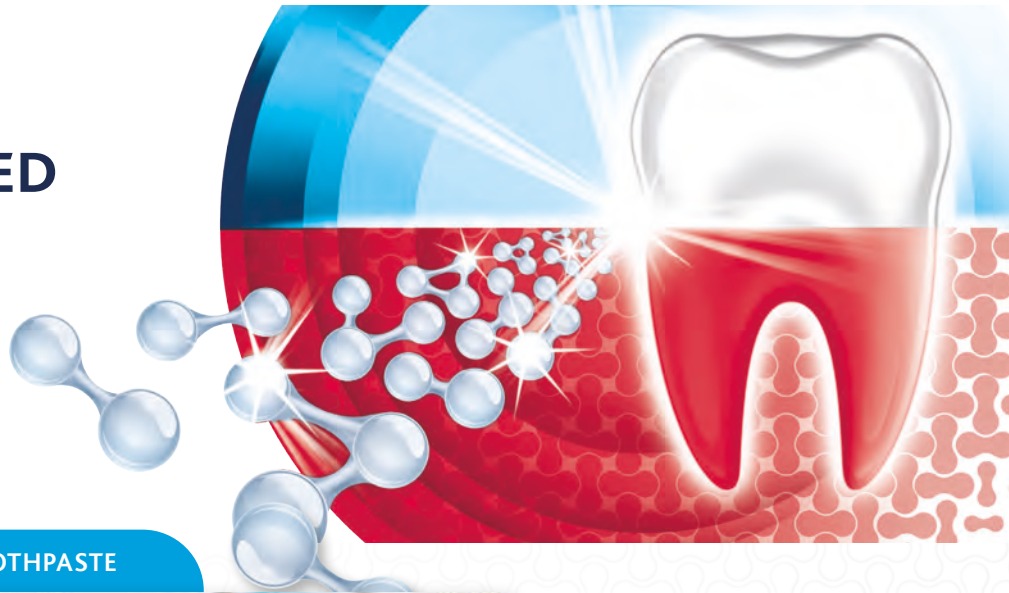
Above all, a strategic oral care plan should be practised by both the mother and infant.

What we need to advise patients is adopt an improved brushing versus feeding routine to ensure good oral health. 

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 [siobhan.hiscott@fmc.co.uk](mailto:siobhan.hiscott@fmc.co.uk)

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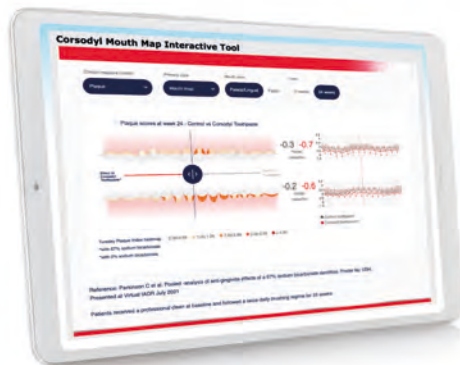


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 1. Jose et al. J Clin Dent 2018;29:33-39. 2. Pratten J et al. Int J Dent Hygiene. 2016;14:209-214.  
 3. Akwagyriam I et al. Oral Health Prev Dent. 2018;16(5):401-407.  
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# Women's hormones and oral health

Nina Garlo considers the impact women's hormones have on oral health

**F**rom adolescence to menopause, a woman's body undergoes hormonal fluctuations that affect oral health and, consequently, overall physical, and mental wellbeing.

During key hormonal periods – such as adolescence, menstruation, pregnancy and menopause – significant changes occur in women's hormones, affecting both oral and overall health. Hormonal changes can also impact the oral cavity, leading to various oral health issues including increased gum sensitivity, gum bleeding and tooth decay.

Women and healthcare professionals need to understand the connection between hormones and oral health, as this knowledge helps in taking proactive measures to maintain oral health.

## ADOLESCENCE

Hormonal changes during adolescence significantly affect oral health. Therefore, parents should serve as examples of good oral hygiene and teach children good hygiene practices early on. Emphasising good oral hygiene and establishing routines lay the foundation for a child's lifelong oral health and wellbeing.

Adolescence may affect girls' self-esteem and body image, and healthy oral health can also support confidence. Therefore, it is essential to encourage good oral hygiene practices during this life stage. During adolescence, dietary habits may change, so adult encouragement towards a balanced diet further supports oral health.

Additionally, orthodontic treatments often begin during adolescence, further highlighting the importance of good oral

hygiene in preventing decay and gum inflammation.

Gingivitis associated with adolescence typically begins around the onset of puberty, between the ages of eight and 13. Adolescent gingivitis manifests as swollen, red, tender or sore gums that may bleed when brushing teeth or even with a light touch. Usually, the inflammation is accompanied by bad breath as well as plaque and tartar build-up on teeth (Chaitra et al, 2012; Jafri et al, 2015).

If adolescent gingivitis is left untreated, it can progress to periodontitis, a more severe gum disease that can cause gum recession and ultimately lead to tooth loss. Guidance and examples from adults support the health of adolescent gums. Preventive care, including effective oral hygiene routines, is crucial (Chaitra et al, 2012; Jafri et al, 2015).

Menstruation onset during adolescence increases the impact of hormonal changes on oral health. Many women experience changes in oral health due to their menstrual cycle, including increased gum sensitivity and bleeding tendency. Studies suggest that fluctuations in hormone levels are associated with increased halitosis or bad breath (Alzoman et al, 2022).

## PREGNANCY

Studies indicate that up to 75% of pregnant women suffer from gum inflammation. Due to hormonal fluctuations, mild gum inflammation in pregnant women can lead to periodontitis.

Pregnancy-related gum inflammation affects many expectant mothers, especially in the second and third

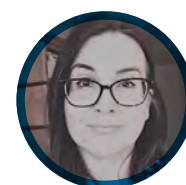
trimesters. Symptoms may include swollen, tender gums that bleed easily. Untreated inflammation can damage tooth support as bacterial plaque progresses under the gums and destroys the supporting connective tissue fibres. Accumulation of bacteria causing periodontitis in the gum line and pockets further increases inflammation. Untreated inflammation can lead to weakened tooth support and eventually tooth loss (Wu, Chen and Jiang, 2015; Yenen and Ataçag, 2019).

Poor oral hygiene often triggers gum inflammation. Regular and thorough brushing and flossing reduce gum irritation and bleeding in pregnant women by removing plaque from tooth surfaces and gum margins. Studies suggest that up to 95% of oral diseases are due to bacterial plaque (Wu, Chen and Jiang, 2015; Yenen and Ataçag, 2019).

Neglecting oral health during pregnancy can lead to premature birth, low birth weight, and the onset of preeclampsia during pregnancy (Srinivas and Parry, 2012).

During pregnancy, good oral hygiene also protects the unborn child. Oral health is part of general health and affects the wellbeing of both the expectant mother and the unborn child.

Hormonal changes during pregnancy increase saliva acidity and resistance to plaque decreases. Therefore, oral hygiene is particularly important during pregnancy. However, brushing with strongly flavoured and scented fluoride toothpaste may be unpleasant during pregnancy. If the strong odour or taste of toothpaste causes morning sickness, trying a different flavour or brand may be helpful.



**NINA GARLO**  
Nina is a health journalist for Koite Healthcare.





Many expectant mothers also suffer from hormonal-induced morning sickness, exposing tooth enamel to stomach acids, which can lead to erosion. Heartburn, a common ailment during pregnancy, can also erode tooth enamel. Softening of the tooth surface due to acid exposure increases the risk of wear, especially during chewing or if teeth are brushed shortly after consuming acidic foods.

To prevent erosion, it is advisable to use xylitol regularly. Rinsing the mouth with water after vomiting also helps reduce erosion caused by stomach acids.

During pregnancy, meticulous oral hygiene is crucial for both the expectant mother and the developing child. Studies have shown that gum disease is associated with the risk of premature birth and low birth weight, making maintaining oral health particularly important during pregnancy. Antibacterial Lumoral treatment is recommended during pregnancy as it helps expectant mothers take care of their oral health.

It may be appropriate to increase the frequency of dental visits for patients who are

pregnant, as this can help reduce oral health problems caused by hormonal factors.

**MENOPAUSE**

Many women experience pain or burning sensations in their mouths during or after menopause. The mouth may be sore, and the mucous membranes may be sensitive and ulcerated. Taste perception may also change.

During menopause, oestrogen production in the body significantly decreases, which also affects oral health as saliva production decreases (Suri and Suri, 2014).

Saliva protects teeth from decay, and if there is a lack of saliva, teeth can decay more easily. As the defence capabilities of the gums weaken due to hormonal changes, even a small amount of bacterial plaque can easily cause gum inflammation (Suri and Suri, 2014; Dutt, Chaudhary and Kumar, 2013).

Dry mouth is much more common in women than in men due to hormonal background. Many diseases and medications prescribed to women in menopausal age also increase the feeling

of dryness in the mouth (Dutt, Chaudhary and Kumar, 2013; Jacob et al, 2022).

The low level of oestrogen hormone after menopause increases the risk of osteoporosis in every woman. When bones weaken due to osteoporosis, gum diseases can occur more quickly. If bone mineral density is low, you are more likely to lose teeth (Grodstein, Colditz and Stampfer, 1996).

Ageing, and the loss of teeth, also increases the likelihood of needing dental implant treatments. Dental implants can also be placed in patients treated for periodontitis. This can be challenging for the durability of implants, as placing implants requires healthy facial bone and healthy gums.

Careful self-care of teeth is essential for successful implant treatment. The risk of gum disease does not disappear when implants are present in the mouth. Without proper treatment, inflammation may develop around the implant.

Peri-implantitis occurs when plaque bacteria affect the gum tissue and bone around the dental implant.



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## SUMMARY

Good oral hygiene habits, regular dental visits, and, if necessary, special treatments can help women maintain their oral health throughout life changes. By taking care of their oral health, women can promote not only their own wellbeing but also prevent potential complications such as premature birth or tooth loss.

Lumoral is a Finnish innovation for maintaining oral health as well as treating and preventing oral diseases at home. The Lumoral method cleans teeth even more effectively than traditional brushing. The light-activated Lumoral treatment kills both *Streptococcus mutans* bacteria that cause tooth decay and gum disease-causing bacteria.

The device is primarily intended for individuals for whom conventional oral hygiene does not produce the desired results. This is often a problem for people with chronic periodontitis, the elderly, and pregnant women, whose hormonal fluctuations cause trouble for oral and bodily wellbeing (Pakarinen et al, 2022; Trujillo et al, 2022).

Understanding the connection between hormones and oral health allows us to take preventive measures and take care of oral health in the best possible way at different stages of life. This way, we can promote overall wellbeing and enjoy healthy mouths and smiles throughout life. [C](#)

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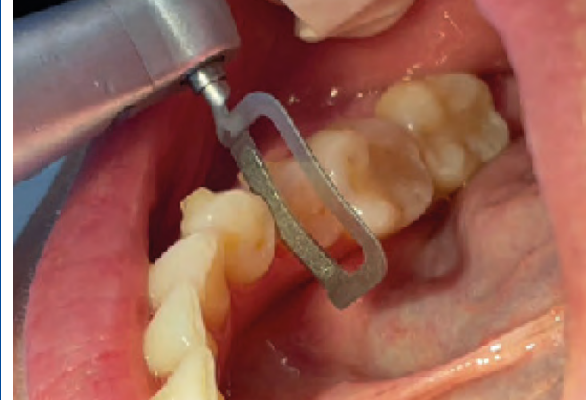
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- Clinical cases

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# ORTHODONTICS

**CLINICAL DENTISTRY AWARDS**  
Presenting the orthodontic categories

76



**AVAN MOHAMMED & YAN HUANG**  
Retention and stability

79



**ARTI HINDOCHA**  
Using mandibular advancement devices for OSA

82



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## ORTHODONTIC CATEGORIES: CRITERIA

### CLINICAL DENTISTRY AWARDS

The Clinical Dentistry Awards aim to acknowledge clinical excellence in practice. The ceremony takes place at Royal Garden Hotel in London on Friday 11 October. The closing date for entries is Wednesday 10 July. For the full list of categories and more information, visit [dentistry.co.uk/clinical-awards](http://dentistry.co.uk/clinical-awards), or scan the QR code to enter.



### ORTHODONTIC PRACTICE

To enter this award the practice must have a strong interest in orthodontics and have adapted an element of the practice towards this discipline.

This category recognises the efforts of an entire team, from procedure to aftercare, focusing on the practice environment as well as clinical outcomes achieved and patient satisfaction.

Entries in this category will be accepted from practices only (not individuals). Judges will be looking at the submission in its entirety and assessing the overall picture it paints of your practice rather than concentrating on individual elements. However, failure to address any of the criteria set out below may negatively impact your submission.

Entries should consist of a portfolio of information, including submission of at least one case and supporting notes. Send up to 1,200 words explaining why your practice is a contender for Orthodontic Practice. Focus on:

**The practice:** the history, location, the appearance, feel and branding. How is a practice culture of excellence attained, both clinically and organisationally? What technology do you use?

**The staff:** who is there, what is their area of interest, what is their training and experience? How has practice investment in training and equipment benefited patients and outcomes?

**The marketing:** how do you attract the patients who are interested in orthodontics? (Marketing materials should be included if available)

**The patient experience:** what does your practice do to make the patient experience unique, from start to finish? How are people put at ease? How are treatment options explained?

**The team:** how does everyone work together to ensure the best results as efficiently as possible?

**Photography:** provide high-resolution before and after clinical photographs to show clinically excellent results, and the practice, the team etc.

Please also provide one case report (up to 1,000 words). This should detail the treatment carried out – the patient's presentation, diagnosis, treatment planning and treatment execution, and specifically include a discussion of how the case was treated as effectively as possible.

### ORTHODONTIC THERAPIST

This award is for an individual dental orthodontic therapist working for a practice (or several practices).

Entries should consist of a portfolio of information, including submission of a case and supporting notes. Send up to 1,000 words focusing on the following:


- Demonstrate hard work and drive; show achievement in your career to date
- Explain how you set yourself apart from other orthodontic therapists
- Present postgraduate training/development information if relevant
- Provide evidence of how you go beyond the regular duty of care
- Provide any other supporting evidence and pictures you feel are relevant
- Provide a portfolio of high-resolution before and after clinical photographs.

Please also provide one report of a case that you feel is exemplary (up to 1,000 words). This should detail the treatment carried out – the patient's presentation, diagnosis, treatment planning and treatment execution, and include a discussion of how the case was treated as effectively as possible.

### YOUNG ORTHODONTIST

This category is open to those born on or after 31 August 1988. Applicants should send up to 1,000 words explaining why they are a contender for an award through any, or a combination, of the following:

- Demonstrate hard work and drive; show achievement in your career to date
- Explain how you set yourself apart from other young orthodontists
- Present postgraduate training/development information if relevant
- Provide evidence of how you go beyond the regular duty of care
- Provide any other supporting evidence and pictures you feel are relevant
- Provide a portfolio of high-resolution outstanding before and after clinical photographs.

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**DR AVAN MOHAMMED**

Avan is an award-winning specialist orthodontist working in private practices in Marylebone, Islington and South Kensington.

**YAN HUANG**

Yan qualified from Barts and London Dental School in 2007. Having completed her orthodontic specialist training she obtained her doctorate degree and membership in orthodontics in 2018. Yan works in mixed NHS/private specialist orthodontic practices in London and Kent.

**ENHANCED CPD**

GDC anticipated outcome: C  
CPD hours: one

Topic: Orthodontics

**Educational aims and objectives:**

To discuss orthodontic treatment planning considerations and factors affecting stability in dental arch alignment, including relevant literature. This article qualifies for one hour of enhanced CPD; answer the questions on page 88.



**O**rthodontic relapse is defined as the return, following correction to the original features of the malocclusion (British Standards Institute, 1983).

Moyers (1973) described retention as: 'The holding of teeth following orthodontic treatment in the treated position for the period of time necessary for the maintenance of the results.'

Stability can only be achieved if the forces derived from the periodontal and gingival tissues, the orofacial soft tissues, the occlusion and post-treatment facial growth and development are in equilibrium (Moss, 1980).

Orthodontic retainers resist the tendency of teeth to return to their pre-treatment positions under the influence of:

- Resolution of bone metabolism
- Periodontal (tension in periodontal fibres particularly those around the necks of the teeth – interdental and dento-gingival fibres)
- Occlusal (quality of final occlusion – with unwanted displacing occlusal contacts potentially leading to unfavourable changes in tooth position). For example, reducing an overbite will be more stable if the lower incisal edge lies anterior to the centre of upper incisor root centroid (Houston, 1989)
- Soft tissue forces and continuing dentofacial growth – unwanted tooth movement after treatment can occur as a result of normal age changes. Due to changes in soft tissue pressures and skeletal structure around the dentition (minor ongoing growth) – these can be regarded as a part of normal ageing process and unpredictable.

Therefore, retainers are indicated not only to resist the tendency of teeth to return to their pre-treatment positions, but also to resist unwanted long-term age changes.

**SHORT-TERM STABILITY**

Short-term stability is the first one to two years following orthodontic treatment. Reitan (1967) found that settling of gingival fibres takes up to seven to eight months.

Factors affecting short-term stability include:

- Poor planning of mechanics with unstable treatment (transverse arch expansion)
- Excessive arch lengthening (ie lower labial segment proclination)
- Moving teeth outwit bony limits
- Severe rotations (a long-term study by Edwards in 1988 confirms that circumferential supracrestal fiberotomy reduces relapse of rotations)
- Spaced dentition
- Deep bites
- Anterior open bites
- Soft tissue factors – large tongue
- Habits – thumb sucking, nail biting
- Failure to plan appropriate retention
- Poor compliance with retention
- Continued growth with skeletal changes and soft tissue maturation.

**LONG-TERM STABILITY****Literature overview**

Little and colleagues (1981) conducted a study of 65 patients who underwent extraction of all first premolars. After 10 years of completion of orthodontic treatment, 70% became crowded with 20% of markedly crowded need of retreatment. Mean crowding was 5.25mm.

Another study carried out on 31 cases who had completed orthodontic treatment 20 years ago found that crowding increased by 1mm on average whereas both arch length and width reduced and only 10% of patients had a clinically acceptable result. They found no significant predictors of stability of lower incisor alignment (Little et al, 1988).

Avan Mohammed and Yan Huang discuss orthodontic treatment planning considerations and factors affecting stability in dental arch alignment, including relevant literature

# Retention and stability



**Malocclusions most likely to relapse**

Diastemas and spacing (Edwards, 1977)
Rotations (Edwards, 1970, 1988)
Deep overbite (Sadowsky and Sakols, 1982)
Cleft lip and palate patients
Arch form changes (De la Cruz et al, 1995)
Altered lower labial segment position (Mills, 1968)
Periodontally involved teeth

**TABLE 1:** Malocclusions and relapse



**FIGURES 1A and 1B:** Palatally displaced upper lateral incisors



**FIGURES 2A and 2B:** Significant retroclination of upper lateral incisors and proclination of upper central incisors

These two studies generally had small sample sizes and no randomisation. However, similar findings have been demonstrated by others (Vaden et al, 1997):

- Little and Reidel (1989) – 30 cases observed for 10 years and assessed relapse in cases with generalised spacing and found 50% cases showing minimal irregularity. Arch length and inter canine width constriction continued into adult years
- Houston and Edler (1990) – no evidence that aligning lower incisor tips to Apo line (proposed by Rayleigh Williams) will guarantee a stable result. 62% case relapse away from Apo position towards their original position
- De la Cruz et al (1995) did a 10-year post retention review of class II div 1 cases with four first premolars extractions. They found increase change in arch form will increase risk of relapse. However, minimising treatment changes was no guarantee of post retention stability with huge individual variation seen. Exceptions are class II div 2 (Mills, 1968), habits, bimaxillary proclination cases (Keating, 1985, 1986), retroclined lower labial segment (LLS) trapped in palate and very mild crowding (Paquette et al, 1992).

**LOWER LABIAL SEGMENT CROWDING: AETIOLOGY**

- Proclination of lower incisors and expansion

of intercanine width during ortho treatment (Mills, 1968, Little et al, 1981)

- Anterior component of force – relationship occurs between LLS crowding and occlusal force but hit may not be cause and effect relationship (Southard et al, 1989, 1990)
- Late mandibular growth with significant growth rotation (Bjork and Skieller, 1972)
- Mesial drift (Southard et al, 1992)
- Lack of interproximal wear (Begg, 1954)
- Tooth size discrepancies (triangular incisor crowns increase risk of irregularity) (Peck and Peck, 1972)
- Tight interproximal contacts increase risk of irregularity (Southard et al, 1990)
- Arch length increased during mixed dentition (Little et al, 1990b)
- Periodontal disease allowing drift.

**THE ROLE OF THE THIRD MOLARS**

Third molars do not influence long-term stability of lower labial segment. Prophylactic extraction of third molars as a means of preventing relapse of lower labial segment is not recommended.

Harradine and colleagues (1998) conducted a prospective, randomised, controlled clinical trial into the effect of third molars on late lower incisor crowding. Patients recruited to study had completed retention following orthodontic treatment and were no longer wearing retainers. Treatment with appliances in upper arch only, in

lower arch premolar extractions or no treatment. All patients had crowded third molars.

Patients were randomly allocated into third molar extraction and non-extraction groups. Of the original 164 patients, 77 attended five years following the end of retention.

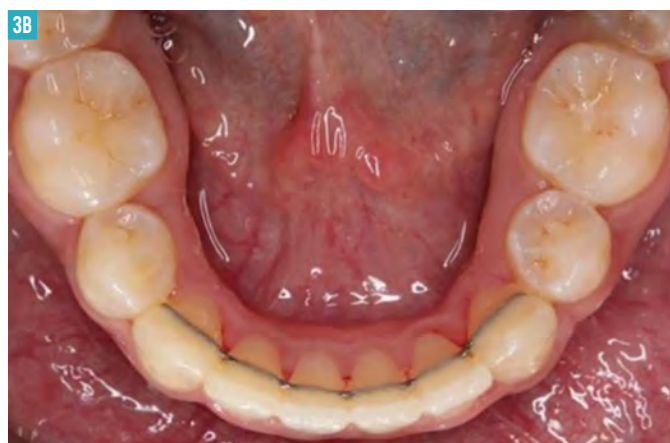
The start and finish study models were digitised to determine Little’s irregularity index, intercanine width and arch length. The study found a very small decrease in lower labial segment irregularity in patients who had had lower third molars removed, therefore the findings were not statistically or clinically significant.

Another study by Ades and colleagues (1990) studied groups of absent eights, impacted eights, aligned and functional eights and extractions eights 10 years previously and found no significant differences between groups for lower labial segment crowding or amount of crowding or in growth pattern.

There is no justification for removable of eights on the grounds of LLS crowding (Harradine et al, 1998; NICE, 2000).

Yu and colleagues’ (2013) Cochrane review on interventions for managing relapse of lower front teeth after orthodontic treatment found no evidence on best practice in managing relapse of the lower labial segment. The removal of third molars in an attempt to reduce the degree of late lower incisor crowding cannot be justified.





**FIGURES 3A and 3B:** Severe crowding of lower labial segment corrected, bonded retainer placed



**FIGURES 4A and 4B:** Upper lateral incisor in anterior crossbite



**FIGURES 5A and 5B:** Tongue thrust resulting in an open bite and proclination of lower labial segment

#### HOW TO MINIMISE RISK OF RELAPSE

When it comes to minimising the risk of orthodontic relapse, factors to consider include the following:

- Extraction of the most displaced teeth or rotated teeth
- Maintain existing arch form if possible
- Maintain intercanine width
- Do not alter anterior-posterior position of the LLS (Mills, 1968; Proffit, 1978)
- Placing lower two to two outside lower three to three (Zachrisson, 1997)
- Correct rotation early in treatment
- Consider interproximal reduction (IPR) for triangular teeth to increase area of interproximal contact (Boese, 1980). However,

this contention is disputed by Gilmore and Little (1984) due to the relapse cases being excluded from published results

- Active retention for skeletal discrepancies throughout growth (use bite plane effect in cases with residual growth) (Nanda and Nanda, 1992)
- Obtain an adequate centroid/edge relationship – lower incisor edge occludes 0-2mm anterior to upper root centroid (Houston, 1989)
- Move upper incisors to within the control of the lower lip
- Maximise interdigitation (Pancherz and Fackel, 1990; Lloyd and Stephens, 1990)
- Use bonded/fixed retainers.

#### CONCLUSION

Retention in orthodontics is necessary in order to allow for periodontal and gingival reorganisation (Blake and Bibby, 1998), minimise changes due to continued growth, permit neuromuscular adaptation to the corrected tooth positions and to maintain unstable tooth positions, if such positioning is required for reasons of compromise or aesthetics. [📄](#)

#### REFERENCES

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# Using mandibular advancement devices for OSA

Arti Hindocha discusses mandibular advancement devices as an alternative to continuous positive airway pressure for obstructive sleep apnoea patients

**A**ccording to the UK National Institute for Health and Care Excellence (NICE), obstructive sleep apnoea (OSA) is defined by repeated episodes of apnoea (temporary cessation of breathing) and hypopnoea (slow or shallow breathing), loud snoring, and excessive daytime sleepiness.

OSA is the most common form of sleep-related breathing disorder (SRBD) (Terzano et al, 2001). Chronically poor sleep disrupts hormones, leading to inflammation, weight gain, and cardiovascular issues, impairing blood sugar regulation, cognition, and memory.

Further, sleep disorders significantly increase the risk of road traffic accidents. In 2017, drowsy driving alone caused an estimated 91,000 crashes, 50,000 injuries, and nearly 800 deaths in the US (National Highway Traffic Safety Administration).

## PREVALENCE OF OSA

OSA affects an estimated 1.5 million adults in the UK, yet 85% of these are undiagnosed, and untreated (British Lung Foundation, 2015). It is thought that around eight million people aged 30 to 69 years may be affected by OSA in the UK alone.

Ling (2023) stated an estimated 39 million adults in the US are suffering, and globally, the figures are staggeringly high.

Based on American Academy of Sleep Medicine (AASM) 2012 diagnostic criteria, Benjafield et al (2019) estimated that 936 million adults aged 30 to 69 years (men and women) have mild to severe obstructive sleep apnoea and 425 million adults aged 30 to 69 years have moderate to severe obstructive sleep apnoea globally. The number of affected individuals was highest in China, followed by the USA, Brazil, and India.

## THE ROLE OF THE DENTAL PROFESSION IN THE TREATMENT OF OSA

An article by Dr Aoife Brid Stack (2022) highlights the profound impact dentists can have on patients' lives. Beyond pain relief, creating beautiful smiles, and detecting oral cancer, Dr Stack proposes that dental sleep medicine offers another opportunity to significantly improve patients' wellbeing.

I echo her sentiments and believe dentists and orthodontists are ideally positioned to screen patients and direct them to appropriate care, often providing treatment themselves that can improve patients' overall health and lifespan.

In 2021, NICE guidelines included mandibular advancement devices (MADs) as a treatment option for mild, moderate and severe OSA. This addition to the guidelines highlights an opportunity for dentists and orthodontists to diagnose and treat patients who are suffering from snoring or sleep apnoea in their clinics.

This minimally invasive, portable and cost-effective device has the potential to significantly improve patients' quality of life.

## CORE SYMPTOMS

OSA symptoms include excessive daytime sleepiness and apnoeas or hypopnoeas (blockages or partial blockages of the airway leading to breathing cessations), leading to dysfunction as a result of non-refreshing fragmented sleep, which has an overall reduction in quality of life (Stoohs et al, 2008). Other associated symptoms are:

- Loud snoring
- Observed episodes of stopped breathing during sleep
- Waking during the night and gasping or choking
- Awakening in the morning with a dry mouth or sore throat
- Morning headaches
- Trouble focusing during the day
- Depression
- High blood pressure
- A decreased interest in sex (Mayo Clinic, 2023).

Untreated OSA has been linked with heart disease, stroke, type two diabetes, risk of motor vehicle accidents and impaired quality of life (Ahrens et al, 2011; British Lung Foundation, 2015).

OSA can shorten life expectancy and sufferers are also at a higher risk of hypertension (British Lung Foundation, 2015).



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## STEPS FOR TREATING OBSTRUCTIVE SLEEP APNOEA AND SNORING

### 1. Initial consultation with patient

Screening for sleep apnoea risk. Conduct a pre-screening questionnaire to assess potential risk of OSA. Utilise validated tools, such as the Epworth Sleepiness Scale, and the STOP-BANG questionnaire (NICE, 2021). Other options include the Berlin Questionnaire and Flemons SACS Questionnaire (Xiong et al, 2019).

Depending on the score, a referral to a medical doctor for further evaluation of OSA may be recommended. For safe and effective use, mandibular advancement devices require careful patient selection and informed consent.

Communication with patient's medical practitioner. As a best practice, send a letter to the patient's general medical practitioner informing them about the consultation, even if snoring is the primary concern. This is because snoring can be a risk factor for OSA, and early detection is crucial.

### 2. Impressions/intraoral scan (if available)

Take impressions or an intraoral scan (if your practice offers it) to create a precise model of the patient's teeth and jaw. Send the impressions/scan along with a bite registration to a reputable dental laboratory accredited for manufacturing mandibular advancement devices (MADs).

### 3. Fit appliance for patient

Once the MAD is fabricated, the patient returns for a fitting. Depending on the severity of sleep apnoea (determined by the initial consultation or referral) and the patient's comfort level, an adjustment period ('titration') is recommended. During titration, the protrusion level of the MAD is gradually increased to find the most effective and comfortable position for preventing airway closure during sleep.

### 4. Follow-up appointment

Schedule a follow-up appointment to assess the effectiveness of the MAD. Discuss the patient's experience with the device, including comfort, sleep quality, and any reduction in snoring (reported by the patient or their sleep partner). Based on the findings, adjustments to the MAD or treatment plan might be necessary.

Regular follow-up appointments are crucial to monitor treatment progress and ensure the MAD continues to be effective and comfortable and to monitor any side effects.

### Additional considerations

It's important to inform patients that MADs are typically most effective for mild to moderate OSA. In severe cases, a continuous positive airway pressure (CPAP) machine might be a more suitable treatment option and is still the gold standard treatment modality for severe OSA.

## RISK FACTORS

The most significant risk factors for OSA are age and obesity. Being over 65 years of age and a body mass index (BMI) of over 25kg/m<sup>2</sup> has a 93% sensitivity for OSA and increased risk of developing the condition (Eckert and Younes, 2014).

Weight loss has been suggested as an alternative treatment option, as high BMI is a major risk factor for OSA. Other modifiable risk factors include alcohol consumption.

With the increasing obesity crisis and increased life expectancy in many populations across the globe, the number of OSA cases looks set to rise further. Interestingly, a recent position statement from the American Academy of Sleep Medicine highlights that chronic opioid use could be another contributing factor, which is especially worrying given the need for such

medication in many chronic and end-stage respiratory conditions (Lancet Respiratory Medicine, 2020).

Sleeping in a supine position encourages the tongue and soft palate to fall backwards onto the back of the throat, causing an obstruction of the upper airway (Greenstone and Hack, 2014).

Other predisposing factors for young, healthy individuals are macroglossia, excess fat in the palate, and adenoidal tonsillar hypertrophy (Douglas and Polo, 1994).

## AETIOLOGY

Sleep apnoea occurs when the upper airway becomes blocked or narrowed during sleep. This blockage disrupts breathing patterns, causing the partial or complete cessation of breathing for brief periods. There are two main reasons why this blockage might happen.

In obstructive sleep apnoea, the most common type, relaxed throat muscles and soft tissues collapse during sleep, blocking the airway. During sleep when the upper airway relaxes, the pharyngeal dilator tone is lost and the base of the tongue and soft palate relax and rest on to the pharyngeal wall, resulting in a partial or complete airway obstruction. This is often linked to factors like excess weight and a large neck circumference.

Hypoventilation means a drop in blood oxygen levels and stimulates an enhanced respiratory effort. This is often observed as a gasp for air and restlessness. This cycle repeats throughout the night, and the more severe, the more it occurs (Parmenter and Millar, 2023; Epstein et al, 2009; Zwillich, 1998). Less commonly, central sleep apnoea happens when the brain fails to send proper signals to the muscles controlling breathing. This can be caused by underlying medical conditions or heart problems.

## DIAGNOSIS

Diagnosis often begins with a two-pronged approach: gathering evidence through patient history and questionnaires, and conducting specialised sleep studies.

During an initial consultation, medical history forms can be a valuable tool for uncovering potential sleep-disordered breathing (SDB).

Research suggests that screening for SDB is crucial during hypertension treatment, as the two conditions are often linked. SDB is prevalent in diabetics due to its impact on glucose metabolism. In children, SDB is frequently associated with ADHD (Urbano et al, 2021).

Secondly, clinicians can utilise questionnaires like the Epworth Sleepiness Scale (ESS) and STOP-BANG to assess potential risk factors based on symptoms like daytime sleepiness, loud snoring, and witnessed breathing pauses during sleep.

The ESS is subjective, scoring the patient out of 24 for varying daytime sleepiness symptoms. The higher the scores, the more severe the symptoms of daytime sleepiness.

STOP-BANG is an acronym for the first letter of each symptom or physical attribute often associated with OSA:

- Snoring: this question assesses whether or not you snore loudly enough to bother a bed partner
- Tiredness: this symptom involves feeling daytime tiredness, which may include falling asleep during daily tasks
- Observed apnoea: if a sleep partner has noticed that you stop breathing or gasp for air as you sleep, this can be a sign of OSA
- Pressure: high blood pressure is also a symptom





- BMI: physicians look for a body mass index that is higher than 35
- Age: those who are older than 50 are at higher risk for OSA
- Neck circumference: physicians measure your neck circumference. A measurement greater than 16 inches is considered a risk factor
- Gender: males are considered to be more likely to have OSA.

However, these questionnaires provide a preliminary picture. Definitive diagnosis often relies on sleep studies like polysomnography, which monitors factors like brainwaves, breathing patterns, and blood oxygen levels during sleep. This detailed data allows healthcare professionals to pinpoint the severity of sleep apnoea and determine the most appropriate treatment course. Working in unity with medical professionals is the correct and holistic approach for a proper diagnosis.

The degree of OSA is classified by the number of apnoea and hypopnoea events, recorded by polysomnography, in an apnoea-hypopnoea index (AHI). Most classifications denote mild cases as five to 15 events per hour, moderate as 15 to 30 per hour, and severe as more than 30 events per hour.

### MAD VERSUS CPAP

Traditionally, CPAP has been considered the most effective treatment for sleep apnoea across mild, moderate, and severe cases (Spicuzza et al, 2015).

A CPAP machine delivers constant and steady air pressure through a hose connected to a mask or nosepiece worn during sleep. This pressurised air helps keep the airway open, preventing apnoea episodes.

However, CPAP can be difficult to tolerate for some patients, which can result in poor compliance rates. Lack of compliance is often due to intolerance of the mask, feeling claustrophobic, and feeling a lack of benefit (Ojuawo et al, 2023), escaping air, difficulty sleeping, nasal congestion and xerostomia (Mayo Clinic, 2023).

A study that analysed factors affecting long-term compliance of 400 patients referred for CPAP treatment between 2012 and 2015 found that after a mean time of three and a half years of follow-up, only around 50% of OSA patients were still using CPAP (Gabryelska et al, 2021).

Low compliance rates for CPAP range between 30% and 60%, suggesting the need for alternative treatment methods (Rotenberg et al, 2016).

A randomised controlled crossover trial by Barnes and colleagues (2004) investigated the effectiveness of continuous positive airway pressure (CPAP) and mandibular advancement



**FIGURE 1:** The Mandibular Snoring Inhibitor is an anti-snoring device

splints (MASs) in treating mild-to-moderate obstructive sleep apnoea (OSA) in 80 sleep clinic patients.

The participants underwent three-month treatment periods with each of CPAP, MAS, and an oral placebo tablet. The study found that both CPAP and MAS significantly reduced sleep apnoea severity compared to the placebo. However, CPAP was more effective than MAS in improving overall sleep apnoea. Interestingly, the study also revealed that MAS treatment improved night-time blood pressure dips, while CPAP did not show this specific benefit. Overall, the findings suggest that both CPAP and MAS are effective treatment options for mild-to-moderate OSA, but CPAP may provide a more comprehensive therapeutic effect.

A Cochrane review by Lim and colleagues (2009) evaluated the effectiveness of oral appliances (OA) compared to an inactive control in treating sleep-disordered breathing. The review found that OA improved subjective sleepiness and SDB indices compared to the control. However, CPAP remained more effective in significantly reducing the AHI.

Notably, the review also highlighted a patient preference for oral appliances over CPAP. This suggests OA may be a suitable alternative for individuals with mild sleep apnoea or those who struggle to tolerate CPAP therapy.

### MECHANISM OF ACTION: MADS

Mandibular advancement devices (MADs) work by physically advancing the mandible forward relative to the maxilla, as described by Jayesh and Bhat (2015). This widens the airway and helps prevent its collapse during sleep, reducing sleep apnoea episodes.

There are two different types of MADs:

1. Custom-fitted MADs, which are fabricated by a dentist/orthodontist from a patient's impression, offering the best comfort and compliance
2. Boil-and-bite MADs, which are the most readily available online, but these often lack proper fit and effectiveness, leading to compliance issues (Corliss, 2021).

A randomised controlled crossover trial by Vanderveken and colleagues (2007) published in the *American Journal of Respiratory and Critical Care Medicine* investigated the effectiveness of custom-made mandibular advancement splints (MAS) compared to off-the-shelf devices in treating sleep apnoea.

The study found that custom-made MAS significantly improved the apnoea-hypopnoea index (AHI), with a success rate of 60% compared to only 31% for off-the-shelf devices. Additionally, custom-made MAS led to a greater reduction in snoring. However, compliance (measured by device retention) was a challenge, with one-third of patients failing to consistently use the off-the-shelf MAS.

MADs have long been considered to be an effective way to eliminate the symptoms of snoring and, more recently, as a treatment for mild, moderate and severe sleep apnoea (Jayesh and Bhat, 2015; NICE, 2021). Yet, MADs are not without their side effects, and may cause short-term issues such as muscle discomfort, drooling or dry mouth, and temporary jaw misalignment upon waking. Potential long-term complications include changes in bite and temporomandibular joint (TMJ) discomfort.

Despite their side effects, a key reason for considering a MAD instead of CPAP are the factors that cause non-compliance of CPAP. MADs may absolutely be considered for patients who cannot tolerate CPAP, aren't willing to try CPAP, or for those who are awaiting referral to a sleep clinic for CPAP treatment (Fleury, Lowe and Oral Appliance Network for Global Effectiveness Group, 2014; NICE, 2021). [📄](#)

### REFERENCES

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### ANTI-SNORING AND SLEEP APNOEA SOLUTIONS COURSE

Arti runs a course titled Anti-snoring and sleep apnoea solutions – a practical guide and overview for dentists and orthodontists. Visit [dbortho.com](http://dbortho.com) to learn more.



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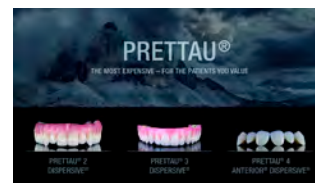


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Delegates will receive practical knowledge on how to perform socket grafting without flap reflection, lateral ridge augmentation and augmentation in the aesthetic zone.

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CD/MAY/CALERO/PAGE 16**

- The patient presented to the practice in this case because of...**
  - a. Trauma to UR1 and UL1
  - b. Failed root canal treatment
  - c. Chipped LL1 and LR1
  - d. Bleeding gums
- The mock-up, produced in the first step, should check what, according to the author?**
  - a. The shape
  - b. The aesthetics
  - c. The final function
  - d. All of the above
- Which Vita System 3D-Master shades was chosen for the Vitablocs Triluxe forte blank?**
  - a. 0M1C
  - b. 1M2C
  - c. 2M2C
  - d. 3M2C
- The final glaze firing took place with how many minutes of drying?**
  - a. Two
  - b. Four
  - c. Six
  - d. Eight

**AESTHETIC DENTISTRY  
CD/MAY/LI/PAGE 24**

- The patient in this case presented seeking a solution with:**
  - a. Minimal maintenance
  - b. Longevity
  - c. Superior aesthetics
  - d. All of the above
- At full smile, the lip line was moderate, with the lips showing how much gingivae beyond the zeniths of the upper incisors?**
  - a. Less than 1mm
  - b. Around 2mm
  - c. 3mm
  - d. Around 4mm

**3. What was the base colour of the tooth shade in this case?**

- a. Vita A2
- b. Vita C1
- c. Vita B3
- d. Vita D2

**4. How many porcelain veneers were placed on the upper teeth in this case?**

- a. One
- b. Four
- c. Eight
- d. 10

**DIGITAL DENTISTRY  
CD/MAY/NULTY/PAGE 37**

**1. According to the authors, the fusion of technology and healthcare has opened new frontiers in:**

- a. Diagnostic precision
- b. Treatment efficiency
- c. Personalised patient care
- d. All of the above

**2. What advantage does 3D imaging have over 2D imaging?**

- a. It provides a lifelike, three-dimensional representation
- b. It aids in treatment planning
- c. It enhances patient communication, understanding and satisfaction
- d. All of the above

**3. According to the authors, robotic assistance in dental procedures could...**

- a. Improve treatment times
- b. Reduce the margin for error
- c. Enhance patient communication
- d. Increase the margin for error

**4. AI-enhanced 3D imaging and its predictive capability is particularly beneficial for which treatment?**

- a. Orthodontics
- b. Implant dentistry
- c. Cosmetic dentistry
- d. All of the above

**ENDODONTICS  
CD/MAY/BOETTO/PAGE 44**

**1. What do Reciproc Blue instruments, produced with nickel titanium that undergoes an innovative heat treatment, have?**

- a. An S-shaped cross section
- b. A variable taper
- c. A non-cutting tip
- d. All of the above

**2. How many Endo Training Resin Blocks with standardised simulated curved root canals were used in this study?**

- a. 10
- b. 20
- c. 30
- d. 40

**3. After preparation, where were the simulated curved root canals cross sectioned at what point from the working length?**

- a. 2mm
- b. 6mm
- c. 10mm
- d. All of the above

**4. At what point from the working length did the most significant amount of surface preparation for both groups occur?**

- a. 4mm
- b. 6mm
- c. 10mm
- d. 12mm

**IMPLANT DENTISTRY  
CD/MAY/SNYMAN/PAGE 59**

**1. When was the nomenclature changed from bisphosphonate-related osteonecrosis of the jaw (BRONJ) to medication-related osteonecrosis of the jaw (MRONJ)?**

- a. 1994
- b. 2004
- c. 2014
- d. 2024

2. Studies report that among patients with MRONJ, tooth extraction was identified as the predisposing event in how many cases?
- a. 10 to 23%
  - b. 27 to 45%
  - c. 62 to 82%
  - d. 95%
3. When it comes to predicting MRONJ, what do the authors suggest as an avoidance strategy?
- a. CTX test
  - b. Drug holiday
  - c. Antibiotic cover
  - d. All of the above
4. With the CTX test, a figure well below what should serve as a contraindication for dental surgery?
- a. 100ng/ml
  - b. 150ng/ml
  - c. 200ng/ml
  - d. 250ng/ml

**ORAL HEALTH**  
**CD/MAY/BANSAL/PAGE 68**

1. What does magnesium help with in baby milk?
- a. Muscle function
  - b. Eye development
  - c. Bone strength
  - d. Metabolism regulation

2. At what age are babies permitted to have full-fat cow's milk?
- a. From birth
  - b. From four weeks
  - c. From six months
  - d. From 12 months
3. According to the author, what is the composition of breast milk?
- a. 79% water, 11% lactose, 7% fat, 3% protein
  - b. 83% water, 9% lactose, 6% fat, 2% protein
  - c. 87% water, 7% lactose, 4% fat, 1% protein
  - d. 91% water, 5% lactose, 2% fat, 2% protein
4. How many essential layers is the tooth made up of?
- a. Two
  - b. Three
  - c. Four
  - d. Five

**ORTHODONTICS**  
**CD/MAY/MOHAMMED/79**

1. Who described retention as: 'The holding of teeth following orthodontic treatment in the treated position for the period of time necessary for the maintenance of the results'?
- a. Moyers (1973)
  - b. Reitan et al (1967)
  - c. Little et al (1981)
  - d. Houston (1989)

2. In Little and colleagues' (1981) study of 65 patients who underwent extraction of all first premolars, what percentage became crowded after 10 years of completion of orthodontic treatment?
- a. 20%
  - b. 50%
  - c. 70%
  - d. 90%
3. What is considered short-term stability following orthodontic treatment?
- a. The first six months
  - b. The first one to two years
  - c. The first three years
  - d. The first four to five years
4. Which factor for minimising risk of relapse did Gilmore and Little (1984) dispute due to the relapse cases being excluded from published results?
- a. Extraction of the most displaced teeth or rotated teeth
  - b. Correcting rotation early in treatment
  - c. IPR for triangular teeth to increase area of interproximal contact
  - d. All of the above

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