

# CLINICAL DENTISTRY

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**12 DENTISTRY CLINICAL CASE AWARDS**  
Announcing this year's winners

**39 DIGITAL DENTISTRY**  
Digitally created endocrowns –  
Oxana Naidyonova

**47 ENDODONTICS**  
Perforation management and  
primary endodontics –  
Petros Mylonas

**69 ORAL HEALTH**  
Enamel demineralisation:  
impact of cola – Sonica Khan



October 2024  
Vol 4 No 9



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All eyes on the winners of the 2024  
Dentistry Clinical Case Awards

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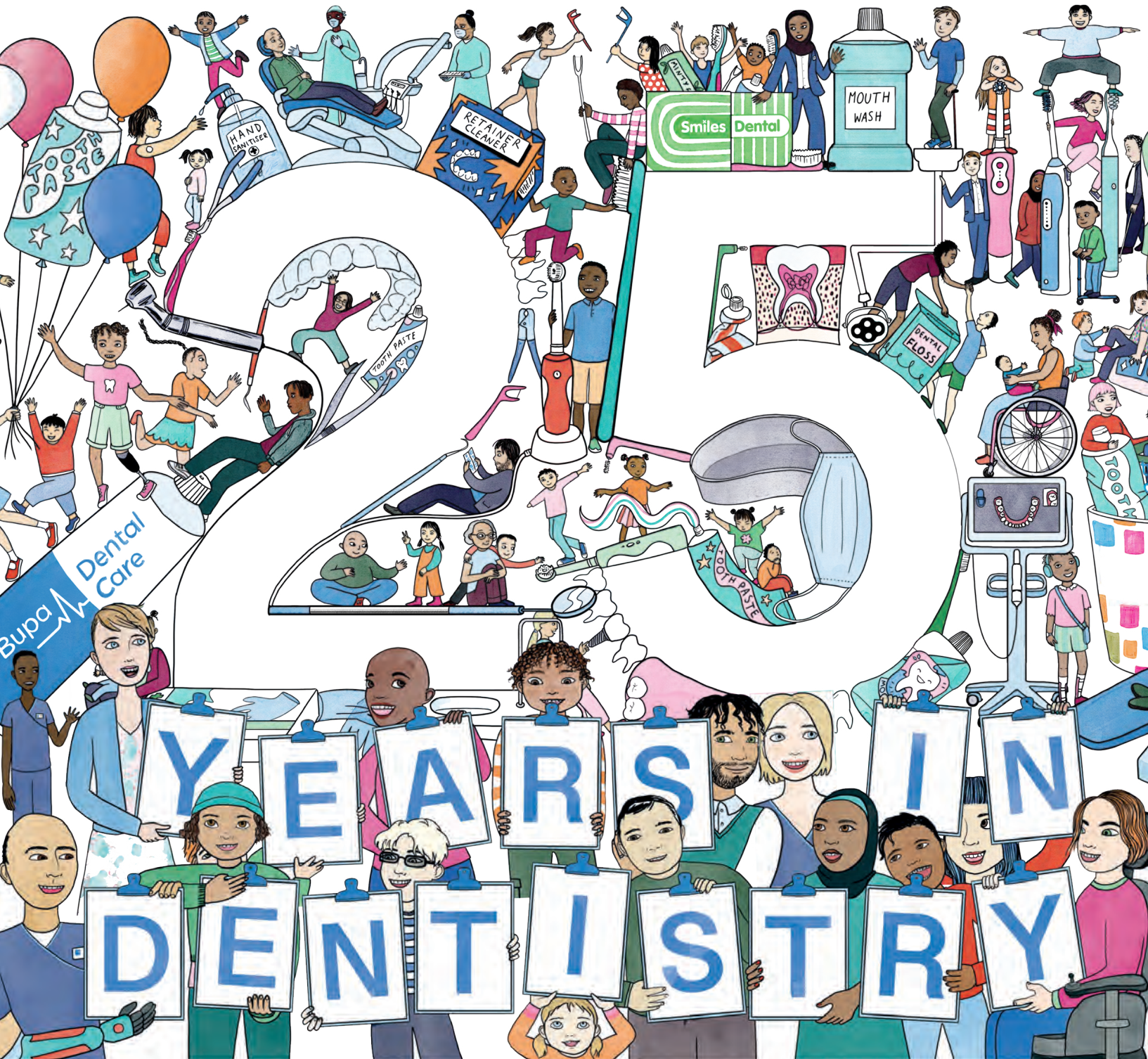
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*Clinical Dentistry* is committed to the advancement of practical clinical skills in dentistry. Through its focus on inspirational clinical casework, its sole aim is to help general dental practitioners enhance their skills and techniques across every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

### Group Managing Editor

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

Tel: 01923 851758

### Content Director

**Guy Hiscott** [guy.hiscott@fmc.co.uk](mailto:guy.hiscott@fmc.co.uk)

Tel: 01923 851754

### Designer

**Glenn Baxter** [glenn.baxter@fmc.co.uk](mailto:glenn.baxter@fmc.co.uk)

### Production Manager

**K-Marcelyne McCalla** [k-marcelyne.mccalla@fmc.co.uk](mailto:k-marcelyne.mccalla@fmc.co.uk)

### Chief Commercial Officer

**Tim Molony** [tim.molony@fmc.co.uk](mailto:tim.molony@fmc.co.uk)

Tel: 07595 282680

### Media Partnerships Manager

**Ivana Perkins** [ivana.perkins@fmc.co.uk](mailto:ivana.perkins@fmc.co.uk)

Tel: 07760 887016

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## CONTACT

PHONE +44 (0) 1923 851777

EMAIL [hello@clinicaldentistry.co.uk](mailto:hello@clinicaldentistry.co.uk)

WEB [www.fmc.co.uk](http://www.fmc.co.uk)



# SHINING BRIGHT



Welcome to the October issue of *Clinical Dentistry*!

The Clinical Dentistry Awards are right around the corner – and we couldn't be more excited to celebrate with you.

Headlines from outside the profession often focus on the problems facing dentistry, but in doing so they miss the fundamental point that the care being offered on the front line is something to celebrate. Therein lies the purpose of the Clinical Dentistry Awards – to acknowledge clinical excellence in practice.

As with all FMC awards, we power our rigorous judging process through our expert judging panel, composed of leading dental clinicians. We received a typically high standard of entries this year, which blew our judges away with the standard of clinical expertise on display – and believe me when I say it's not easy to impress the panel! We'll be celebrating the standout winners on Friday 11 October at Royal Garden Hotel in Kensington, London.

One of the things I love most about the Clinical Dentistry Awards is the entry process. I have often written about the merits of putting together an entry from an entrant's perspective, and the incredible benefits of analysing your efforts – regardless of the final outcome come awards night.

Some may refer to this as 'trusting the process'. Having confidence in the steps you are taking, even when the outcome is uncertain, is a theme common to so many of the award submissions I've seen over the years. It might sound trite, but we've seen time and time again that hard work, perseverance and patience do eventually lead to success.

It's natural to want immediate results, but growth and progress don't come overnight. It's vital to let go of doubt and embrace the journey, recognising that setbacks are a part of development and learning. It is a mindset that encourages resilience, helping you to stay focused on your goals despite the many challenges that beset even the most successful practices.

When you trust the process, and stay committed to your efforts, each step you take – no matter how small or difficult – is a building block towards your ultimate objective. The culmination (and celebration) of that effort is what we're all about at *Clinical Dentistry* – and I can't wait to see it come to life at this year's awards.



**Siobhan Hiscott**

Group Managing Editor

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



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*Clinical Dentistry* proudly presents its editorial advisory board – our panel of leading clinicians helping guide the title to clinical excellence



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Specialist in periodontics, honorary lecturer at the University of Birmingham School of Dentistry.

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*BDS MJDF (RCS Eng) MClintDent MEndo (RCS Ed)*  
Specialist in endodontics and lecturer at King's College London.

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**Wilhelm Pertot**

*DCD DEA PhD*  
Practice limited to endodontics in Paris.

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**Komal Suri**

*BChD*  
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*BChD MSc PhD (Pret)*  
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*BChD MFDGP MSc*  
Cosmetic dentist and principal of Fresh Dental Clinic.

**Reena Wadia**

*BDS MJDF (RCS Eng) MClintDent MPerio (RCS Ed) FHEA*  
Specialist in periodontics and associate specialist at King's College Hospital.

**Julian Webber**

*BDS MSc DGDPUK*  
Specialist in endodontics and visiting professor at the University of Belgrade, Serbia and Montenegro.

**Moira Wong**

*BDS LDS (RCS Eng) FDS (RCS Eng) MOrth (RCS Ed)*  
Specialist in orthodontics.

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## TOPTIPS CONTRIBUTORS

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# Meet the experts

Introducing some of the people who have shared their expertise in this issue of *Clinical Dentistry*



### SAM JETHWA

BDS MFDS RCS (EDIN) PGDIP CLINED  
Sam Jethwa, supported by Bespoke Smile Academy faculty members Cony Caravotas, Aamir Vaghela, Preyaanthana Ragu and Hassan Kanani, presents 10 top tips for veneers on page 32.

Sam is the founder of Bespoke Smile Advanced Dentistry and Academy, and president elect of the British Academy of Cosmetic Dentistry.

He is an innovator of cosmetic dentistry techniques, earning a stellar reputation as a leading smile designer and international lecturer on the topic of ultra thin porcelain veneers, and facially harmonious smile makeovers.

He has created his own techniques that deliver predictable, confident smiles that are tailored to each individual.



### TOYIN AKALA

Toyin Akala shares her 10 top tips for using non-verbal communication when interacting with patients in a dental setting on page 74.

Toyin became a trainee dental nurse aged 17. In 2004, she participated in the Sure Start Programme and earned a foundation level certificate in oral health promotion. Working with disadvantaged families and young children from diverse backgrounds sparked her curiosity about oral health and educating and engaging with different communities. Toyin qualified as a dental nurse in 2005 and advanced to become a dental sedation nurse. In 2010, she earned a qualification as an oral health practitioner, and in 2016, completed her training as a dental therapist at King's College London.

AESTHETIC  
DENTISTRY

32

ORAL  
HEALTH

74

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October 2024 ■ Vol 4 No 9

# Dentistry CLINICAL CASE AWARDS 2024 WINNERS

12

Revealing the winners  
for this year's Dentistry  
Clinical Case Awards

## FEATURES

GENERAL  
DENTISTRY  
15

## 17 TRAUMA: PREDICTABLE RESTORATIONS

A novel approach for restoring fractured anterior teeth with high-quality direct composite – Sandeep Sadana

AESTHETIC  
DENTISTRY  
21

## 23 VENEERS AND COMPOSITE BONDING

The use of Tokuyama Estelite Asteria for smile enhancing veneers – Vera Da Silva

## 29 ULTRA THIN CERAMIC VENEERS

An ultra thin ceramic veneers case study that highlights one way of making a good smile even better – Sam Jethwa

## 32 TOP TIPS: VENEERS

Master veneer treatments and achieve predictable results with this expert advice – Sam Jethwa

DIGITAL  
DENTISTRY  
3739 RESTORATIVE DENTISTRY: DIGITALLY  
CREATED ENDOCROWNS

A case highlighting a defect-oriented, CAD/CAM-fabricated endocrown restoration with polychrome hybrid ceramic – Oxana Naidyonova



## FEATURES

## ENDODONTICS

45

## 47 PERFORATION MANAGEMENT AND PRIMARY ENDODONTICS

A challenging case, consisting of perforation repair, canal location and primary root canal treatment – Petros Mylonas



## IMPLANT DENTISTRY

51

## 53 EVALUATING CROWN-TO-IMPLANT RATIO

Marginal bone stability around extra-short implants supporting a fixed partial prosthesis in posterior mandible and the impact of crown-to-implant ratio – Eduardo Anitua

## 57 SOFT AND HARD TISSUE AUGMENTATION WITH IMPLANT PLACEMENT

Restoring a missing UL2 – Selvaraj Balaji

## 61 IMMEDIATE VERSUS DELAYED IMPLANTS

Practical guidance for mastering both immediate and delayed implant placement protocols – Imi Nasser

## ORAL HEALTH

67

## 69 ENAMEL DEMINERALISATION: IMPACT OF COLA

Dental erosion and provides a review of the comparative impact of diet and regular cola – Sonica Khan

## 74 TOP TIPS: PATIENT INTERACTION

Using non-verbal communication when interacting with patients in a dental setting – Toyin Akala

## ORTHODONTICS

77

## 79 ORTHODONTICS AND TEMPOROMANDIBULAR JOINT DYSFUNCTION

The relationship between orthodontics and temporomandibular disorders including relevant literature – Avan Mohammed and Sri Jeganathan



## MARKETPLACE

83

## INDUSTRY INNOVATIONS

The latest product, services and equipment news from the industry

## ENHANCED CPD

86

## Q&amp;A: ECPD

Earn seven hours of enhanced CPD in this issue

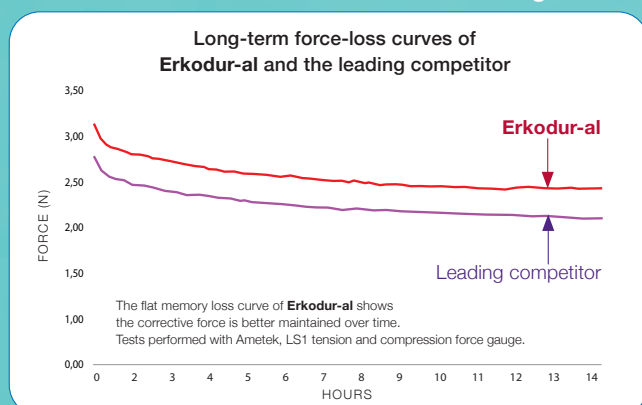
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# Dentistry CLINICAL CASEAWARDS

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## WINNERS

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**RESTORATIVE: SINGLE TOOTH COMPOSITE**

**WINNER:** Thomas Sealey

**HIGHLY COMMENDED:** Zohaib Khwaja

**RESTORATIVE: SINGLE TOOTH CERAMIC**

**WINNER:** Owais Hussain

**RESTORATIVE: FULL MOUTH REHABILITATION**

**WINNER:** Alan Burgin

**HIGHLY COMMENDED:** Thomas Sealey

**RESTORATIVE: DENTURES**

**WINNER:** Emily Pittard

**RESTORATIVE: COMPOSITE SMILE MAKEOVER**

**WINNER:** Mahmoud Ibrahim

**HIGHLY COMMENDED:** Thomas Sealey

**HIGHLY COMMENDED:** Edward Li

**RESTORATIVE CERAMIC SMILE MAKEOVER**

**WINNER:** Gary O'Neill

**PERIODONTAL TREATMENT: NON-SURGICAL**

**WINNER:** Urwah Saleem

**PERIODONTAL TREATMENT: SURGICAL**

**WINNER:** Khurram Hussain

**ORTHODONTICS: CLEAR ALIGNER**

**WINNER:** Brian Dunne

**HIGHLY COMMENDED:** Avan Mohammed

**ORTHODONTICS: CHILD/TEENAGER FIXED**

**WINNER:** Virginia Rootkin-Gray

**HIGHLY COMMENDED:** Parm Dhillon

**ORTHODONTICS: ADULT FIXED**

**WINNER:** Brian Dunne

**HIGHLY COMMENDED:** Ciara Ennis

**FACIAL AESTHETICS: FULL FACIAL  
TREATMENT/BOTULINUM TOXIN**

**WINNER:** Alex Chan

**ENDODONTIC TREATMENT****WINNER:** Nida Kamal**HIGHLY COMMENDED:** Byron Tsivos**ENDODONTIC RETREATMENT****WINNER:** Nida Kamal**HIGHLY COMMENDED:** Hana Anbarserri**TRANSFORMATIVE TREATMENT****WINNER:** Thomas Sealey**HIGHLY COMMENDED:** Paul Reaney**HIGHLY COMMENDED:** Ayesha Ghaffar**TOOTH WHITENING****WINNER:** Tariq Bashir**DENTISTRY CLINICAL CASE AWARDS**

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# GENERAL DENTISTRY

**SANDEEP SADANA**

Trauma: predictable restorations

17



The treatment was successful because the remaining tooth tissue was conservatively prepared, a verifiable seal was present, well condensed void-free composite was placed and the restorations were provided start to finish in 40 minutes. Both my patient and I were very happy with the result as demonstrated by both of our ear-to-ear smiles – Sandeep Sadana, p17

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**SANDEEP SADANA**

Sandeep (Dr Sunny) began his dental journey at Bart's and the Royal London School of Medicine and Dentistry, simultaneously serving in the Army Reserves with the University of London Officers Training Corps. Dr Sunny now runs his own restorative referral service and provides educational courses.

**ENHANCED CPD**

**GDC anticipated outcome: C**

**CPD hours: one**

**Topic:** General dentistry

**Educational aims and objectives:**

To present a novel approach for restoring fractured anterior teeth with high-quality direct composite. This article qualifies for one hour of enhanced CPD; answer the questions on page 86 or scan the QR code.



**A** female patient in her mid-30s was seen after being involved in a hit and run accident that luckily only affected the dentition. She did not report pain but just that the teeth felt sore, especially when biting into food (Figure 1).

**ASSESSMENT AND DIAGNOSIS**

Initial assessment was performed by my colleague who confirmed the traumatic injury and localised the affected teeth to the four upper incisors (Figure 2):

- The UR2 suffered the most extensive fracture
- The UR1 had a visible hairline fracture
- The UL1 and UL2 had fractures localised to the enamel
- All four teeth in question (TIQ) tested vital to cold spray
- All TIQ were tender to percussion
- Radiographs did not reveal any endodontic treatments, periapical pathology or root fractures
- None of the TIQ had mobility.

It was explained to the patient that the teeth had suffered concussion. She was recommended a soft diet and to avoid chewing on the affected teeth.

After initial investigation by my colleague, restorative options were presented. The patient was then referred to me for composite restorations.

The patient was informed about the risk of the tooth requiring root canal treatment in the future, despite being asymptomatic now, and the associated treatment fees.

I find that being transparent about possible monetary and time commitments reduces the chances of miscommunication-related issues later on, allowing patients to provide fully informed consent.

**TREATMENT PLANNING**

At the initial visit, all incisors were still vital and aesthetics were the patient's primary concern. I used a consultation aid software called Chairsyde to help her visually understand what was going on

– this technology has definitely improved my case acceptance across the board.

An intraoral mock-up was carried out in which different composite shades were placed directly on the teeth (without etching or bonding) to find the best match. The teeth were dried first to ensure the composite was easy to handle (Figure 3). During the intraoral mock-up, the composite was extended over the incisal edge, rather than only placed on the tooth surface, to allow us to see light passing through the material.

At this point, the patient was asked which colour they liked best. Joint decision-making is preferable for aesthetic cases, to relieve the pressure of full responsibility based solely on the clinician's opinion. A photo was also taken to record the consent process.

I chose to use Brilliant Everglow from Coltene, which comes in a dual shade system (eg A1/B1, A2/B2, A3/D3) and, in my experience, it blends really well into natural tooth tissue. Not to mention it handles well without the need for a composite heater and polishes quickly to a really high gloss.



**FIGURES 1 and 2:** Initial situation

**Sandeep Sadana** presents a novel approach for restoring fractured anterior teeth with high-quality direct composite

# Trauma: predictable restorations



The patient had visible white and brown spots on her upper anteriors and, after discussion, we agreed that it would look natural to include the white spots in the UR2 restoration. I planned to use a body shade for the dentine and then translucent Brilliant Everglow for the enamel. The enamel shades come in Translucent and Bleach Translucent for patients with whiter teeth.

### TREATMENT PROVISION

Local anaesthetic was provided as a single buccal infiltration using articaine 4% 1:100000. Using a high-speed handpiece and red band diamond bur, a short bevel was created on the UR2, UL1 and UL2 edges.

A slow handpiece and medium disc were then used to create a long bevel as well as remove surface contaminants and provide fresh enamel rods to bond to.

Conventionally, cases like this are treated using full rubber dam, floss tie and perhaps a clamp or two in place in order to isolate, which is crucial for successful composite placement.

I approached isolation differently, using the Greater Curve matrix system to provide standalone isolation for the anterior teeth where humidity was less of a concern for the bond. The system comprises a series of curved bands and works with a Greater Curve retainer.

The Greater Curve retainer is contra-angled allowing it to clear the incisal edges rather than be obstructed by them.

A Greater Curve Wide band was securely set up on the retainer, seated on the UR2 and tightened fully. A seal was achieved, preventing the ingress of blood, saliva and gingival crevicular fluid, providing isolation. The matrix flared coronally, so that it laid against the neighbouring marginal ridges.

A fast handpiece with red band tungsten carbide bur was used to cut an access window, improving visualisation of the surface to be restored.

Usually, when using a matrix band, a wedge is needed to create separation to compensate for the thickness of the matrix and achieve a contact. However, I employed a technique known as contact opening.

A ball burnisher was used to burnish where the contact goes as usual. Then a fast handpiece and yellow band rugby ball shaped diamond bur were used without water to gently rub the matrix at the contact.

The site was checked every few rubs until the final layer of matrix was removed producing a contact opening. This allowed for an anatomical contact area to be produced without relying on a wedge (Figure 4).

### COMPOSITE PLACEMENT

To begin composite placement, the tooth was etched and bonded. The palatal wall was built-up to an approximate length, using Brilliant Everglow shade A1/B1.

A dentine layer was placed using an anterior Misura instrument to set the dentine thickness. This allowed enough space for stain and the enamel layer, without producing an enamel layer too thick that it creates a greyish and dull appearance.

White Miris2 Effect Shade tint was then used sparingly – an effective tint should be barely visible when placed on the dentine layer.

A final uninterrupted surface layer of Brilliant Everglow translucent shade was placed, blending into the tooth.

The Greater Curve matrix was then removed and the finishing process was undertaken to achieve the desired form with the patient sitting up in the chair for a more direct view.

At this stage, the patient preferred to close the mesial embrasure space of the UR2 to match the UL2. She also wished to leave composite placement on the UL2 until a later stage.

The UL1 and UL2 incisal edges were restored freehand.



**FIGURE 3:** The teeth were dried before treatment



**FIGURE 4:** Creation of an anatomical contact area

Final polishing was carried out using a slow handpiece and Diatech polishing wheels from Coltene (Figure 5), during which my dental nurse used a three-in-one syringe to provide water lubrication. A pink wheel was used, followed by a blue wheel.

### OUTCOME

The treatment was successful because the remaining tooth tissue was conservatively prepared, a verifiable seal was present, well condensed void-free composite was placed and the restorations were provided start to finish in 40 minutes. Both my patient and I were very happy with the result as demonstrated by both of our ear-to-ear smiles!

The combined use of a reliable matrix system and high-quality composite bonding systems allowed me to produce composite restorations, simply, predictably and profitably. [🔗](#)



**FIGURE 5:** Final result following polishing

### PRODUCTS USED

**Brilliant Everglow** Coltene  
**Soft Side Contra-Angle Retainer**  
 Greater Curve  
**Wide Tofflemire Band** Greater Curve  
**Misura** Styleitaliano LM-Arte  
**Miris2 Effect Shade** Coltene  
**Diatech** Coltene



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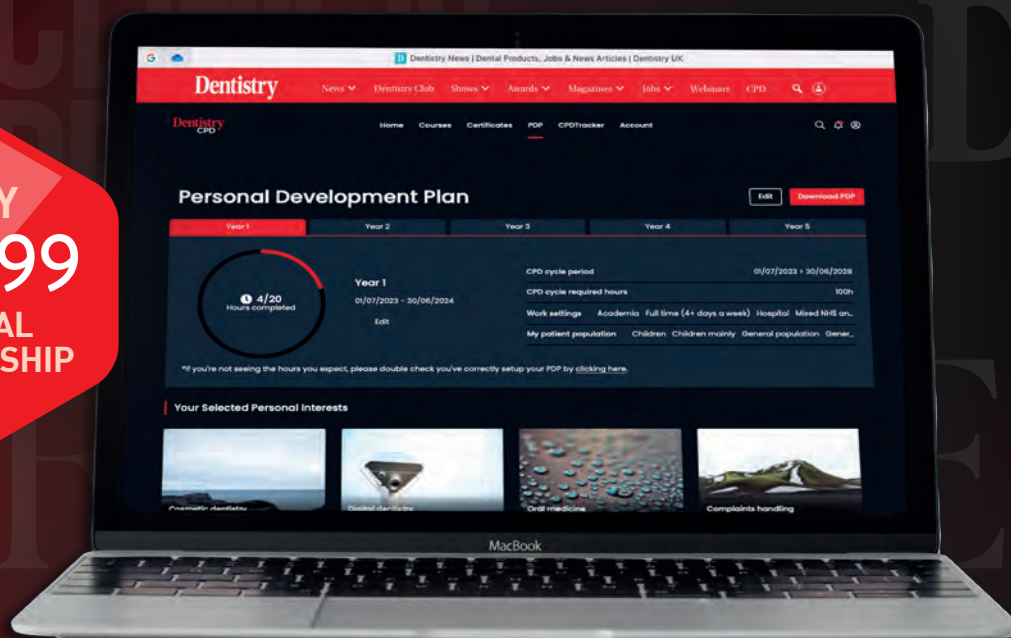
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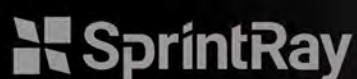


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# AESTHETIC DENTISTRY

**VERA DA SILVA**

Veneers and composite bonding

**23**



**SAM JETHWA**

Ultra thin ceramic veneers

**29**



**SAM JETHWA**

Top tips: veneers

**32**



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# Veneers and composite bonding

**Vera Da Silva** highlights the use of Tokuyama Estelite Asteria for smile enhancing veneers

**A** 38-year-old male patient presented with multiple broken molar restorations. In addition, he had severely chipped incisal edges of his upper anterior teeth and concerns about aesthetics.

The patient is very active physically (he plays Brazilian jiu-jitsu). He feels that he clenches his teeth, especially when playing contact sports. He believes that he might also be grinding at night, as he feels tension in his jaw early in the morning.

As far as he can remember, his smile has not changed much over the years apart from some chipping on the incisal edges of his teeth. He dislikes the size of his upper incisors and would appreciate it if his teeth could be just a little bit lighter in colour.

Upon examination, it was determined that he had non-carious tooth surface loss localised at the incisal edges of his upper and lower incisors, most likely due to tooth attrition and erosion. His teeth were not sensitive to differences in temperature or to different foods and drinks, which confirmed the slow progression of the wear.

The size proportion of the upper central and lateral incisors compared to the upper canines was irregular, making the patient look older than he really is.

## AESTHETIC ISSUES

When smiling, he presented with a non-consonant smile arc (Figure 1).

The smile arc refers to the relationship between a hypothetical curve drawn along the incisal edges of the maxillary anterior teeth and the inner contour of

the lower lip while smiling. Generally, the curve of the incisal edges of the upper anterior teeth is more pronounced in women than in men and tends to become flatter with age. The curve of the lower lip is usually more pronounced in younger individuals.

In an ideal smile arc, known as 'consonant', the curve of the upper anterior teeth aligns with or is similar to the border of the lower lip during smiling. The lower lip can either touch, not touch, or slightly cover the upper anterior teeth.

A study of untreated individuals found that those whose lower lips touched or did not touch the upper anterior teeth had a higher aesthetic score than those whose upper anterior teeth were slightly covered (15.76% of the sample).

In a 'non-consonant' smile arc, the upper anterior teeth are either flat or curve opposite to the curvature of the lower lip.

The patient also exhibited a mild class III skeletal profile with an edge-to-edge bite on the anterior teeth (Figure 2). He presented with a class III incisor relationship and edge-to-edge bite on a mild class III profile. Canine guidance was not observed bilaterally with premature contact on the non-working side between UL7 and LL7, causing patient discomfort. On protrusion, the anterior guidance was unbalanced with premature contact on various posterior teeth.

It was observed that there was staining from colour-producing bacteria (chromogenic bacteria) on the cervical areas of the teeth. Appearing as black staining, this kind of staining is often

seen along the palatal or lingual aspects of the teeth, but brushing two or three times a day can help remove the bacteria that cause this staining.

## TREATMENT OPTIONS

Several treatment options were discussed with the patient, including orthodontic treatment before aesthetic treatment, composite bonding of the upper anterior teeth, or no treatment at all.

It was explained to the patient that individual direct composite bonding (from UR4 to UL4) could help disguise the malocclusion by adding composite to create length and volume to the upper anterior and cuspid teeth.

He was informed that to achieve strength and better function, it would be necessary to remove around 1mm from the incisal edges of the lower teeth to create the required space for the composite on the palatal aspect of the upper teeth, resulting in a more stable occlusion.

Due to grinding and clenching habits, as well as challenging occlusion, porcelain veneers were not recommended due to the high risk of non-repairable veneer fracture and the additional cost.

He was informed that composite bonding could chip or break, but it could be repaired at a lower cost.

It was also explained that composite could stain due to oral flora, and maintaining excellent daily oral hygiene and regular hygienist visits would be necessary to prolong the treatment and minimise the risk of staining from chromogenic bacteria.



**VERA DA SILVA BDS**

Vera qualified from Brazil in 1995 and has progressed in her career completing a prosthodontics specialisation course (Brazil) in 2005. Vera has a special interest on minimally invasive dentistry and prosthodontics. She is currently completing a curriculum on biomimetics and practises at Vitali Teeth Dental Spa in Edinburgh.



Additionally, the composite bonding treatment would require follow-up and maintenance. It would be recommended to have the composite polished annually to renew its shine and ensure proper function, especially if clenching and grinding are not controlled or if grinding mouthguards are not used.

In terms of the combined orthodontic-aesthetic treatment, it was thought that he would benefit from a course of orthodontic treatment. The aim of this would be to retrocline the lower anterior teeth and procline the upper anterior teeth by approximately 10 to 15 degrees to improve the overjet and correct the edge-to-edge bite.

However, due to financial constraints and time limitations of the orthodontic treatment, this option was waived by the patient, and he opted for the direct composite bonding only.

I explained to the patient the process of freehand composite bonding and advised him on how to prepare for the treatment appointment, including having a good breakfast and wearing comfortable clothing.

I also informed him about the expected changes in the volume of his teeth and how his upper lip might feel odd against his upper teeth initially, but would improve within a few days.

The patient was eager to undergo the smile transformation, and I was equally excited to deliver pleasing aesthetic results along with an improved occlusion.

### TREATMENT PROVISION

The technique used was freehand. As I had previously done a direct mock-up, I knew exactly how long the teeth should look to restore form and function.

I made the decision to retract the lips using an Optragate soft lip cheek retractor (Ivoclar Vivadent) and to control moisture by employing relative isolation with cotton rolls, gauze, a high-volume evacuator, and a saliva ejector.

It is crucial also to have the assistance of a highly experienced dental nurse. In this case, my assistant provided invaluable help by consistently checking for moisture control and ensuring the patient's comfort at all times.

The incisal enamel edges on the upper centrals were unsupported in places, so only the supported enamel needed to be removed with a coarse Optidisc (Kerr).

The incisal edges of the lower incisors were reduced by 1.5mm with a super fine, yellow polishing bur, so that space was created for the palatal aspect of the composites on the upper anterior teeth. The enamel was cleaned with pumice and water, etched for 30 seconds with 37% phosphoric acid, and, after the enamel was washed, it received two coats of Scotchbond



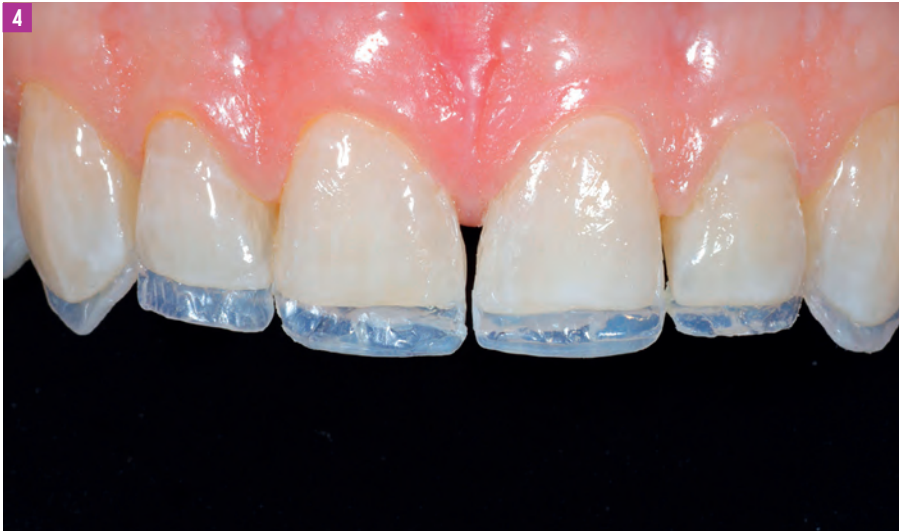
**FIGURE 1:** Initial presentation highlighting non-consonant smile



**FIGURE 2:** Intraoral view of initial presentation



**FIGURE 3:** Close up of upper anteriors showing damaged incisal edges



**FIGURE 4:** Upper anteriors after the palatal restoration of the incisal edges



**FIGURE 5:** Intraoral view of restorations prior to final polishing



**FIGURE 6:** Intraoral facial view after polishing

Universal (Solventum). I also painted a very thin layer of Pink Opaque (Cosmedent) to mask out some underlying dark stain.

It is important to be very attentive to any overflow of the bonding agent onto the gingival margin, so that any excess can be removed with a surgical suction tip and vigorous airflow, as those details make all the difference when you are finishing your veneers.

Using the extra thin Composi-Tight instrument (Garrison Dental Solutions) associated with Composite Wetting Resin (Ultradent) facilitated the positioning of the palatal shell with Z350 XT nano composite shade CT (Solventum), giving the strength needed for the area and also the translucency to mimic the enamel (Figure 4).

The intermediate layer was built up using Estelite Asteria (Tokuyama), shade A1B (body area), before the outer layer was finalised with Estelite Asteria shade WE.

The spherical filler particles of Estelite Asteria guarantee easy placement and manipulation of the composite as well as outstanding polishing results (Figure 5).

The polishing of those beautiful composites must be detailed and meticulously performed. I started the polishing with a coarse red Optidisc (Kerr) to reduce the volume and length, before moving to a fine yellow diamond bur 4209 (Kerr) and a 4236F bur to help improve the cervical areas and determine areas of shadow and light.

Using Composoft Cup (Eve) polishers for smoothing, pre-polishing and polishing is one of my favourite steps. After using them you will be able to see how the light reflects off the surfaces of the teeth and how your choices of colours have gone.

I usually associate the above steps with an extra round of polishing using medium and fine Diacom Plus (Eve) polishers (Figures 6, 7 and 8). On the proximal surfaces a very sharp scalpel (number 12) is used along with Epitex Finishing Strips (GC).

At the end of this, the smile arc was now more naturally consonant with the central incisors' edges creating a positive curve for the smile (Figure 9). The occlusion was checked and only minor adjustments were made.

I was very glad to confirm that canine guidance and anterior guidance on protrusion were established and that the premature contact on the molars, noticed prior to treatment, was eliminated.

#### CASE REFLECTION AND FURTHER TREATMENT

The patient's reaction on seeing the new smile was amazing, he couldn't believe his eyes and said that he felt very comfortable with the lip and new volumes of the teeth. He said he needed no adjustment time, he was already adapted to it!





**FIGURE 7:** Intraoral lateral view after polishing



**FIGURE 8:** Final restoration of the upper anteriors after polishing



**FIGURE 9:** Final restorations with consonant smile

## We have to remember that not all journeys will be the perfect one

So that we could create a harmonic appearance between the upper and lower teeth, Philips Zoom! Day White tooth whitening with a concentration of 6% hydrogen peroxide was proposed for use on the lower teeth to lighten their shade.

I prefer not to provide prior tooth whitening for the teeth I will be doing veneers on, instead using pink opaquer to mask discolouration if it is needed. In this particular case, the patient had an event to attend and wanted the veneers to be done as soon as possible, so we decided to delay the tooth whitening on the lower teeth until after the veneers were completed.

The occlusion was much improved and I believe that I managed to disguise the class III edge-to-edge to a class I. It was explained to the patient that bruxism treatment is a multidisciplinary approach and dentists can only treat the side effects of it. He was encouraged to continue to exercise to improve his wellbeing and to try to live as stress-free as possible!

The patient is committed to wearing a Michigan splint every night to protect the veneers and to avoid wear and breakages of the composites.

In hindsight, I wish the patient could have afforded the perfect route, which would have been orthodontics and then composite veneering treatment, but we have to remember that not all journeys will be the perfect one.

Nevertheless, they are worthy, especially as we know the patient's self-confidence and comfort are improved and the treatment was minimally invasive. We can say that we protected the teeth and transformed the person who now wears a beautiful smile! [CD](#)

### PRODUCTS USED

Estelite Asteria Tokuyama  
Optragate Ivoclar Vivadent  
Optidisc Kerr  
Scotchbond Universal, Z350 XT Solventum  
Pink Opaque Cosmedent  
Composi-Tight Garrison Dental Solutions  
Composite Wetting Resin Ultradent  
Composoft Cup, Diacomp Plus Eve  
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Zoom! Day White Philips

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**SAM JETHWA**

BDS MFDS RCS (EDIN) PGDIP CLINED  
Sam is the founder of Bespoke Smile Advanced Dentistry and Academy, and president elect of the British Academy of Cosmetic Dentistry.

**ENHANCED CPD**

GDC anticipated outcome: C  
CPD hours: one

Topic: Aesthetic dentistry

**Educational aims and objectives:**

To present an ultra thin ceramic veneer case study. This article qualifies for one hour of enhanced CPD; answer the questions on page 86 or scan the QR code.



**A**s dentists, there are a number of things that can scare us, amongst them are porcelain veneers (in general); high patient expectations, and a smile that is already good, and needs to be even better.

Something we have all heard before, I'm sure, is: 'It is easy to make a terrible smile look better, but super difficult to make a good one look even better.'

Patient CJ was referred to me by her friend who had received 10 upper ultra thin porcelain veneers at the practice. CJ attended to see if this treatment – or another option – would benefit her in any way.

At the appointment, CJ listed the following as her concerns:

- Some teeth appear small and narrow
- There are some gaps
- Smile lacks volume and teeth lack visibility
- Symmetry right and left side.

In addition to having all these concerns met, her desired goal was to have a perfect, but natural, smile that was whiter and had more volume.

**PATIENT DISCUSSION**

I take a co-diagnosis approach for my consultations. I find it encourages patient ownership of the risks, benefits and choices, therefore allowing an element of patient management to begin at this early stage.

During the appointment, we discussed the following treatment options:

- Do nothing, except for whitening. This option may or may not address colour goals, and will not address volume, size nor shape goals
- Orthodontics. This isn't really an option, as position is not the issue, it is tooth shape and size
- Composite bonding. In order to create volume and shape, it is composite veneers not edge bonding that is needed here. This opens up more discussion on minimum thickness of composite, wear properties, stain risks and longevity
- Minimal prep porcelain veneers. This is the

highest priced option, however, if executed using a predictable workflow and excellent ceramics, it would be the longest lasting, and most likely to deliver all of the wish list.

The patient consented to minimal prep porcelain veneers. For this particular treatment, we use the following five-step predictable workflow:

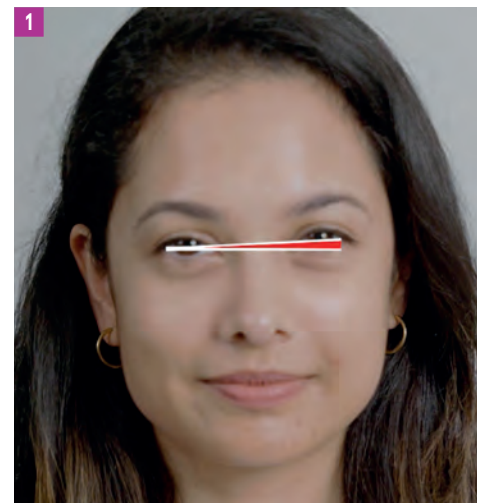
1. Smile design
2. Handmade trial smile and minimal tooth prep
3. Preparation through the temps
4. Copy into ceramic
5. Cementation.

**STEP ONE: SMILE DESIGN**

I care about facially driven smile design, not just golden proportion and a retracted photo.

A smile sits in a face, so whatever the face is doing will need to be considered in the smile.

If the design is outsourced to digital smile designing labs, or for a wax-up, often this element



**FIGURE 1:** Example of one of the aspects we check to ensure our design works with the face, not against it

Sam Jethwa provides an ultra thin ceramic veneers case study, highlighting one way of making a good smile even better

# Ultra thin ceramic veneers



is done a little less harmoniously with the face than we need, due to templated tooth shapes and an inability to create a design in the dynamic environment with a real patient.

This is why we will draw on our photos, use DMG Luxaflow mock-ups, and then copy this into the mouth, rather than reliance on software or a lab tech at this stage (Figure 1).

### STEP TWO: HANDMADE TRIAL SMILE AND MINIMAL TOOTH PREP

A wax-up in my hands now will only hinder me from creating the vision I have in my mind for each smile. This is because I have been working off the preop, but on the day of the prep I am faced with a new design, which is better but not quite where I want it to be.

All my mental preparation will be wiped out and I need to smile design again from a new design, which will need improvement (I don't rely on the wax-up being spot on, as it usually is not!).

Figure 2 shows the handmade temporaries using DMG Luxaflow.

### STEP THREE: PREPARATION THROUGH THE TEMPS

Now we have a design to work off, we can proceed to prep through our temps.

The first thing to do is to take a DMG Honigum impression of it, using a prep workflow that involves depth cuts, incisal reduction, interproximal path of insertion, occlusion related preparation palatally, and buccal for shape and to avoid bulky veneers.

All of this is done through the temporaries. In this case, extremely minimal enameloplasty was required to achieve a minimum preparation to accommodate our veneers. This is also down to the ceramic choice at 0.4-0.5mm, and because we chose the appropriate number of units to provide volume.

This makes the case mostly additive, and meant that no local anaesthetic was required for any of the treatment carried out in this case.



**FIGURE 5:** Hand layering and a putty matrix of our approved temporaries being used as a guide (image courtesy of Bespoke Smile Laboratory)



**FIGURE 2:** Handmade temporaries, using DMG Luxaflow



**FIGURE 3:** Preparation through the temps



**FIGURE 4:** Measurements of each tooth in the temps, and map of translucency and effect



**FIGURE 6:** The veneer fit



FIGURES 7 to 9: Final result

# We will always hand polish veneers

## STEP FOUR: COPY INTO CERAMIC

The patient will return for a trial smile review, where we review functional occlusion to identify if any adjustments are required to ensure incisal edges are safe from breakages. The lab will receive copies of the temps and will proceed to produce hand-layered ceramic veneers.

We send measurements of each tooth in the temps, an overall map of translucency, and effect (however, this would have been considered ahead of treatment, so our prep and thickness was sufficient), and a discussion surrounding which ingot and material to use (Figure 4).

In this case, we chose Impulse, which is a rarely used ingot of Emax (Ivoclar). We then hand-layered each veneer to produce a precise aesthetic, with the perfect tone for the patient's features. Ingot choice is critical.

If you have ever wondered why you prefer some cases to others, it is likely to do with this, as it affects opacity, translucency, transparency, chroma, and how effects and layering appear.

We will always hand polish veneers, with little glaze, as this helps only to produce an overly reflective surface that conceals the hard work of hand layering underneath.

## STEP FIVE: CEMENTATION

When it comes to the veneer fit, the first step is to ensure impeccable gum health in the temporaries, to avoid contamination through crevicular fluid or bleeding.

Other considerations include instruments that make life easy when removing bonded temps followed by an easy try-in process, cleaning process, and seating process.

After microabrasion, we will etch, place a desensitizer, such as Gluma, and a bonding agent, which will be lightly cured. The thickness of the material may require a dual cure cement, however in this case they are thin, so a light cure cement is preferred, with more working time.

Figures 7, 8 and 9 show the final result. For long-term management, we provided the patient with Essix retainers for nightly usage. [CD](#)

## PRODUCTS USED

- Gluma Kulzer
- Luxaflow Honigum DMG
- Emax Ivoclar



## TOP TIPS...

WITH  
SAM JETHWATEN TOP TIPS  
FOR VENEERS

**1** Try and take control of the design yourself in your temporaries, to guide the lab, by shaping/building with flowable composite, rather than reliance on wax-ups. When we design a smile using veneers, we work off the patient's preop situation. This means we think, plan, design using the before photo. When we ask the lab for a wax-up, often with limited instructions, the lab will struggle to create a design that is as tailored to the face. The other aspect to consider is if we are hand waxing up, creatively, or using digital planning with templated teeth. Ultimately, the wax-up arrives, and you face a brand-new smile to improve, after hours of thinking and planning from a preop. This makes life difficult, and reliant on the lab if we want changes. Take the creativity into your own hands, and use flowable composites, burs and discs to create bespoke shapes for every patient as an enhanced version of the preop.

**2** Never skip a review of the temporaries when the patient is not numb. It can be tempting to skip some steps and get to the end. Often a deadline placed on us by the patient will result in a quicker sequence of visits. The review of the temporary design is fundamental. Not only can you review and ask the patient to sign off on the design after they've become accustomed, but you can also review without a numb lip, increasing predictability, and patient satisfaction/expectation management.

**3** When a patient is in temporaries, Corsodyl Gel and hyaluronic acid 1% can help keep gums in tip top condition. Splinted temporaries, even with the best materials, can be a little harsh on gums, especially when splinted. Keeping interdental areas accessible with brushes, and papillae with freedom, plus tricks like the above will keep things clean and healthy, resulting in healthy tissue and stress-free cementation.

**4** Check the bite laying down and sitting up. Often, we will keep our patients in the chair lying down to complete our bite checks. This is not realistic, but then nor is what I was once taught, and that is to check them sitting up only. Checking both laying down and sitting up positions covers us for bruxism and for chewing.

**5** Think about skin tone, thickness of ceramic, underlying core colour, and ingot choice in ceramic when picking a shade. The darker the skin tone, the whiter the teeth will look. The warmer the eyes, the less white you want to go with the teeth. The thicker the ceramic, the more chroma you need to avoid grey lithium disilicate veneers, and the darker the underlying prep, the more opaque we need to go.

**6** Whiten all teeth before veneers, so that veneers can be kept thin without show through. This is essential if we want to keep our veneers thin, and not too opaque that we improve the core shade.

**7** Book long initial consultations. Cosmetic patients come in to see if their expectations can be met. Without a thorough discussion with photos, and a full ability to gauge if personalities work and expectations can be met, the case can be destined to fail. A new patient cosmetic consultation should last between 90- and 120-minutes.

**8** Discuss 'trade-offs'. Want the white white, but not big? Want them flat at the edges, but to look feminine? These are what I call 'trade-offs'. Ask the patient to choose which one of the two conflicting wishes they want more, as both is impossible. This process helps to keep expectations realistic and provides ownership of the result with the patient.

**9** Use the correct instruments. To remove temporaries easily, first use a thin needle bur to section the temp, off-centre, so around two thirds of the way across the tooth. Once fully sectioned, use a crown removal instrument (I like a square ended, flat plastic), which whips off temps with ease.

**10** Stress-free cementation. Once the preps are perfect and the veneers fit well, we can cement in any order. Use the correct soft tissue management, such as retraction paste or rubber dam, with a light cure cement (only if you have a thin veneer). Setting fast, dual cure cements are only needed for zirconia or thick crowns/bridges that a light cure will not penetrate. [CD](#)

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Dr Aamir Vaghela

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Courses usually sell out months in advance. With maximum group sizes set to 15 delegates, the next cohort dates set with a very small number of spaces available:

- Day 1 & 2: 8-9 February 2025
- Day 3 & 4: 22-23 February 2025
- Day 5 & 6: 22-23 March 2025. [📅](#)

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# DIGITAL DENTISTRY

**OXANA NAIDYONOVA**

Restorative dentistry: digitally created endocrowns

39



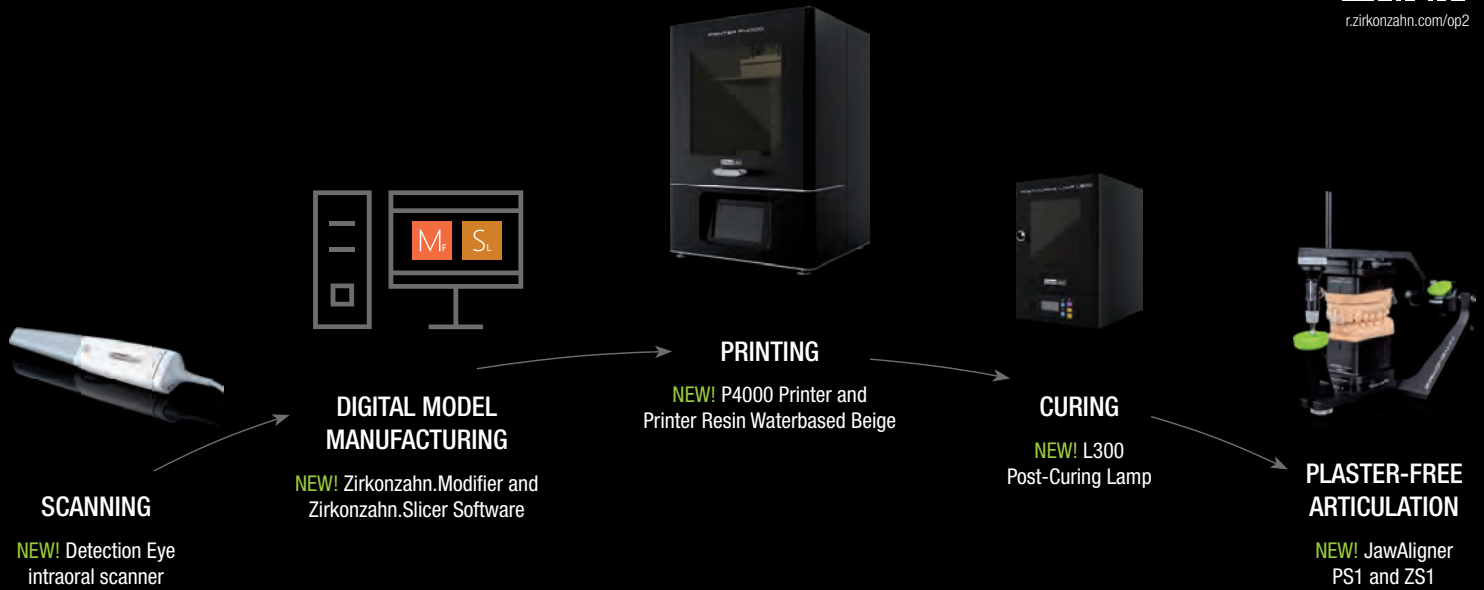
In contrast to full crown preparations, tooth substance preservation is a top priority for endocrowns. However, in these kinds of cases, this requires CAD/CAM materials such as the biomimetic hybrid ceramic material Vita Enamic (Vita Zahnfabrik), that allow for extremely delicate reconstructions with minimum wall thicknesses and material properties that exhibit tooth-like behaviour – Oxana Naidyonova, p39

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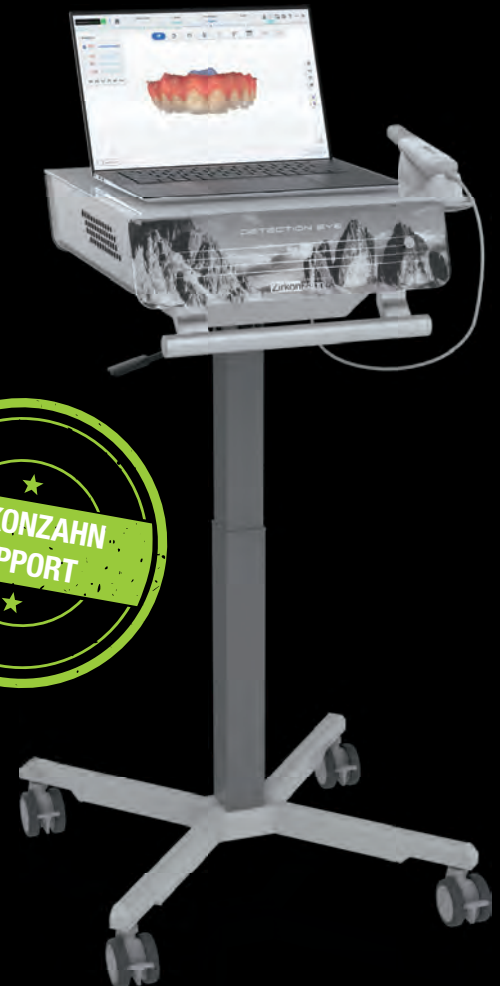
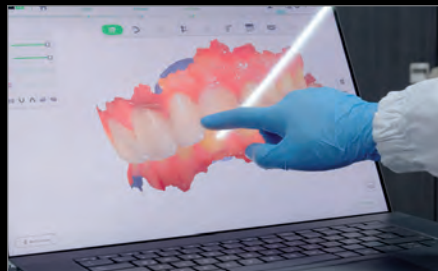




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**DR OXANA NAIDYONOVA**

Oxana is a dentist with a practice in Karaganda, Kazakhstan.

**ENHANCED CPD**

**GDC anticipated outcome: C**

**CPD hours: one**

**Topic:** Digital dentistry

**Educational aims and objectives:**

To present the step-by-step procedure of a defect-oriented, CAD/CAM-fabricated endocrown restoration with polychrome hybrid ceramic. This article qualifies for one hour of enhanced CPD; answer the questions on page 86 or scan the QR code.



**U**sing endocrowns to restore deeply damaged teeth that have undergone root canal treatment is a defect-oriented and minimally invasive procedure.

In contrast to full crown preparations, tooth substance preservation is a top priority for endocrowns. However, in these kinds of cases, this requires CAD/CAM materials such as the biomimetic hybrid ceramic material Vita Enamic (Vita Zahnfabrik), that allow for extremely delicate reconstructions with minimum wall thicknesses and material properties that exhibit tooth-like behaviour.

In the following case, the hybrid ceramic was also selected because its high edge stability allows it to be processed precisely with CAM technology, and it ensures a secure adhesive bonding, according to the proven all-ceramic protocol.

In this case study, the aim is to show my step-by-step procedure.

**CASE REPORT**

A 28-year-old male patient visited the clinic after an endodontic treatment and filling therapy on the UR4, due to consistent food remnants in the distal proximal space that were difficult to remove and often led to local inflammation.

The clinical evaluation found that the filling restoration (OD) was insufficient. The X-ray check showed nothing out of the ordinary. The patient opted for a new, time-efficient CAD/CAM-supported fabrication of the restoration.

The polychrome Vita Enamic Multicolor was selected for the reconstruction. This CAD/CAM blank has an integrated shade and translucency gradient, and a natural play of colours and light that can be conveniently reproduced at the push of a button.



**FIGURE 1:** Insufficient composite filling on the UR4 (OD) had led to inflammations in the interdental space



**FIGURE 2:** After removal of the old composite filling, an inflammatory bleeding of the gingiva appeared on the proximal box



**FIGURE 3:** A distal gingivectomy was performed and a retraction cord was inserted

**Oxana Naidyonova** presents a case highlighting a defect-oriented, CAD/CAM-fabricated endocrown restoration with polychrome hybrid ceramic

# Restorative dentistry: digitally created endocrowns



CLINICAL STEPS

Before the preparation, the tooth shade 2M2 was determined using the Vita Toothguide 3D-Master (Vita Zahnfabrik), and the appropriate blank in the shade 2M2 was selected. Local anaesthesia was applied and the composite filling was then removed.

After full adhesive conditioning, all undercuts were evened out with a low-viscosity composite. The remaining cavity walls were only reduced with a shoulder preparation.

This was followed by the insertion of a retraction cord, as well as a gingivectomy of the enlarged and inflamed gum areas on the distal box so that an optical scan could be used to detect all relevant areas.

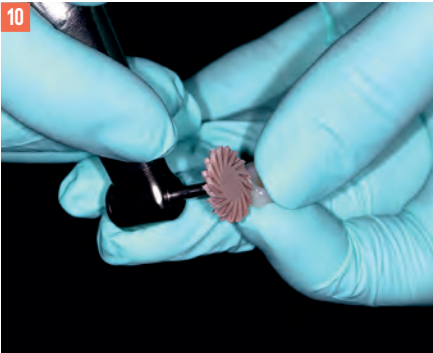
CAD CONSTRUCTION AND CAM FABRICATION

After the CAD design was complete, the restoration could be positioned in the virtual Vita Enamic Multicolor blank with its six finely nuanced layers, so that the translucency and shade gradient corresponded to the clinical situation. This was followed by fabrication using the Mycrown Mill grinding unit (Fona Dental).

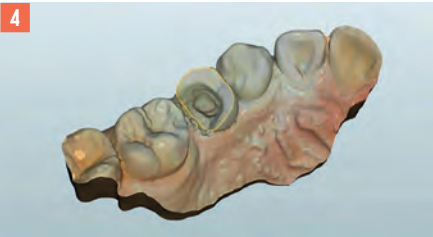
After the restoration was finished with fine diamonds, the fissures were conditioned with hydrofluoric acid (5%) and silane in order to characterise them with light-curing composite stains. The final step was the high-gloss polish.



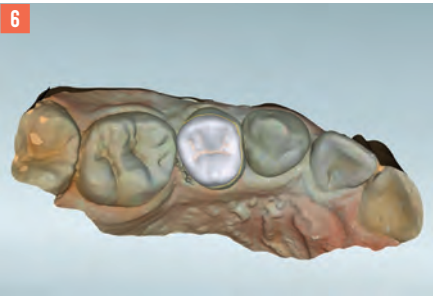
**FIGURE 9:** The CAD/CAM-supported fabricated restoration after the preparation at the clinical try-in



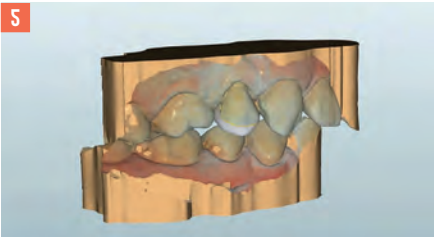
**FIGURE 10:** The finished hybrid ceramic crown was then polished to a high gloss



**FIGURE 4:** Based on the intraoral scan, a virtual model was created for the construction



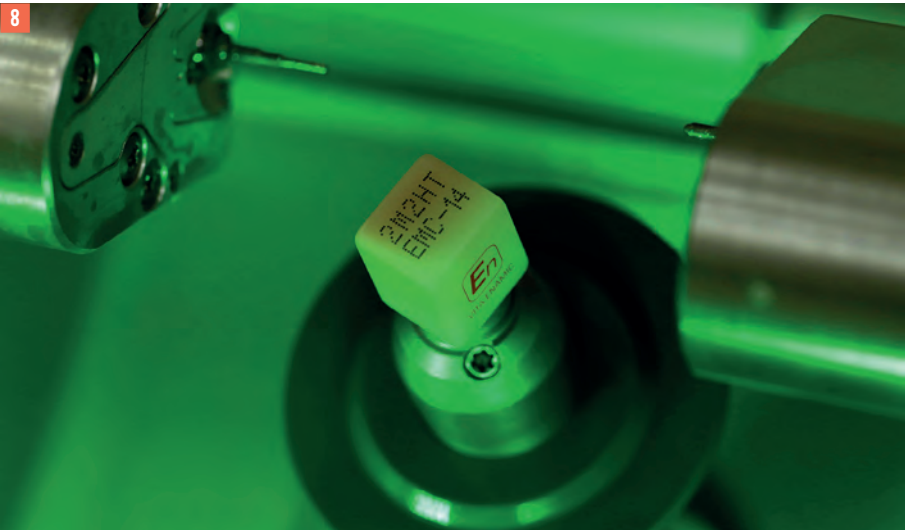
**FIGURE 6:** The virtual design in occlusal view before nesting in the virtual block



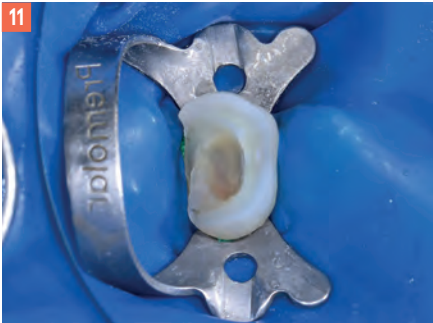
**FIGURE 5:** The finished virtual design of the endocrown restoration in the vestibular view



**FIGURE 7:** Thanks to six finely nuanced layers, the shade and translucency gradient of the restoration could be controlled with the positioning



**FIGURE 8:** The highly translucent, hybrid ceramic block in shade 2M2 positioned in the grinding machine



**FIGURE 11:** Under rubber dam, the fully adhesive seating began with phosphoric acid etching of the cavity



**FIGURE 12:** Condition immediately after full adhesive seating, before removal of the cement residues



**FIGURE 13:** Immediately after the final seating, the gingiva was still irritated and inflamed



**FIGURE 14:** Three-month follow-up – healthy gingival conditions



**FIGURE 15:** Final result

#### FULL ADHESIVE SEATING AND FINAL RESULT

A rubber dam was placed for the fully adhesive seating in order to prevent contamination and to ensure absolute dryness and a sustainable bond. The adhesive surfaces of the restoration were conditioned using hydrofluoric acid (5%) and silane. In order to create a retentive etching pattern on the enamel areas and to prepare the dentine for the adhesive bond, the cavity was etched with phosphoric acid and then an adhesive was applied.

For luting, composite from Micerium in the shade HRI was heated to give it a lower viscosity for insertion. Light curing and removal of the composite residues followed. As a result, the polychrome hybrid ceramic restoration was integrated harmoniously into the natural tooth structure, producing a very aesthetic result. The follow-up appointment three months later showed a healed and inflammation-free gingiva around the restoration. [C](#)

#### PRODUCTS USED

Mycrown Mill Fona Dental  
Vita Enamic Multicolor, Toothguide 3D-Master Vita Zahnfabrik



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## TOMMASO WEINSTEIN EXPLORES THE KEY INTEGRATED FEATURES OF INVISALIGN SMILE ARCHITECT



**TOMMASO WEINSTEIN**

Tommaso is adjunct professor at the MEDTEC School, Humanitas University, Milan and also works in private practice.



**FIGURES 1A and 1B:** Facial lines



**FIGURE 2:** Integrated view

### INVISALIGN

For more information, go to  
[www.invisalign.co.uk/gp/invisalign-solutions/smilearchitect](http://www.invisalign.co.uk/gp/invisalign-solutions/smilearchitect).



# INVISALIGN SMILE ARCHITECT: CASE REPORT

In this case, the main problems were diastemas between upper central and lateral incisors, the different gingival levels of the centrals and the fracture of their incisal margins. Using the key integrated features and step-by-step workflow of Invisalign Smile Architect™, we were able to plan and complete treatment for the patient with exceptional accuracy and results. Here's how the software formed the basis of planning and treatment.

### FEATURE 1: FACIAL LINES

Using the Invisalign® Practice App, we were able to take a wide smile photograph, then display facial lines that identify the patient's aesthetic parameters by relating the elements of their smile to their face. This tool establishes with precise references the optimal position of the patient's future smile. It is even possible to visualise the clinical outcome, based on the 3D model, on the patient's face.

### FEATURE 2: INTEGRATED VIEW

This second tool offered by Invisalign Smile Architect™, Integrated View, superimposes the 3D model on the patient's face. This combines the macro, mini and micro elements of treatment planning, so the ClinCheck® plan can be developed further.

### FEATURE 3: RESTORATION

Invisalign Smile Architect™ software also allowed us to plan the restorative



**FIGURE 3:** Restoration

phase of treatment, including all the previous alignment considerations. In fact, the Restorations button even allowed us to perform a virtual wax-up of future restorations, right to the final position planned in the alignment. It's an extremely useful function, as it allows us to assess whether the planned alignment will work for a minimally invasive restoration.

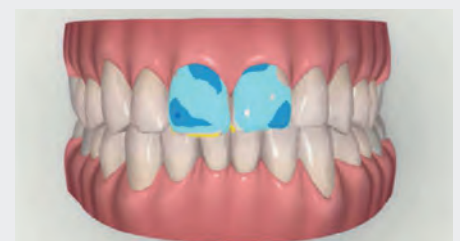
### FEATURE 4: TOOTH MASS ANALYSIS

This advanced function shows the thickness of future restorations on the ClinCheck treatment plan. This meant we could instantly recognise whether our planned alignment was appropriate for the patient, or whether further modifications of the final position would be necessary to perform non-invasive preparations or purely additive restorations.

### THE RESULT

To properly solve the patient's dental issues, facial lines were firstly used to set up the correct dental final position of central and laterals, aided by 3D Controls.

The final position was then checked with the wax-up of the future restoration of the centrals together with the In-face visualization. Invisalign Smile Architect™ enabled us to carry out extremely accurate treatment planning. We could study the case in depth, and better communicate to the patient the therapeutic solutions we had designed for them. [CQ](#)



**FIGURE 4:** Tooth mass analysis

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# ENDODONTICS

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PETROS MYLONAS

Perforation management and primary endodontics

47



A diagnosis of generalised periodontitis (stage 2, grade A) with unknown stability was determined, alongside previously initiated therapy with a symptomatic apical periodontitis, and distal perforation for the UR2 – Petros Mylonas, p47

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**PETROS MYLONAS**

Petros is a clinical lecturer and speciality training registrar in restorative dentistry.

**ENHANCED CPD**

**GDC anticipated outcome: C**

**CPD hours: one**

**Topic: Endodontics**

**Educational aims and objectives:**

To present a challenging endodontic case, consisting of perforation repair, canal location and primary root canal treatment (RCT). This article qualifies for one hour of enhanced CPD; answer the questions on page 86 or scan the QR code.



**A**n 80-year-old female presented to Cardiff Dental Hospital restorative department consultant clinic in November 2022. The patient was experiencing occasional pain from the UR2.

Previous acute pain in the same tooth had led to RCT in May 2022 by her general dental practitioner (GDP). An iatrogenic perforation had occurred at this time. The UR2 was dressed temporarily before her referral to Cardiff Dental Hospital.

The patient was a regular attender with good oral hygiene. Her medical history revealed hypothyroidism, previous deep vein thrombosis, and crepitus associated with her right-hand side temporomandibular joint on opening.

**ASSESSMENT**

The patient experienced sharp pain followed by a dull throb, particularly when she bit down hard. In addition, a temperature-sensitive shooting pain was noted in the UR2 region.

A thick gingival biotype was identified, with no swellings or pathology, some recession generally, and periodontal assessment scores of 3/3/3, 3/3/3. The dentition was heavily restored, but there was no evidence of caries or other primary hard tissue disease. Assessment of the UR2 revealed a positive response to percussion testing, buccal tenderness, no probing depths over 5mm, positive response to sensibility testing, and grade zero mobility.

An intraoral periapical radiograph revealed normal bone levels, temporary restoration in the UR2, and a veneer on the UR1 (Figure 1). Radiolucency was identified distally on the UR2. The root canal of the UR2 was not clearly visible at the apical third, and the periodontal ligament was intact.

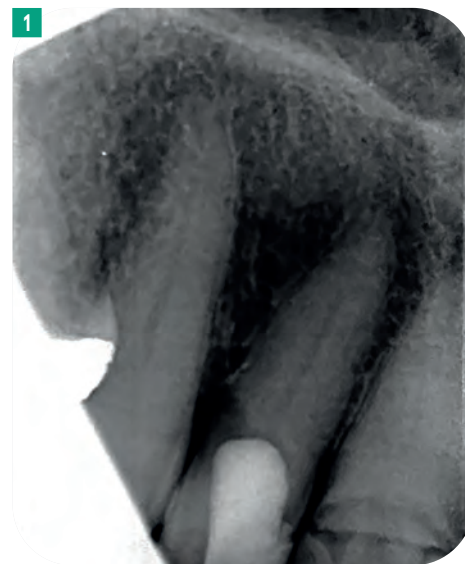
**DIAGNOSES AND TREATMENT OPTIONS**

A diagnosis of generalised periodontitis (stage 2, grade A) with unknown stability was determined, alongside previously initiated therapy with a symptomatic apical periodontitis, and distal perforation for the UR2.

Four treatment options were discussed:

1. No treatment and monitor (not recommended)
2. Non-surgical perforation repair and orthograde RCT
3. Surgical perforation repair and orthograde RCT
4. Tooth extraction and prosthetic provision.

The patient consented to option two, but understood that options three and four were distinct possibilities and provided consent for these too, if necessary.

**FIGURE 1:** Radiographic assessment

**Petros Mylonas** presents a challenging case, consisting of perforation repair, canal location and primary root canal treatment

# Perforation management and primary endodontics





**FIGURE 2A:** Clinical assessment



**FIGURE 2B:** Removal of temporary restoration



**FIGURE 3:** Debridement of perforation site



**FIGURE 4:** Working length

### TREATMENT PLAN

The treatment plan for the UR2 was as follows:

- Restorability assessment following the removal of the existing temporary restoration
- Visualisation of perforation, and determination whether perforation can be located externally
- Consider cone beam computed tomography (CBCT) evaluation if clinical assessment of the perforation is inconclusive
- Determine whether perforation is supra- or sub-crestal
- Attempt non-surgical repair
- If successful, continue with orthograde RCT
- If unsuccessful, carry out surgical repair – then continue with orthograde RCT.

Further evaluation of the periodontal condition, stabilisation, and management of periodontal disease, to be provided by her GDP.

### TREATMENT PROVISION

#### Visit one: restorability assessment, perforation location, true canal location

The temporary composite restoration with cotton pledget and Ledermix was removed, caries was



**FIGURE 5:** CBCT

removed, and the true root canal was visualised (Figures 2a and 2b). This was done without dental dam to ensure visualisation of the crown axis and aid bur angulation.

The UR2, UR1, UL1 and UL2 were then isolated with dental dam using Wedjets and floss ties. The perforation site was thoroughly debrided with sterile saline, and dried gently with an ISO 70 paper point (Figure 3).

There was no communication between buccal mucosa and the UR2 perforation, though some granulation tissue was evident, and the angulation of perforation appeared to track distobuccally. The true root canal had a working length of 22mm (Figure 4).

The perforation had an ISO greater than 70 in diameter, and it was difficult to know the precise shape or whether it was supra- or sub-crestal. As such, further radiographic assessment was required – a high resolution, low field of view CBCT of the UR2 (5x5cm) – to visualise the

perforation shape, position, size, extent, and whether it was supra- or sub-crestal.

### TIPS TO AVOID PERFORATION

- Appreciation of visible clinical crown with consideration of position and contour of tooth structure at the level of cemento-enamel junction
- Assessment of crown/root angulation radiographically
- Careful planning of access cavity according to approximation of orifice location – remember centrality and concentricity as described by Krasner and Rankow (2004)
- Use of magnification and illumination allowing visualisation of colour changes on pulp chamber floor
- Periodic radiographs to check your access angulation when there is clinical uncertainty.



**FIGURE 6:** Perforation repair and root canal treatment



**FIGURE 7:** Perforation repair and root canal treatment



**FIGURE 8:** Root canal treatment completion



**FIGURE 9:** 12-month review appointment

#### Visit two: discussion of CBCT results with patient and finalisation of treatment strategy

CBCT review revealed the UR2 had an access cavity that tracked the long axis of the clinical crown, but did not match the angulation of the root. The crown axis and root axis did not align.

The CBCT also showed that the perforation tracked distobuccally, with dimensions similar to a tapered diamond dental bur. The distal aspect was approximately 2mm in length, and width varied from 5mm to 1mm coronal-apically. The perforation had an irregular shape, and was entirely supra-crestal (Figure 5).

It was agreed with the patient to attempt non-surgical repair of the perforation using resin-modified glass ionomer (Vitrebond) and continue with primary endodontic treatment.

#### Visit three: controlling the main canal and stage one of perforation repair

The main root canal orifice was accessed, and

coronal preparation completed to ensure ease of access for future primary RCT. The perforation site was thoroughly cleaned with a 50:50 ratio of 2% NaOCl and sterile saline.

Granulation tissue was removed with a gooseneck bur, the site was temporised with non-setting calcium hydroxide paste, and a cotton pledget. Poly-F Plus temporary restoration was provided to allow resolution of bleeding and facilitate perforation repair at the next visit.

#### Visit four: completion of perforation repair and primary RCT

After the removal of the temporary restoration and irrigation of both the main root canal and perforation, the main canal was blocked with a large polytetrafluoroethylene (PTFE) barrier.

The perforation site was gently cleaned with 50:50 2% NaOCl and saline mixture and dried with micro-suction and size 70 paper points. The repair was carried out carefully using Vitrebond

glass ionomer and a modified injection technique. An intraoral periapical radiograph was taken to confirm restoration (Figure 6).

Following this, a Reciproc Blue R25 file was used for canal shaping, the site was irrigated with full strength 2% NaOCl, and activated with Endoactivator. Obturation was performed using gutta percha and AH Plus sealer, with a warm vertical condensation technique, to a length of 22mm (Figures 7 and 8).

#### Visit five: first review at six months

At a six-month review, there were no clinical symptoms relating to the UR2, indicating the need for surgery would be unlikely in the near future.

#### Visit six: one-year review

At a 12-month review, there were still no signs or symptoms, and there were no radiographic features evident. The patient was discharged for continued monitoring by the GDP (Figure 9).

#### CASE REFLECTION

This was a difficult case due to the location and size of the perforation. CBCT imaging allowed the complete 3D visualisation of the perforation – it supplemented clinical assessment findings, and informed treatment planning including material selection and repair strategy.

A minimally invasive approach was undertaken with chemomechanical shaping of the main canal to preserve pericervical dentine and minimise risk of communication with the perforation.

Use of Vitrebond allowed for controlled restoration of the perforation with a moisture tolerant material indicated in similar situations.

Reason for iatrogenic perforation: the UR2 had a mismatch in axis/angulation between the clinical crown and the root. The root mesially inclined far more than expected from the clinical crown visible. [📄](#)

#### REFERENCE

Krasner P, Rankow HJ (2004)  
Anatomy of the pulp-chamber floor.  
*J Endod* 30(1): 5-16

#### PRODUCTS USED

Ledermix Ozdent Dental Products  
Wedjets Coltene  
Vitrebond Solventum  
Poly-F Plus, Endoactivator, AH Plus  
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# IMPLANT DENTISTRY

**EDUARDO ANITUA**

Evaluating crown-to-implant ratio

**53**



**SELVARAJ BALAJI**

Soft and hard tissue augmentation with implant placement

**57**



**IMI NASSER**

Immediate versus delayed implants

**61**



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**EDUARDO ANITUA**

DDS MD PHD

Eduardo is in private practice at Eduardo Anitua Institute in Spain. He is also the director of the University Institute of Regenerative Medicine and Oral Implantology of the University of the Basque Country, and scientific director of BTI Biotechnology Institute. He is the president of the Eduardo Anitua Foundation for Biomedical Research.

**ENHANCED CPD****GDC anticipated outcome: C****CPD hours: one****Topic:** Implant dentistry**Educational aims and objectives:**

To evaluate the effect of crown-to-implant (CI) ratio on the marginal bone stability around extra-short implants supporting a fixed-partial prosthesis in posterior mandible. This article qualifies for one hour of enhanced CPD; answer the questions on page 86 or scan the QR code.



**S**hort and extra-short implants are a powerful tool in modern implant dentistry these days (Gonçalves et al, 2015). The use of these implants allows resorbed edentulous ridges to be rehabilitated with a simple approach.

The principal problem with short and extra-short implants is the crown-implant ratio. The height of the area to be rehabilitated along with the length of these implants creates an unfavourable prosthesis on the basis of the crown-implant ratio.

The concept of the crown-implant ratio originates from the crown-root ratio in general dentistry and, for implants, the use of these parameters is similar. However, when comparing general dental concepts to those relating to implant prostheses, it's important to note that while they have several similarities, there are also big differences.

The most important difference is the biomechanical behaviour of the implant-prosthesis junction and the way this conveys stress to the crestal bone.

The absence of a periodontal ligament, and the ankylosis that occurs between the bone and the implant, may generate significant force in the crestal bone. This is believed to result in major bone resorption.

A large difference between the length of the restoration and the length of the implant would therefore appear to indicate poor biomechanical behaviour of the assembly, adversely affecting marginal bone loss and increasing the rate of failure.

However, analysis of the studies published on this topic do not show a greater bone loss in high crown-implant ratios, and crown-implant ratios higher than two are considered a safe and predictable therapeutic option (Rakni et al, 2005; Blanes et al, 2007; Schneider et al, 2012; Sanz and Naert, 2009).

The aim of this study was to evaluate the effect of

crown-implant (CI) ratio on marginal bone stability around extra-short implants supporting a fixed partial prosthesis in the posterior mandible. The secondary outcome was to the implant survival.

**MATERIAL AND METHODS**

This article was written according to the STROBE (Strengthening the Reporting of Observational studies in Epidemiology) guidelines (Von Elm et al, 2007). All described data and treatments were obtained from a single dental clinic in Vitoria, Spain.

Patient records were retrospectively reviewed to identify patients that fulfilled the following inclusion criteria:

- Aged 18 years or older
- Placement of extra-short (length  $\leq 6.5$  mm) implants before December 2010
- Placed in posterior mandible

The principal outcome was the marginal bone loss and the secondary outcome was the implant survival rate.

Patients/implants that did not meet any of these criteria were excluded from the study.

Prior to surgery, and in order to make a proper treatment plan, all patients underwent a standard diagnostic protocol consisting of reviewing the medical and dental history, diagnostic casts, and radiographic evaluation.

To assess the principal and secondary outcomes, implants were followed clinically and radiographically to identify the crestal bone loss and implant failure (failure to achieve osseointegration or loss of acquired osseointegration).

The measurement of the marginal bone loss was performed on the most recent radiograph. To do that, known implant length was used to calibrate the linear measurements on the radiograph. Then, the distance between the uppermost point of the implant platform and the most coronal bone-implant contact was measured mesial and distal to the implant by a computer software (Sidexis).

**Eduardo Anitua** discusses marginal bone stability around extra-short implants supporting a fixed partial prosthesis in posterior mandible and the impact of crown-to-implant ratio

# Evaluating crown-to-implant ratio





**FIGURE 1:** Diagram representing the measurements of the implant and crown to the posterior calculation of the CI ratio. The crown was measured from the highest cusp of the molars and premolars occlusal side, to the top of the implant platform, along a perpendicular line. The implant was measured at the centre, from the platform to the end of the apex

The bone level recorded just after the placement of the provisional prosthesis served as a reference for the measurement of the marginal bone loss. Bone loss was measured mesially and distally to the implant. Finally, a mean of the two measurements was reported due to the absence of statistically significant differences.

The crown-implant ratio was determined by two measurements (Figure 1):

1. The crown was measured from the tip of the highest cusp to the platform of the implant, along a perpendicular line
2. The implant was measured at the centre, from the platform to the end of the apex.

The same surgical protocol was followed in all patients. Before surgery, patients underwent a routine dental scaling to start the implant treatment with an adequate periodontal health.

Radiographic evaluation was also performed to establish the treatment plan. All patients received prophylactic antibiotic medication before and after surgery.

An infiltrative anaesthesia was applied and incisions were made to elevate a full thickness flap. Implant sites were prepared using a low-speed drilling procedure (125rpm) without irrigation (Anitua et al, 2015a; Anitua et al, 2007).

Before installation, implants were carefully embedded in liquid plasma rich in growth factors (PRGF) prepared from the patient's blood according to a protocol developed by the manufacturer (PRGF-Endoret, Biotechnology Institute BTI) to bioactivate the implant surface.

For placing the dental implant, the surgical motor was set at 25Ncm and the implants were seated manually by a calibrated torque wrench. The final insertion torque was annotated in the patient's record.

Implant Position	5,5 mm lenght				6,5 mm lenght			
	Ø 3,75	Ø 4,0	Ø 4,5	Ø 5,0	Ø 3,75	Ø 4,0	Ø 4,5	Ø 5,0
35				1			2	
36				1	1		2	2
37				2			3	2
45					1	1	1	
46			2	1			3	3
47				3			3	3

**FIGURE 2:** Location, diameter and length of the implants included in the study



**FIGURE 3A:** Front intraoral photograph showing partial edentulism in mandible and total edentulism in the maxillae



**FIGURE 3B:** Lateral intraoral photograph showing partial edentulism in mandible and total edentulism in the maxillae

Prosthetic rehabilitation was carried out by a prosthodontist. Impression copings were placed and an impression was made with polyether impression material (Impregum Penta) and the open-tray technique at three months after implants insertion.

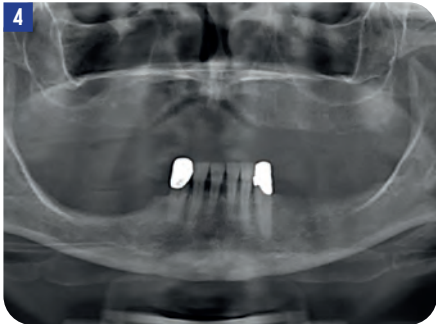
The follow-up visits were scheduled for a series of periodic evaluations, consisting normally of visits at one week after intervention, at one month, at three months, at six months, and once a year from that point.

STATISTICAL ANALYSIS

Data collection and analysis was performed by two independent examiners.

The patient was the statistical unit for the statistical description of demographic data, social habits and medical history. The implant served as the statistical unit for the descriptions of implant length, diameter, location, insertion torque, marginal bone loss and survival of the implants.

Absolute and relative frequency distributions were calculated for qualitative variables and mean values and standard deviations for quantitative variables. The Shapiro-Wilk test was selected to check the normal distribution of the data.



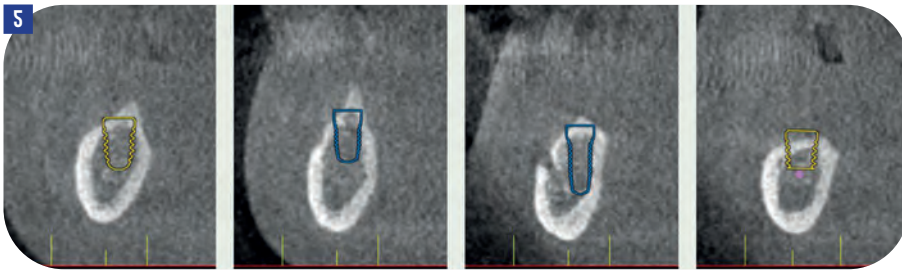
**FIGURE 4:** Initial panoramic X-ray

The cumulative survival rate of implants was analysed using a life-table analysis (Actuarial method). The SPSS v15.0 for Windows statistical software package (SPSS Inc, USA) was used for statistical analysis.

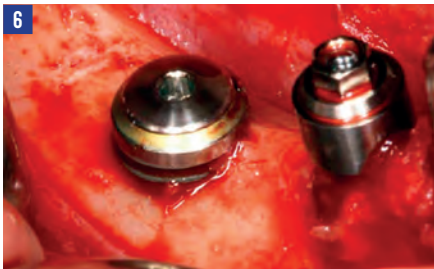
RESULTS

In this study, 32 patients participated with 46 implants with a crown-implant ratio higher than one.

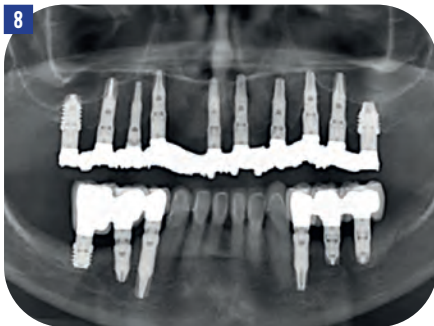
The patients' mean age was 68 plus-minus six years (range 55 to 74 years) at the time of surgery and the 78.3% of the patients were females. Three patients were smokers (4.8%), and none of them referred alcohol habits. One of the patients



**FIGURE 5:** Planification of dental implants in the cone-beam with the software BTI-Scan III



**FIGURE 6:** Implant surgery – insertion of an implant extra-short in the most distal area of the fourth quadrant. The bone resorption at this level requires the use of a technique of vertical growth



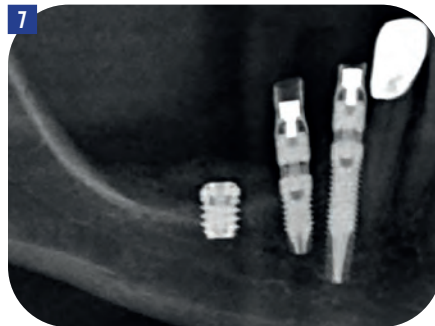
**FIGURE 8:** Panoramic X-ray at one-year follow-up post loading. In the fourth quadrant, we can observe the crown-implant ratio of the extra-short implant

was diabetic (1.6%), seven patients had previous periodontal disease (11.1%), one patient had previous radiation (1.6%).

The diameter, length and position of the implants included in the study are shown in Figure 2. The mean of the follow-up was 23 plus-minus eight months (range 14 to 43). The mean crown-implant ratio was 2.4 plus-minus 0.47 (range 1.50 to 3.64).

Regarding the type of prosthesis, all patients were rehabilitated using fixed-partial prosthesis. Of the restorations, 67.4% were screw-retained prosthesis and the rest were cemented.

The measurement of marginal bone loss (MBL) was performed at 12 and 24 months of loading. The mean of mesial bone loss was 1.04 plus-minus 0.70mm and the mean distal bone



**FIGURE 7:** Postoperative radiograph. In the area of the extra-short implant, we can see the bone volume used for the vertical growth



**FIGURE 9:** X-ray at seven-year follow-up with stability of the bone at crestal level

loss was 0.94 plus-minus 0.71mm. There was no statistically significant difference between the MBL measurements at different follow-up times ( $p > .05$ ), indicating that bone level around implants under functional loading was stable over time. No significant influence was found between the CI ratio and MBL, even considering separately CI  $< 2$  and CI  $\geq 2$ .

The overall survival rates of short implants and prosthesis were 100% for the implant and patient-based analysis, respectively, at the end of the follow-up time. Figures 3 to 10 show one of the cases included in the study.

## DISCUSSION

The prosthetic rehabilitations in which short implants are involved often lead to imbalances between the lengths of the crown and the implant.

It has been suggested that disproportionate prosthetic restorations could induce poor biomechanical behaviour with a potential impact on marginal bone loss and reduced implant survival rate (Blanes et al, 2007).

In this study, no associations were found between marginal bone loss and the CI ratio of implant-supported prostheses in extra-short implants.

Previous studies in which short implants were used have evaluated the influence of CI ratio on marginal bone loss (Rokni et al, 2005; Tawil et al, 2006; Birdi et al, 2010). In general, most of these studies concluded that no relation may be established between an unfavorable CI ratio and marginal bone loss, independently of the type of prosthetic rehabilitation.


All implants in this study used splinted restorations. Short and extra-short implants exhibit better biomechanical behaviour when the prostheses are splinted. An additional rationale for splinting implant crowns together is to favourably distribute the nonaxial loads, minimise their transfer to the restoration and supporting bone, and increase the total load area (Nissan et al, 2011a; Nissan et al, 2011b).

Splinting the crowns reduced the peri-implant bone stress under horizontal load in a finite element analysis model especially recommended for implants surrounded by poor-quality bone (Nissan et al, 2011a; Grossmann et al, 2005).

When placing extra-short implants, it is necessary to carry out adequate planning and the splitting implants are a correct protocol in these cases (Anitua et al, 2015b; Anitua et al, 2014).

## CONCLUSIONS

Within the limitations of this study, the results show that an increased crown-to-implant ratio in extra-short implants has no significant influence on crestal bone loss and implant survival.

The study limitations include its retrospective design, the small sample size and short follow-up time. Further studies with more extra-short implants, followed for a longer period of time, are necessary to establish sound conclusions about the effect of increased crown-to-implant ratio on implant survival. 

## REFERENCES

 siobhan.hiscott@fmc.co.uk

## PRODUCTS USED

Impregum Penta 3M Espe  
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# Soft and hard tissue augmentation with implant placement

Selvaraj Balaji presents an implant case that required both soft and hard tissue augmentation with dental implant placement to restore a missing UL2

**A** female patient in her 60s presented missing a lateral left incisor that she wanted to replace. She visited the practice shortly after the COVID-19 pandemic, during which she had developed an infection and the UL2 had been extracted.

A full medical history was taken, showing the patient to be generally fit and well. A CT scan revealed buccal bone loss around the UL2 site and where a large cyst had been removed there was a major bony defect.

There was also a soft tissue defect around the site of the UL2. The patient's periodontal health was fair, and a crown was identified on the UR1.

## TREATMENT PLANNING

The patient was presented with all appropriate treatment options, including:

- No treatment
- A removeable denture
- A bridge
- An implant-retained crown.

She was hesitant to proceed with a removable denture due to her preference for a fixed solution. A bridge would also have required the removal of the UR1 crown, with the associated increased costs, which she was keen to avoid as well. An implant, therefore, was the most suitable treatment for this patient.

At this point, it needed to be decided whether bone augmentation and

delayed implant placement would be most appropriate, or if simultaneous grafting and implant placement could be performed.

A CBCT scan provided greater visualisation of the bony defect, demonstrating adequate bone for primary implant stability.

Consequently, simultaneous bone augmentation – using a combination of autogenous bone and xenograft material – was indicated alongside implant placement to treat the bony defect and increase the hard and soft tissue volume for optimal results.

There was also a need for soft tissue augmentation in order to increase the gingival volume to ensure good healing and a highly aesthetic outcome.

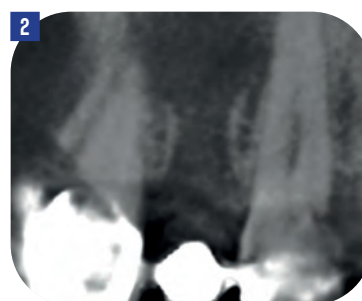
A connective tissue graft was selected for this case, using autogenous soft tissue from a connective tissue graft (CTG) harvested from the patient's palate.

Treatment was planned to determine the most suitable implant position, angle and depth, with consideration for the restorative space created. Harvesting sites were also identified and communicated to the patient.

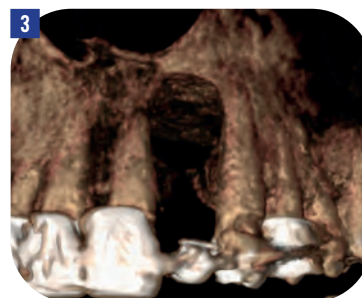
All aspects of the procedures involved were discussed with the patient in detail, exploring the benefits, limitations and risks. Once all the patient's questions were answered and she was comfortable with treatment, she provided informed consent to proceed.



**FIGURE 1:** Presentation



**FIGURE 2:** CT scan of presentation



**FIGURE 3:** CBCT scan of presentation showing large bony defect



**DR SELVARAJ BALAJI**  
BDS MFDS  
RCPS(GLA) MFD  
SRCS(ED) LDS  
RCS(ENG)

Since obtaining his BDS degree, Selvaraj has worked in maxillofacial units in the UK and gained substantial experience in surgical dentistry. He is the principal dentist of The Gallery Dental Group, which is made up of Meadow Walk Dental Practice and The Gallery Dental & Implant Centre. Selvaraj is also the founder of the Academy of Soft and Hard Tissue Augmentation (ASHA) and runs courses, lectures and study clubs for aspiring implant dentists.



SURGICAL APPOINTMENT

The UL2 area was numbed using LA and a full thickness flap was raised to reveal the buccal bony defect. Autogenous bone was harvested from the left external oblique using a safe scraper.

The UL2 bony defect cavity was then filled with a mixture of the autogenous bone and a xenograft material. What I refer to as a 'layering technique' was used to achieve this, which is designed to ensure the autogenous bone graft attaches around 360° of the implant for osteointegration to provide maximum strength and stability.

An Astra Tech EV 3.6mm diameter implant was placed to the pre-determined position, angle and depth. Sufficient primary stability was achieved from the interdental bone and at the apex of the implant.

Bone augmentation was completed as planned, adding a mixture of autogenous bone and xenograft around the implant, which was then secured using a native collagen membrane with master pins.

During the same appointment, connective tissue was harvested from the palate. This was placed over the implant site to increase the soft tissue thickness post-surgery. The flap was then closed tension-free with 6.0 monofilament, resorbable glycogen sutures.

A temporary restoration was placed out of occlusion. The patient was given all the standard postoperative oral hygiene instructions and advised to avoid chewing on the implant site for a few days.

It is crucial to have the skills and the confidence to provide effective soft tissue management

REVIEW AND RESTORATION

The patient returned to the practice one week later for the initial surgical review. She reported only very minor discomfort – as would be expected – which was managed with over-the-counter painkillers. A radiograph was taken to confirm the implant position and the beginning of the osseointegration process.

Three months post-surgery, the implant was exposed, and a temporary restoration fitted. Approximately six months after this, the patient

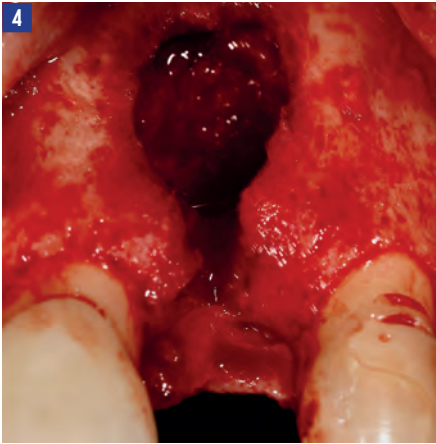


FIGURE 4: Full thickness flap raised to reveal bony defect



FIGURES 6A and 6B: Harvested bone

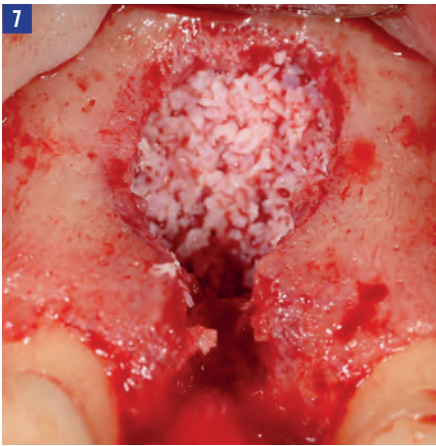


FIGURE 7: Bone augmentation mixture of autogenous bone and xenograft placed

confirmed she was happy with the aesthetics and function of the temporary restoration, and the final restoration was fitted.

Upon a review of the patient five years after the treatment was completed, the implant remained fully integrated, bone levels were stable and the soft tissue was thick, pink and healthy.

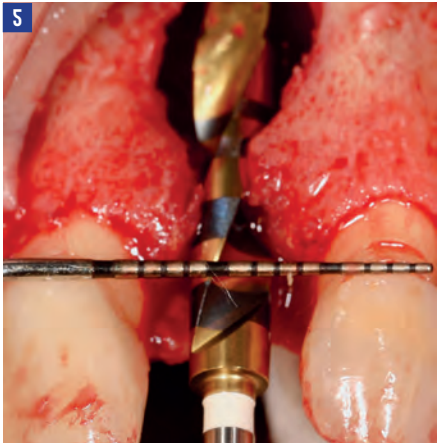


FIGURE 5: Preparing socket for implant placement

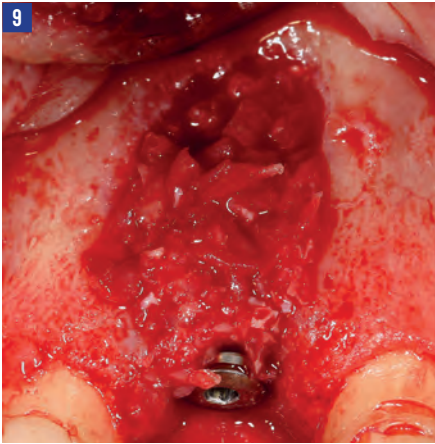


FIGURE 8: Implant placed

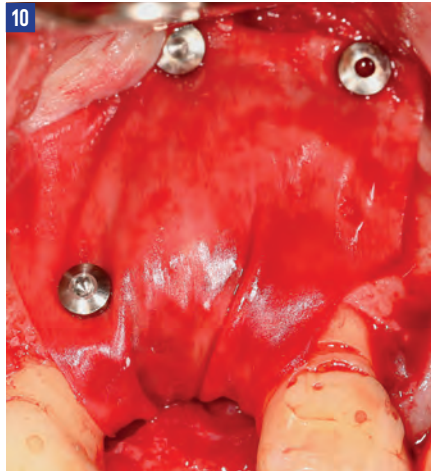
DISCUSSION

Both the patient and clinician were pleased with the outcome delivered in this situation. The case clearly demonstrates what can be achieved even when a significant bony defect is detected.

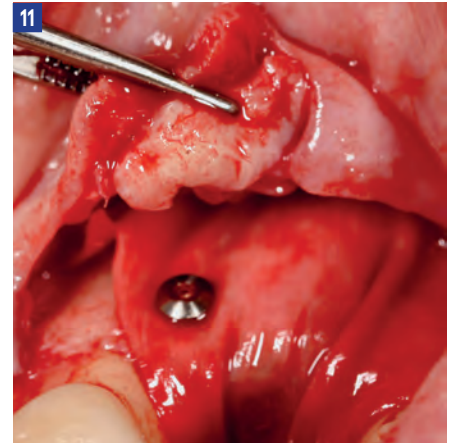
For the treating clinician, it is crucial to have the skills and the confidence to provide effective soft tissue management when approaching



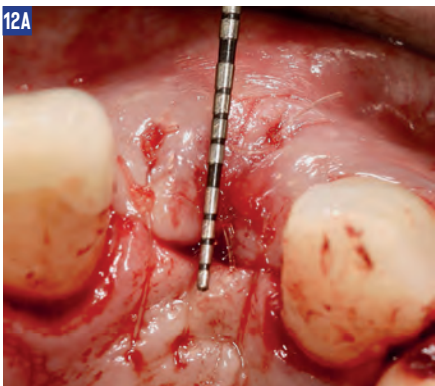
**FIGURE 9:** Bone augmentation material packed around implant



**FIGURE 10:** Membrane placed over graft



**FIGURE 11:** Preparing for tension-free flap closure with soft tissue graft



**FIGURES 12A and 12B:** Flap closed



**FIGURE 13:** Healed implant site three months after surgery



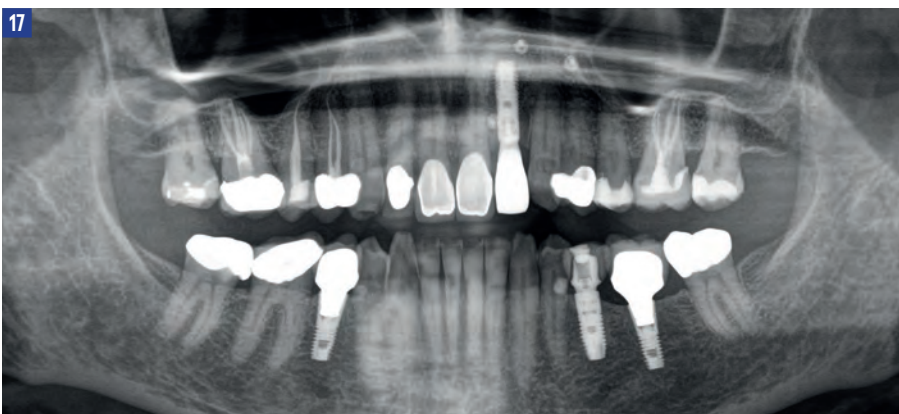
**FIGURE 14:** Exposed implant



**FIGURE 15:** Temporary restoration



**FIGURE 16:** Final restoration



**FIGURE 17:** Five-year postoperative radiograph

similar clinical scenarios, including everything from tension-free flap closure to the harvesting of a connective tissue graft for enhanced soft tissue aesthetics and healing. The flap design and soft tissue manipulation techniques must be incorporated into the treatment plan so both the practitioner and patient know exactly what to expect during and after surgery. [GO](#)

#### PRODUCTS USED

Astra Tech EV 3.6mm  
Dentsply Sirona

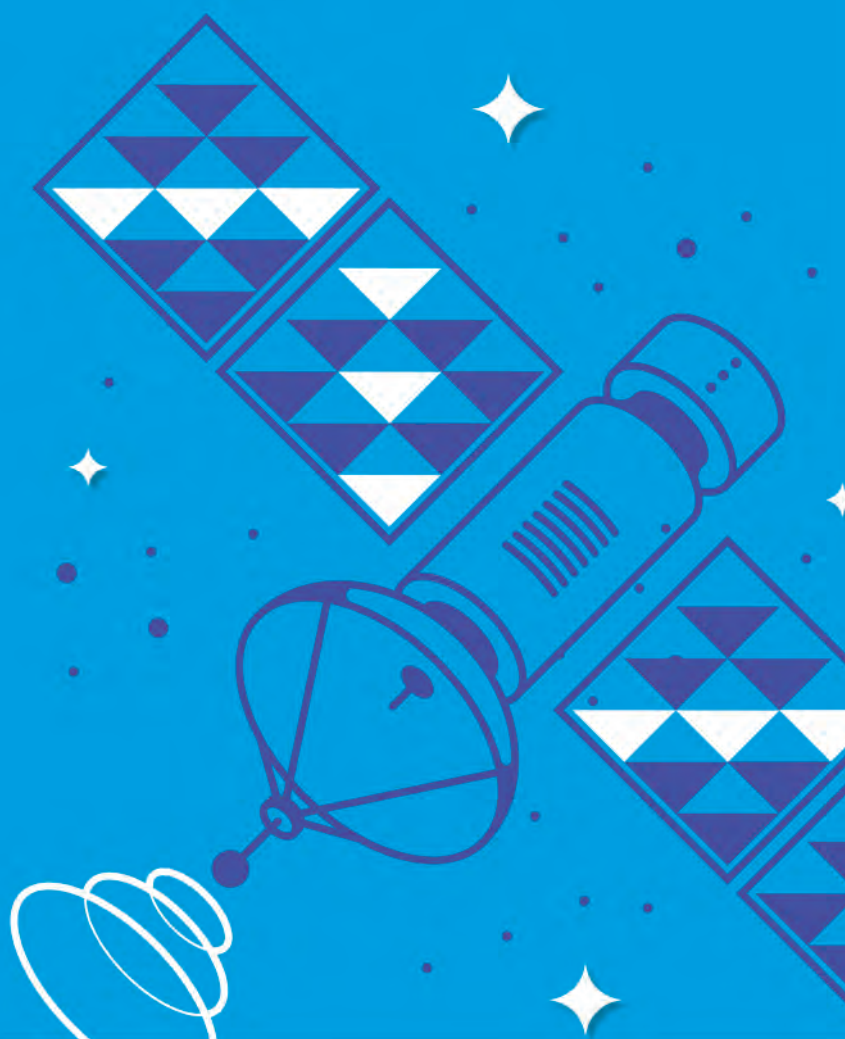
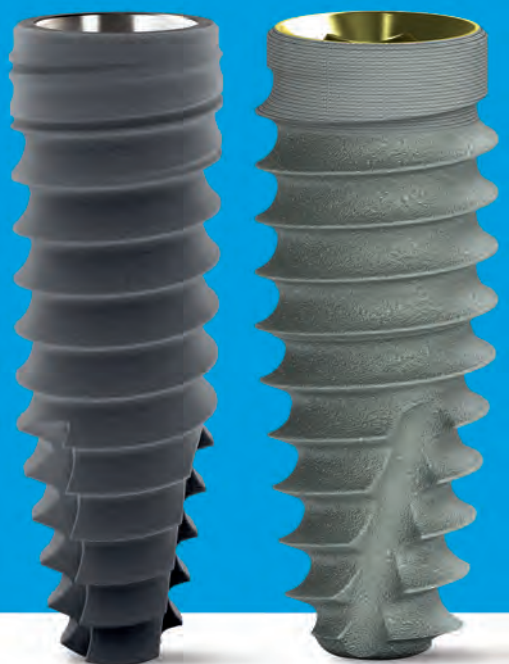


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# Immediate versus delayed implants

Imi Nasser shares practical guidance for mastering both immediate and delayed implant placement protocols

**A**s a dental professional and educator, I completely believe in the power of collaboration, continuous learning and patient-centric approaches to help us improve and advance our techniques. As a result, throughout my implant journey, I aim to share invaluable insights and practical guidance for mastering both immediate and delayed implant placement protocols.

My focus is to bridge the gap between implant surgery and aesthetic restorative dentistry while concentrating on surgical precision and aesthetic harmony.

Essentially, each patient must receive personalised care tailored to their unique needs and desires.

## IMMEDIATE IMPLANT PLACEMENT

In today's era of instant fulfilment, patients demand swift solutions for their dental needs. Removable solutions such as dentures are often met with hesitation, as individuals seek more immediate replacements.

Advancements in techniques, drills and implant design have propelled us towards embracing immediate implant placement as a standard practice. This evolution has reached remarkable heights, with procedures involving the extraction of all teeth followed by immediate implant placement and provision of a restoration on the very same day.

This represents a monumental advancement in dental implant procedures, providing timely solutions for cases such as fractured teeth or compromised dentition.

My approach generally begins with meticulous assessment and advanced imaging techniques, including cone beam computed tomography (CBCT), to evaluate bone density and soft tissue conditions.

In a recent case involving a fractured central incisor (Figures 1 to 11), I leveraged precise surgical techniques and customised implant selection to achieve optimal outcomes.

Through meticulous planning and execution, I demonstrated the feasibility of immediate placement, capitalising on favourable bone density and soft tissue conditions.

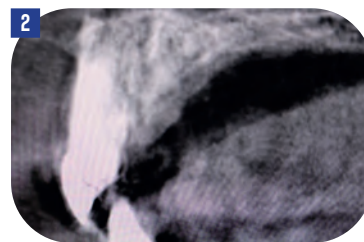
## TOP TIPS

When it comes to immediate implant placement, I offer the following tips:

- Optimal bone assessment: utilising CBCT imaging enables accurate evaluation of bone density and morphology, guiding implant placement with precision
- Surgical precision: meticulous techniques for osteotomy preparation and implant placement are imperative for ensuring optimal stability and long-term success
- Soft tissue management: prioritising soft tissue augmentation using innovative materials such as Novomatrix promotes favourable aesthetic outcomes and enhances long-term stability
- Innovative materials: exploring novel biomaterials like Novomatrix offers opportunities for enhanced tissue regeneration and dimensional stability, contributing to improved patient outcomes.



**FIGURE 1:** Case one – patient referred with a coronal horizontal root fracture of the UR1



**FIGURE 2:** CBCT shows good foundations for immediate implant replacement with palatal and apical bone available

## DELAYED IMPLANT PLACEMENT

While immediate placement addresses certain clinical scenarios, delayed implant placement remains a valuable strategy in cases where immediate placement is not advisable.

I would like to stress the importance of preserving socket dimensions and promoting bone regeneration through socket preservation techniques. By maintaining optimal conditions for future implant placement, delayed procedures ensure successful integration and long-term stability. Tailored treatment planning, considering factors such as bone quality, soft tissue health and treatment goals is paramount in achieving predictable outcomes.



## IMI NASSER

Imi graduated from Bristol Dental School in 2006. After posts in oral and maxillofacial surgery and restorative dentistry, he has been in private practice for 14 years. In 2020, he founded Cheltenham & Cotswold Dental. Since starting to place implants in 2010, Imi has focused on integrating implant surgery with aesthetic restorations. He co-created and teaches the Aesthetic Prosthetic and 15c Preserve courses.





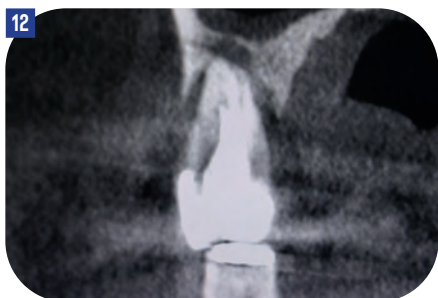
**FIGURE 3:** Unrestorable root fracture (and interim trauma to UR2, which will be managed by the referring GDP)



**FIGURE 6:** Fabrication of customised healer with addition of flowable composite



**FIGURE 9:** Customised healer placed and no immediate provisionalisation due to the patient having a deep overbite and showing signs of increased parafunctional wear



**FIGURE 12:** Case two – this patient was referred with an infected UR5 that was displaying signs of a root fracture. There is severe bone loss apically and on the buccal and palatal plates. It was decided to carry out a ridge preservation procedure at the time of extraction



**FIGURE 4:** Atraumatic extraction and placement of immediate Coneolog Progressive-Line 3.8mm implant in prosthetically driven position



**FIGURE 7:** Novomatrix RTM to augment the soft tissues



**FIGURE 10:** Following three months' healing, the site is showing good volume of soft tissue and is ready for a lab made provisional



**FIGURE 13:** A flapless procedure was performed utilising dual approach dense PTFE membranes and Mineross Blend allograft with an open healing protocol (as taught on the 15c ridge preservation course)



**FIGURE 5:** Placement of temporary abutment to construct customised healer to support soft tissue profile



**FIGURE 8:** Novomatrix stabilised with sutures and hard tissue augmentation being carried out with Mineross Blend allograft



**FIGURE 11:** Provisional screw retained restoration in situ

#### TOP TIPS

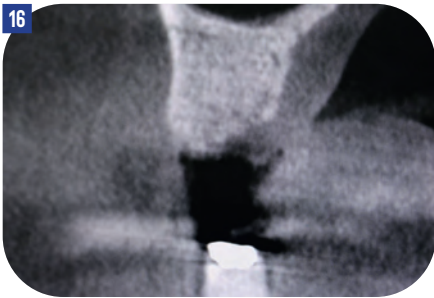
- Socket preservation: employing techniques to maintain bone volume and preserve socket dimensions lays the groundwork for successful delayed implant placement
- Patient-specific planning: customising treatment plans to individual patient needs enhances treatment predictability, considering bone quality, soft tissue health and treatment timeline
- CBCT-guided surgery: utilising CBCT-guided surgical stents enhances precision during implant placement procedures, ensuring accurate placement and optimal outcomes.

#### MASTERING IMPLANT PLACEMENT

To master immediate and delayed implant



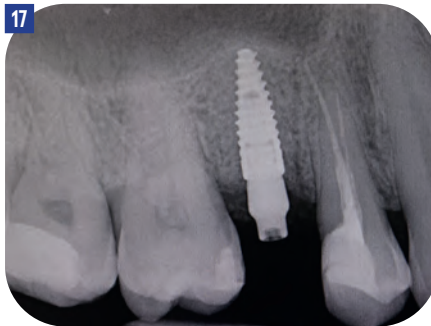
**FIGURE 14:** The membranes were overlapped occlusally



**FIGURE 16:** Following five months' healing, the CBCT showed excellent regeneration of ridge volume



**FIGURE 15:** The membranes were stabilised with 5/0 non-resorbable sutures



**FIGURE 17:** Placement of bone level implant – no further augmenting necessary

placement represents a convergence of clinical expertise, innovative techniques and patient-centred care. By embracing advancements in technology and strategic treatment protocols, dentists can elevate the standard of care in implant dentistry, ensuring functional restoration and aesthetic satisfaction for their patients.

I hope my insights serve as a beacon for those seeking to enhance their implant placement techniques and deliver exceptional care in their practice. Through collaboration, continuous learning, and a steadfast commitment to excellence, dental professionals can drive transformative change in dentistry. Furthermore, by sharing knowledge, embracing advancements, and prioritising patient-centric care, dental professionals can navigate the complexities of immediate and delayed implant placement with confidence and proficiency. [C](#)

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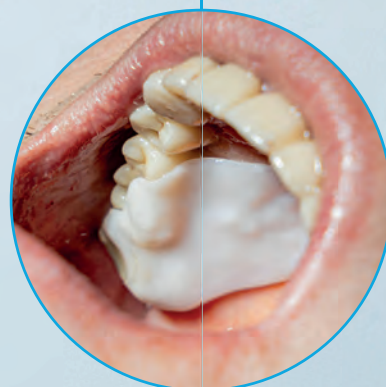
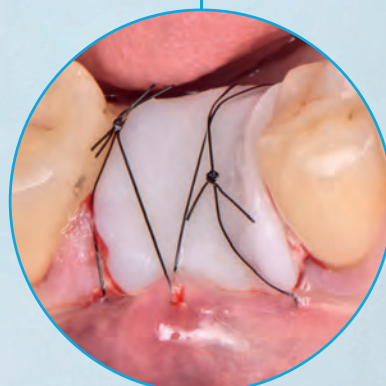
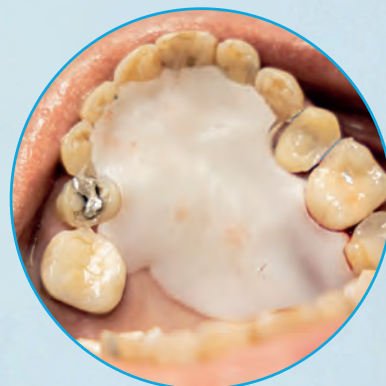
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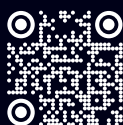


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**FIGURE 2:** Surrounded by the beautiful South Tyrolean landscape, get immersed into Zirkonzahn's world and discover where it all began!

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**F**ounded in 2019, the Klinik DeMedici is one of Zirkonzahn's nine training centres located in the Aurina Valley (South Tyrol, Italy).

This education facility has been designed to host events focusing on interdisciplinary collaboration between clinics and laboratories, offering educational training for dentists and dental technicians to optimise patient's care.

A dental restoration can be well done and be highly aesthetic from a dental technical perspective. However, whether it does justice to its true function and develops the desired aesthetics is solely defined in the one place it's used – the patient's mouth. For this reason, most training is performed on real patient cases, allowing participants to learn in a real-life situation and verify the results in situ.

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- Digital workflow course – With theoretical and practical sessions, participants explore all the possibilities that Zirkonzahn's software, equipment and materials offer. Trainers explain how each workflow component perfectly combines with the others forming a seamless and well-coordinated workflow, and how communication between the clinic and dental laboratory is considerably optimised



**FIGURE 1:** Klinik DeMedici – for the good of the patient

- Prettau® Skin® course – This new course is meant to provide dentists and dental technicians with the necessary skills for producing ultra-thin Prettau® zirconia veneers (0.2 mm). Through targeted contents, participants can learn how to produce, prepare and cement the ultra-thin veneers based on a proven protocol developed by Zirkonzahn, including technical and clinical working steps. Available next dates: 6-7 February 2025!
- Preparation course – Another new course focusing on the importance of a conservative approach to dental treatments, combining digital and analogue workflow steps. It is conceived for all dentists willing to practice and improve skills on minimally invasive tooth preparation for different clinical situations. Available next dates: 13-14 February 2025!

All events are organised over two or three days, including moments of conviviality and joint meals immersed in the traditional South Tyrolean atmosphere. The Klinik DeMedici is located a few kilometres away from Zirkonzahn's headquarters, allowing participants to arrange a visit to the company's headquarters and production sites. Guided by an employee, participants can walk in the company's 'behind the scenes', watching Zirkonzahn at work and getting a better understanding of the work philosophy that drives day by day the South Tyrolean company's work. [CD](#)

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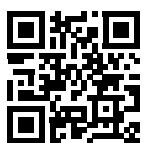
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# ORALHEALTH

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**SONICA KHAN**  
Enamel demineralisation:  
impact of cola

**69**



**TOVIN AKALA**  
Top tips: patient interaction

**74**



Dental erosion is defined as the irreversible chemical dissolution of dental hard tissues, including enamel and dentine, through a chemical process. This erosion occurs independently of bacterial or biofilm factors and is associated with an acidic oral environment – Sonica Khan, p69

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**SONICA KHAN (SONA)**  
Sona is a fourth-year dental student at the University of Leeds.

ENHANCED CPD

GDC anticipated outcome: C

CPD hours: one

Topic: Oral health

Educational aims and objectives:

To provide a review of the comparative impact of diet and regular cola. This article qualifies for one hour of enhanced CPD; answer the questions on page 86 or scan the QR code.



**D**ental erosion is defined as the irreversible chemical dissolution of dental hard tissues, including enamel and dentine, through a chemical process. This erosion occurs independently of bacterial or biofilm factors and is associated with an acidic oral environment, characterised by a pH level below 4.0 (Reddy et al, 2016).

The prevalence of dental erosion shows significant variation among different countries and age groups. However, a study conducted by Schlueter and Luka in 2018 revealed estimated rates of 30 to 50% in children and 20 to 45% in adults.

This issue is of concern for all dental professionals, as Al-Omiri and colleagues (2006), have observed that patients with enamel wear are nine times more likely to report discontent with their teeth when compared to the control group (Mehta et al, 2023). Furthermore, higher levels of enamel wear have also been associated with a lower oral health related quality of life and satisfaction (Mehta et al, 2020). As a result, it is vital that the dental team can appropriately manage tooth wear, particularly dental erosion. Through such efforts, they can help to minimise its extensive impact and prevent its progression.

Dental erosion is manifested by the demineralisation of enamel; acids are the primary agents that result in a softened enamel. Exposure to the acid alters the ability of saliva to remineralise the surfaces of enamel that have undergone demineralisation. When the exposure to acid is short, saliva can remineralise the enamel while naturally increasing the pH back to 7.0.

In contrast, when the exposure to acid is continuous, saliva's ability to remineralise enamel is insufficient to mitigate the damage, leading to loss

of tooth structure (Cardoso et al, 2019). Therefore, the role of saliva in regulating acid attacks is significant, as it can aid in the remineralisation of dental hard tissue.



**FIGURE 1A:** Dental erosion in anterior teeth, front view



**FIGURE 1B:** Dental erosion in anterior teeth, lateral view



**FIGURE 1C:** Dental erosion in anterior teeth, occlusal view

**Sonica Khan** discusses dental erosion and provides a review of the comparative impact of diet and regular cola

# Enamel demineralisation: impact of cola



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## ORAL HEALTH

70

### AETIOLOGY

The aetiology of dental erosion is complex, typically categorised into extrinsic and intrinsic factors.

Extrinsic factors are largely influenced by dietary choices, particularly the consumption of acidic foods and beverages, which play a pivotal role in the erosion process. In contrast, intrinsic factors include various diseases and habits that elevate the presence of gastric acidic content in the oral cavity, further contributing to the exacerbation dental erosion. Conditions such as gastrointestinal eating disorders are common examples of this intrinsic factor (ten Cate and Imfeld, 1996).

Soft drinks are primarily characterised by their low pH levels resulting from high acidic content. In recent decades, the consumption of soft drinks has surged. Public interest reports that in 2004, approximately 37 gallons of soft drinks were manufactured for every man, woman, and child (Jacobson, 2004).

Another study found that in the past three decades almost 66% of children and 77% of adolescents choose to consume sugary beverages daily (Lutovac et al, 2017). Therefore, the considerable increase in the consumption of these acidic soft drinks has now emerged as a principal cause of dental erosion (Reddy et al, 2016). Furthermore, it is also associated with weight gain, obesity, and type 2 diabetes, affecting adults more (Lutovac et al, 2017).

However, it is essential to identify that the presence of saliva in the oral cavity influences the overall impact of cola's acidic contents on enamel. In cases where saliva is deficient, the erosive process intensifies as the protective mechanisms, such as hydrogen ion dilution and buffering, become compromised (Reddy et al, 2016).

### COMPARING THE EFFECT OF REGULAR AND DIET COLA ON ENAMEL

Tooth enamel is the hardest structure in the human body, made up of highly organised crystals arranged in 3D prisms, starting from the amelo-dentine junction towards the outer tooth surface. The unique morphology of enamel prisms is coordinated by ameloblasts cells, where each enamel prism is a product of a single ameloblast.

The enamel surface isn't flat; instead, it exhibits a wavy structure with shallow grooves known as perikymata.

Yet under the influence of acidic beverages like cola, after five minutes, there is statistically significant disorder of the integrity of enamel crystal structure. Therefore, the erosion of this surface anatomy, accompanied

with sensitivity are distinctive inductions of dental erosion linked to regular consumption of cola (Lutovac et al, 2017).

Individuals consuming soft drinks more than twice a day are four times more likely to develop a lesion through erosion, which could be as much as 1µm per day (Lutovac et al, 2017). Moreover, if enamel erosion is not effectively managed and controlled it can lead to dentinal hypersensitivity, which will result in unpleasant pain (Alcântara et al, 2019).

Carbonated acidic substances, such as cola, induce changes in the mineral structure of enamel, leading to a subsequent fall in enamel's physical and mechanical properties (Inchingolo et al, 2023).

The acidity of cola primarily is derived from the presence of phosphoric acid, which is an additive used to enhance flavour and extend shelf life. Additionally, citric acid can also be included to create a tangy flavour profile while also serving as a preservative (Khamverdi et al, 2013).

Both regular and diet cola share a similar pH range of approximately 2.7 to 3, well below the critical pH threshold of 4.0 (Khamverdi et al, 2013).

Diet cola contains both phosphoric acid and citric acid, unlike regular cola, which only contains phosphoric acid (Lutovac et al, 2017).

Earlier studies using atomic force microscopy (AFM) have shown that beverages with citric acid can cause more extensive enamel erosion than drinks like regular cola, which only contain phosphoric acid (Sigusch et al, 2008).

This distinction becomes apparent when considering a study by Khamverdi and colleagues (2013) that compared the effects of cola and diet cola on enamel, revealing that 'Diet Coca-Cola is more erosive than the regular type'. They further observed that the erosive potential of diet cola is more pronounced due to the presence of additional citric acid.

## Understanding the erosive potential of diet cola enables individuals to make informed choices

The consumption of beverages with a pH value below 4.0 poses a significant risk to dental health. The presence of acidic flavourings in these beverages reduces the solubility product of enamel, shifting it into a more soluble phase.

Understanding the pH of these beverages empowers dental professionals to plan effective preventive strategies as part of treatment plans. This knowledge allows them to address dental erosion implications and guide patients in making dietary choices that avoid substances with a pH below four while favouring options above this threshold (Cardoso et al, 2019).

### EFFECT OF CITRIC ACID ON CRYSTAL MORPHOLOGY

Citric acid is a weak acid, found in various citrus fruits such as lemon, grapefruit, tangerine and orange (Penniston et al, 2008). It is often used as an ingredient to modulate taste of beverages while serving as a natural preservative (Grigor, Johnson and Salminen, 2002).

The research by Khamverdi and colleagues (2013) demonstrated that while regular cola contains phosphoric acid, the increased erosive potential of diet cola can be linked to the presence of additional citric acid.

The pronounced erosive potential of citric acid stems from its role as a chelator, where it can effectively bind to the calcium ions within enamel's hydroxyapatite structure (Attin et al, 2003).

It was found that temperature had no effect on the erosive potential (Khamverdi et al, 2013).

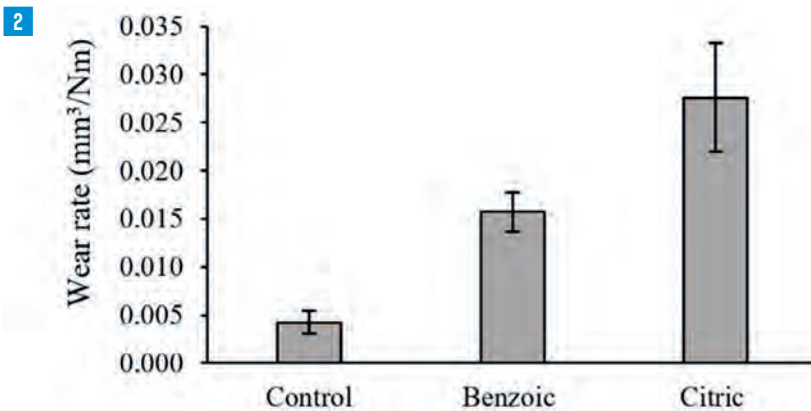
In previous research, the impact of citric acid on enamel morphology and wear has been investigated (Cardoso et al, 2019).

Human enamel was cut and exposed to citric acid and benzoic acid, using conditions that mirror those that occur during a normal meal.

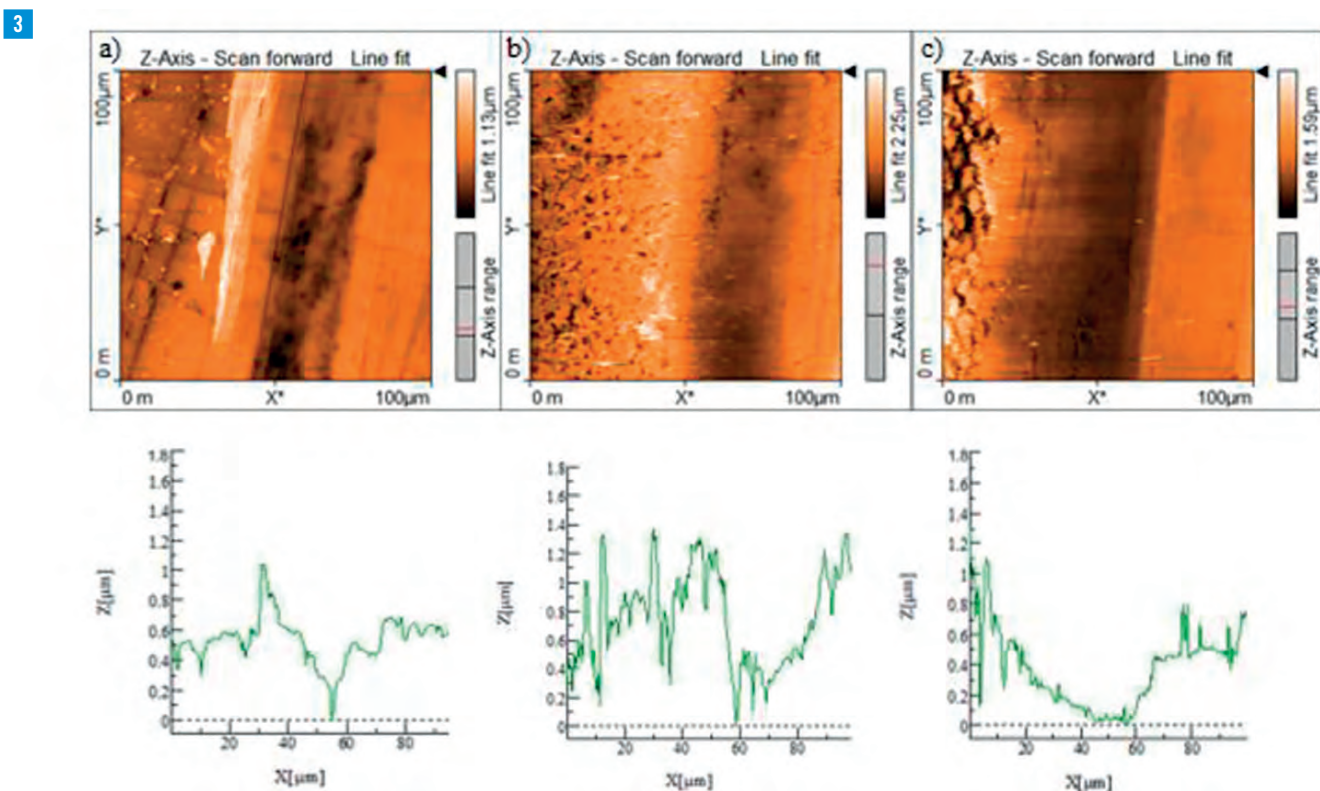
Cardoso and colleagues (2019) found that the wear resistance of enamel is found to be lowest when subjected to citric acid. This is primarily due to the distinct way citric acid interacts with enamel, inducing alterations in the enamel crystal morphology.

Specifically, citric acid's action is characterised by a selective, uneven modification of the enamel structure (Cardoso et al, 2019).

Enamel morphology was closely examined using atomic force microscopy (AFM) and scanning electron microscopy (SEM), before and after the acid exposure. It was found that citric acid selectively targets the interrod regions, resulting in the isolation of the individual enamel rods orientated perpendicularly.



**FIGURE 2:** Enamel wear rate after exposure to the three condition (Cardoso et al, 2019)

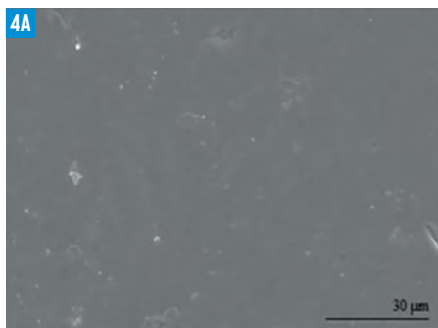


**FIGURE 3:** AFM images (100×100 μm²) and the corresponding profiles of the wear tracks: a) control; b) benzoic acid; c) citric acid (Cardoso et al, 2019)

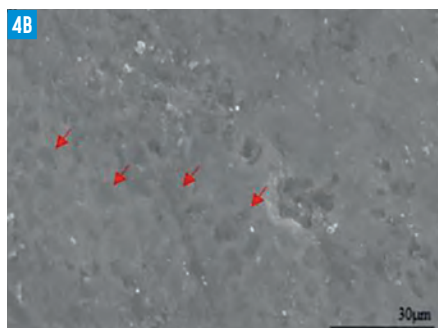
In contrast, benzoic acid attacks the enamel uniformly, thus enamel has a higher wear resistance.

A similar result was also observed by Zhang and colleagues (2015), where it was concluded that in an acidic environment the mechanical and wear properties of enamel are influenced.

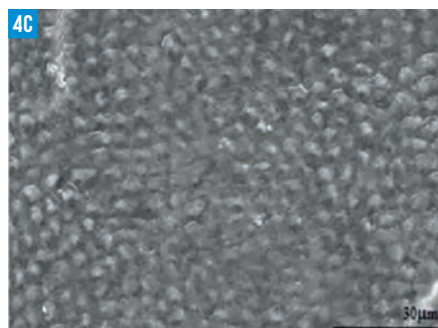
Based on SEM images, there are surface irregularities on citric exposed enamel, making it more susceptible to fractures (Cardoso et al, 2019). Therefore, this examination reveals the delicate balance between citric acid and the overall structural integrity of enamel, highlighting the underlying mechanisms that contribute to enamel's poor wear resistance.



**FIGURE 4A:** SEM image (x1000) of the enamel surface: control (Cardoso et al, 2019)



**FIGURE 4B:** SEM image (x1000) of the enamel surface: benzoic acid (Cardoso et al, 2019)



**FIGURE 4C:** SEM image (x1000) of the enamel surface: citric acid (Cardoso et al, 2019)

## CONCLUSION

It can be concluded that the erosive potential of diet cola has shown that it poses a significant threat to the dental enamel, where the acidic content is the primary culprit. Dental erosion of the dental hard tissues, particularly the enamel, is a widespread issue affecting both children and adults.

Dental erosion significantly compromises dental health but also has a poor impact on an individual's quality of life, as observed through higher levels of dissatisfaction and discomfort among patients who are affected. Thus, dental erosion remains as a cause for concern for dental professionals and a source of dissatisfaction among patients.

Studies have demonstrated that diet cola, which is often consumed as a healthier alternative to regular cola, paradoxically contributes to dental erosion the most, due to its acidic flavourings, specifically the addition of phosphoric acid and citric acid.

It is important to note that saliva plays a crucial role in buffering and remineralising the dental enamel. It aids to compensate the negative effects of the acidic flavourings, but its absence or insufficiency can exacerbate the erosion process.

As the consumption of soft drinks continuous to rise, it becomes increasingly essential to raise awareness about the erosive potential of diet cola.


Understanding the erosive potential of diet cola enables individuals to make informed choices regarding their consumption of beverages, as awareness is necessary for prevention.

Dental professionals can play a significant role by conducting dietary analysis, enabling them to promote preventive education and collaborate with patients in making informed choices. This approach empowers individuals to take control of their oral health.

By assisting patients in selecting beverages with a pH above four and advising to gradually eliminate acid consumption, we empower patients to make impactful dietary adjustments to help maintain the integrity of enamel.

It is then essential that individuals use this information and consider making the required dietary changes and seek dental advice to protect their oral health.

Further research into dental erosion and its impact on enamel will help to discover more effective preventive measures.

The erosive potential of diet cola is a topic of concern, and it serves as a reminder that an individual's dietary choices can impact their oral health with significant consequences. 

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## LISTEN TO THE EXPERTS: TACKLING GUM DISEASE TOGETHER

Haleon recently hosted a panel of dental experts to discuss the barriers dental professionals face in encouraging behaviour change for improved gum health. Led by Professor Tim Newton, President of the Oral Health Foundation, the panel explored practical strategies for motivating patients.

The experts included Rhiannon Jones, President Elect of the British Society of Dental Hygiene and Therapy; Dr. Neha Mehta, a newly qualified dentist; and Dr. Amit Rai, a general dental practitioner.\*



Watch the panel videos to learn more



# TOP TIPS...

WITH  
TOYIN AKALA

## TEN TOP TIPS FOR PATIENT INTERACTION

Effective communication is a cornerstone of quality oral healthcare. In a dental setting, clear and empathetic communication is essential for building trust, ensuring patient comfort, and facilitating successful treatment outcomes.

By understanding and harnessing the power of non-verbal communication, dental professionals can enhance patient interactions, improve overall satisfaction, and contribute to more effective oral healthcare.

Here are my top 10 tips for using non-verbal communication when interacting with patients in a dental setting.

### 1 Be mindful of facial expressions.

Remember to smile and use reassuring expressions! A warm and genuine smile helps put patients at ease and creates a friendly atmosphere.

Use calming and empathetic facial expressions to convey understanding and support, especially if the patient is nervous.

### 2 Maintain eye contact.

Appropriate eye contact demonstrates attentiveness and sincerity, helping to build rapport and show that your focus is on the patient and their concerns.

Gentle glances using soft eye contact will reassure patients during procedures or explanations.

### 3 Consider your body language.

Maintain an open and relaxed posture to appear approachable and engaged. Avoid crossing your arms or turning away, as these can seem defensive or disinterested. In addition, slightly leaning in during conversation shows interest and attentiveness. Be relaxed and attentive by sitting or standing in an open manner to show that you are fully present and attentive to the patient. Subtly mirroring the patient's posture can help create a sense of connection and make them feel more comfortable.

### 4 Gestures, signals and aids.

Use clear and deliberate hand signals to indicate actions or provide guidance, such as

showing how to position themselves or explaining procedures.

To enhance verbal explanations, incorporate diagrams, models, or charts to visually communicate information about procedures, conditions, or care instructions.

### 5 Reassure and guide with touch.

When appropriate, use gentle touches, like a hand on the shoulder, to offer comfort and build a connection. In addition, use touch to guide patients into position or help them understand the procedure, being mindful of the patient's preferences and boundaries.

### 6 Space and proximity.

Respect personal space; be mindful of the patient's personal space and adjust your proximity based on their comfort level.

Maintain a distance that is professional yet approachable, making the patient feel secure and at ease.

### 7 Observation and adaptation.

Pay attention to non-verbal signals. Observe the patient's non-verbal cues, such as fidgeting or changes in posture, to assess their comfort level and adjust your approach accordingly.


### 8 Use of silence.

Allow moments of silence for the patient to process information or relax, particularly before or after discussing sensitive topics.

### 9 Use listening cues.

Nod occasionally to show that you are actively listening and understanding the patient's concerns. Show you're listening attentively. Use non-verbal cues like leaning slightly forward to show that you are fully engaged in the conversation.

### 10 A welcoming atmosphere and setting.

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# ORTHODONTICS

**AVAN MOHAMMED & SRI JEGANATHAN**

Orthodontics and temporomandibular joint dysfunction

79



There are no data that identify a link between active orthodontic intervention and the causation of temporomandibular dysfunction. Based on the lack of data, orthodontic treatment cannot be recommended for the treatment or prevention of temporomandibular dysfunction – Avan Mohammed and Sri Jeganathan, p79

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**DR AVAN MOHAMMED**

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

**SRI JEGANATHAN**

Sri is a specialist orthodontist based in London, working in both private and NHS practices. She qualified from King's College London in 2007. She has worked in paediatric, general dentistry and oral maxillofacial surgery departments.

**ENHANCED CPD**

**GDC anticipated outcome: C**

**CPD hours: one**

**Topic:** Orthodontics

**Educational aims and objectives:**

To discuss the relationship between orthodontics and temporomandibular disorders. This article qualifies for one hour of enhanced CPD; answer the questions on page 86 or scan the QR code.



**T**emporomandibular dysfunction (TMD) refers to a collection of clinical problems affecting the temporomandibular joint (TMJ) and/or the muscles of mastication, as well as contiguous tissue components (Okeson and de Kanter, 1996).

**PREVALENCE**

TMD is common and can be found in individuals all over the world. Prevalence varies between seven to 84% with an age range of three to 74 years within the studies (Luther, 2007). Prevalence studies have reported approximately 75% of the population having at least one sign of joint dysfunction (abnormal jaw movement, joint noises, tenderness on palpation etc) and approximately 33% having at least one symptom (facial pain, joint pain, etc) (Rugh and Solberg, 1985; Schiffman et al, 1990). It is more common in females than in males and tends to start in teens and increase in prevalence with age.

Mohlin and Thilander (1984) reported that the prevalence and severity of TMJD reduced from 19 to 30 years old and 25% showed a complete recovery.

**SIGNS AND SYMPTOMS**

Common signs and symptoms of TMD include (NIH guideline 1996; Riolo, Brandt and TenHave, 1987; Harris et al, 1993):

- Facial pain
- Joint sounds (clicking, grating)
- Limited or asymmetrical jaw movement. Limited opening: less than 40mm in males and less than 35mm in females. Reduced lateral excursions
- Headaches
- Earaches
- Masticatory muscle hypertrophy
- Abnormal occlusal wear.

**AETIOLOGY**

The causes of temporomandibular disorders are not fully understood. The aetiology of TMJD is thought to be multifactorial (Mohlin and Thilander, 1984). They are inflammatory, degenerative, dysfunctional or idiopathic (eg stress, parafunctional activity, trauma, impaired general health).

There is weak evidence suggesting that psychological factors are involved but they may be exacerbating and maintaining factors rather than causal factors (de Leeuw, 2008).

Some evidence suggests a role for genetic factors and adrenergic dysregulation (Diatchenko et al, 2005; Light et al, 2009; Ribeiro-Dasilva et al, 2009).

There are three main types of temporomandibular disorders:

1. Myofascial pain — a masticatory muscle disorder characterised by a regional, dull, aching pain
2. Disc displacement — an abnormal relationship or misalignment of the articular disc of the temporomandibular joint relative to the condyle
3. Osteoarthritis — a localised degenerative disorder of the temporomandibular joint.

Indices used to assess TMJD include the Helkimo index and the craniomandibular index.

The Helkimo index sums up TMJD symptoms and assigns a grade of severity when a certain level is exceeded (Helkimo, 1974).

It was originally designed as an epidemiological tool and is therefore not sensitive to small changes. There is insufficient evidence to support the validity of this index and it has not been calibrated (van der Weele and Dibbets, 1987).

Craniomandibular index addresses the problems of validity and reproducibility associated with Helkimo index.

However, it is more cumbersome and rarely used (Fricton and Schiffman, 1987).

Avan Mohammed and Sri Jeganathan discuss the relationship between orthodontics and temporomandibular disorders including relevant literature

# Orthodontics and temporomandibular joint dysfunction



## MALOCCLUSION AND TMD

Various malocclusions have been associated with TMD signs and symptoms. Ricketts (1953) carried out a study on 180 TMJD cases and found relationship between TMJD and different types of malocclusion that were class II div 1 malocclusion with abnormal overjet (OJ), class II div 2 cases with condyle displaced distally, premolar and molar interferences and loss of posterior support.

Later there were more cross-sectional studies to show weak correlations between certain malocclusion and TMJD. Riolo and colleague's (1987) study showed posterior crossbite, anterior open bites (AOB) and increased OJ related to TMJD.

Thilander and colleagues (2002) also found weak correlation between AOB and excess OJ either class II or class III and TMJD. However, all these are cross-sectional studies and are prone to investigator bias and method errors.

Egermark, Magnusson and Carlsson (2003) conducted a prospective cohort study on 402 randomly selected samples and found that forced bite between RCP and ICP (unilateral posterior crossbite) may relate to TMJD. And Carlsson, Egermark and Magnusson (2002) found a relationship between deep overbite and TMJD.

Thilander and Bjerklin (2011) carried out a review on 13 studies regarding posterior crossbites and concluded that there is an association between unilateral posterior crossbite with mandibular deviation and signs and symptoms of TMJD (eg muscular pain, clicking and headache).

However, those large studies only show weak correlations. Only five to 35% of population have TMJD and 60% of the population have a malocclusion (Proffit, 1999). Some studies found that TMJ is no more common in patients with severe malocclusions than controls with no malocclusions (Paquette et al 1992; Luppapornlarp and Johnston, 1993).

The majority of these studies are difficult to perform and associated with biased sampling, inadequate design and open to substantial criticism. Some of the studies used the Helkimo index to assess TMJD. Van der Weele and Dibbets (1987) and Luther (1998) have discussed the problems associated with this index regarding its validity and reproducibility and suggested that it is not appropriate to use it to measure the latent variable TMJD.

Dibbets et al (1985) carried out a longitudinal cephalometric growth study and found that those subjects who had symptoms of TMD had a different facial form or appearance compared to those who did not. They tend to have longer face and tend to be more skeletally class II.

Other cephalometric studies found similar



**FIGURE 1:** Unilateral dislocation of the left TMJ. There is an incidental finding of an ectopic LL3

findings using magnetic resonance imaging (MRI) to assess disc displacement (Luther, 2007). However, these studies all had several methodological problems with selection bias, lack of power calculation or not blind, which prevented them from being clinically useful.

In conclusion, there may be some weak association between malocclusion and TMJD but a cause and effect relationship cannot yet be confirmed.

## OCCUSAL INTERFERENCES AND TMD

A double-blind study by Magnusson and Enbom (1984) showed doubled in signs and symptoms of TMJD in a group of subjects with artificially induced non-working side interferences compared with controls.

However, Sadowsky and BeGole (1980) found that non-working side contacts are common (with 90% patients) and difficult to find control groups for this type of study.

Ramfjord et al (1983) found that mandibular displacements from retruded contact position to intercuspal position are common with more than 90% of population having slide of more than 1mm. Larger slides more often produce lateral deviation, which is associated with TMJD.

Luther (1998) reviewed articles and concluded that there is little evidence in the literature that clarifies the relationship between occlusal interferences and TMJD. Huang et al (2004) also believed that the relationship is not straight forward. There is available evidence from a Cochrane systematic review of three small trials (including 92 people) that found that occlusal adjustment is not effective for treating and preventing TMJD and concluded that there is an absence of trial-based evidence that occlusal

adjustment is an effective treatment for TMJD. The evidence suggests no difference in outcomes between occlusal adjustment and placebo (Koh and Robinson, 2003).

## DOES ORTHODONTICS PROVOKE TMJD?

Roth (1973) demonstrated the symptoms of TMJD from nine post treatment cases resolved once they were equilibrated using positioning splints. He concluded that TMJD in these patients was due to failure to correct anterior-posterior jaw relationship, insufficient buccal root torque of upper molars, excessive buccal root torque of lower molars and poor coordination of arch widths. However, there was no control group in this study and the sample size was very small. At the time of this study removable appliances were common and treatment mechanics and orthodontic appliances have since changed.

In the literature, certain treatment mechanics have been implicated in causing TMJD by altering the position of the condyles. These are extraction cases (Bowbeer, 1987), upper incisor retraction (Bowbeer, 1987) class II/III elastics, high pull headgear and chin cup therapy (Wyatt, 1987).

Dibbets and Van der Weele (1992) carried out a longitudinal prospective study over a 15-year period on patients treated with removable appliances, Begg class I and II mechanics, extractions and chin cup therapy. There was no control group. They found that age was a confounding factor as the prevalence of TMJD increased with age. They also found that neither the types of orthodontic treatments nor if extractions were carried out predisposed to developing TMJD after orthodontic treatment.

Henrikson, Nilner and Kurol (2000) carried out a series of prospective studies to study

the symptoms and signs of TMJD and occlusal changes in girls aged between 11 and 15 with class II malocclusion receiving orthodontic treatment in comparison with untreated class II malocclusion and with normal occlusal subjects. Sixty-five subjects had fixed appliances (headgear, class II elastics and extractions), 58 were untreated class II and 60 subjects had normal occlusion. Assessments for these prospective studies were undertaken blind to an extent. They used the research diagnostic criteria to assess TMJD, which is more valid and reproducible compared to Helkimo index.

They found that subjects with normal occlusions had the lowest prevalence of TMJD signs compared with those with treated and untreated class II malocclusion, which means the type of occlusion may play a role as a contributing factor for developing TMJD although this influence is difficult to quantify and predict.

In the individuals, TMJD fluctuated substantially overtime with no predictable pattern. Orthodontic treatment with fixed appliance either with or without extractions did not increase the prevalence of symptoms and signs of TMJD or worsen the preexisting TMJD.

Kim, Graber and Viana (2002) conducted a meta-analysis to investigate and relationship between orthodontic treatment and TMJD. They reviewed 31 studies and the data were heterogeneity, a definitive conclusion cannot be drawn because of the unknown cause of TMJD, methodologic shortcomings, and lack of a widely accepted classification scheme. However, the data included in this comprehensive meta-analysis do not indicate that traditional orthodontic treatment increased the prevalence of TMD. Egermark, Magnusson and Carlsson (2003) conducted a 20-year follow-up study of patients who had previous orthodontic treatment using a questionnaire. They found no difference in signs and symptoms of TMJD. However, this

study used Helkimo index to assess TMJD and the types of orthodontic treatment were only recorded from patient history. Clearly the varied nature of the treatment mechanics could not be recorded precisely on the basis of the patients' recollection.

One of the more robust studies – by Conti and colleagues (2003) – assessed 200 participants divided into four groups dependent on the malocclusion type. There was no control group, however, they found an association between parafunctional habits such as grinding to TMJD but not orthodontic treatment.

### DOES ORTHODONTIC TREATMENT CURE OR PREVENT TMJD?

Proffit (1993) stated that orthodontics can have a beneficial role to play in patients whose symptoms are primarily related to muscle fatigue and spam secondary to excessive grinding and clenching in response to stress. He then discussed the possibility that orthodontic treatment could reduce symptoms of TMJD as a result of the periodontal ligament being temporarily painful, reducing any bruxism habits and resting the TMJ.

Sadowsky and BeGole (1980) found that TMJD was reduced in patients who had fixed appliances, however, the results were not statistically significant.

Kremenak and colleagues (1992) carried out a prospective longitudinal study and found that TMJD was reduced in patients who had fixed appliance. The change was small but statistically significant. However, the sample size was small with a short follow-up time (two to three year).

Egermark, Carlsson and Magnusson (2005) recruited a total of 50 subjects (27 males and 23 males) that were further subdivided due to the varied nature of the malocclusions that had been treated. The overall incidence of manifest TMD that required treatment was 1% and the study showed that orthodontic treatment in childhood does not increase the risk of developing TMJD later in life.

The Cochrane review by Luther, Layton and McDonald (2010) found the validity and reliability of the criteria used in all the trials are not adequate. They concluded that inaccurate and inconsistent diagnosis of TMJD caused misleading reporting of TMJD and incomparability of results with other trials.

There were limitations of the methods used in the trials from not assessing TMJD appropriately to the inconsistent use of indices for assessment of TMJD. Therefore, they concluded that there is no evidence to support or refute the use of orthodontic treatment for the treatment of TMJD and orthodontic treatment cannot be recommended for the prevention of TMJD.

### CONCLUSION

Much of the earlier evidence on this subject is unreliable due to inadequate design, biased sampling, small sample size, non-existing control group, viewpoint articles and retrospective, cross-sectional studies.

The problem of TMJD is the intermittent nature of the condition; signs and symptoms come and go. The 2010 Cochrane review outlines the recommendations for future research, which include using standardised diagnostic criteria for TMJD, studies must be well controlled with respect to bias and blinding and samples of adequate size based on power calculations should be used.

There are no data that identify a link between active orthodontic intervention and the causation of TMD. Based on the lack of data, orthodontic treatment cannot be recommended for the treatment or prevention of TMD.


Most TMJD patients will experience spontaneous improvement. Non-invasive and reversible treatment should be recommended. Relaxation and cognitive behavioural therapies are effective approaches to managing the pain. However, there is lack of evidence in most treatment approaches of TMJD.

Patients who have signs and symptoms of TMJD prior to orthodontic treatment should be informed with regards to the possible progression of the problem. Patients should be informed that the condition may worsen, stay the same or improve.

Full history and examination are important and should be taken before starting the treatment (pain on palpation of TMJ, pain on palpation of associated muscles, limitation or deviation of mandibular movement and joint sounds).

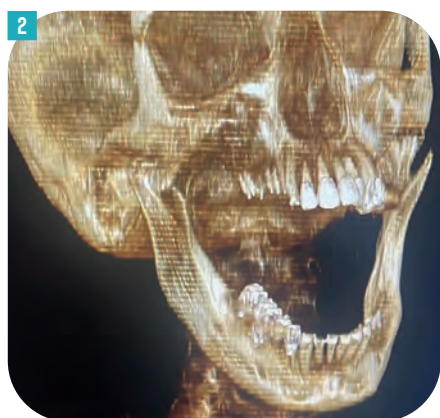
If pain arises during treatment, reassure the patient and reduce forces, stop use of elastics and eliminate gross interference eg, using a bite plane or orthodontic adjustment (there is little evidence to support the efficacy of these approaches).

Conservative measurement that should be recommended to patients include:

1. Resting the joint (eg, avoiding over opening during wide yawning etc)
2. Soft diet
3. Pharmacological pain control (NSAIDs if not contraindicated, opiates, muscle relaxants and serotonin reuptake inhibitors)
4. Application of heat (eg, a heat pack can be used to relax muscles). 

### REFERENCES

 siobhan.hiscott@fmc.co.uk



**FIGURE 2:** Bilateral TMJ dislocation in a 70-year-old female

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## GENERAL DENTISTRY CD/OCT/SADANA/PAGE 17

1. In this case, which tooth suffered the most extensive fracture?
  - ☐ a. UR1
  - ☐ b. UR2
  - ☐ c. UL1
  - ☐ d. UL2
2. What was the patient's primary concern in this case?
  - ☐ a. Aesthetics
  - ☐ b. Not being able to eat comfortably
  - ☐ c. Costs
  - ☐ d. The risk of root canal treatment
3. What shade of Brilliant Everglow was used to build up the palatal wall to an approximate length?
  - ☐ a. A1/B1
  - ☐ b. A2/B2
  - ☐ c. A3/D3
  - ☐ d. None of the above
4. How long did it take for the restorations to be provided from start to finish?
  - ☐ a. 30 minutes
  - ☐ b. 40 minutes
  - ☐ c. 50 minutes
  - ☐ d. 60 minutes

## AESTHETIC DENTISTRY CD/OCT/JETHWA/PAGE 29

1. What treatment did the patient opt for in this case?
  - ☐ a. Tooth whitening
  - ☐ b. Composite bonding
  - ☐ c. Orthodontics
  - ☐ d. Minimal prep porcelain veneers

2. To ensure a predictable workflow for this particular treatment, how many steps were involved?
  - ☐ a. Three
  - ☐ b. Four
  - ☐ c. Five
  - ☐ d. Six
3. What happens during step four?
  - ☐ a. Copy into ceramic
  - ☐ b. Handmade trial smile and minimal tooth prep
  - ☐ c. Cementation
  - ☐ d. Preparation through the temps
4. What ingot was chosen in this case?
  - ☐ a. High translucency
  - ☐ b. Impulse
  - ☐ c. Medium translucency
  - ☐ d. Low translucency

## DIGITAL DENTISTRY CD/OCT/NAIDYONOVA/PAGE 39

1. How old was the patient in this case?
  - ☐ a. 26 years old
  - ☐ b. 27 years old
  - ☐ c. 28 years old
  - ☐ d. 29 years old
2. Before the preparation, what was the tooth shade determined using the Vita Toothguide 3D-Master?
  - ☐ a. 1M1
  - ☐ b. 2M2
  - ☐ c. 4M2
  - ☐ d. 5M3
3. Why was a rubber dam placed for the fully adhesive seating?
  - ☐ a. To prevent contamination
  - ☐ b. To ensure absolute dryness
  - ☐ c. To ensure a sustainable bond
  - ☐ d. All of the above

4. The follow-up appointment took place how long after completion of the treatment?
  - ☐ a. One month
  - ☐ b. Three months
  - ☐ c. Six months
  - ☐ d. One year

## ENDODONTICS CD/OCT/MYLONAS/PAGE 47

1. When did the patient in this case present to Cardiff Dental Hospital restorative department consultant clinic?
  - ☐ a. May 2022
  - ☐ b. November 2022
  - ☐ c. October 2023
  - ☐ d. November 2023
2. Which tooth was the patient suffering pain from?
  - ☐ a. UR1
  - ☐ b. UR2
  - ☐ c. UL1
  - ☐ d. UL2
3. How many treatment options were discussed with the patient?
  - ☐ a. Two
  - ☐ b. Three
  - ☐ c. Four
  - ☐ d. Five
4. What was the working length of the true root canal?
  - ☐ a. 16mm
  - ☐ b. 19mm
  - ☐ c. 22mm
  - ☐ d. 25mm

## IMPLANT DENTISTRY CD/OCT/ANITUA/PAGE 53

1. According to the author, what is the principal problem with short and extra-short implants?
  - ☐ a. The surface material
  - ☐ b. The crown-implant ratio
  - ☐ c. Published survival rates
  - ☐ d. None of the above
2. Crown-implant ratios higher than what are considered a safe and predictable therapeutic option?
  - ☐ a. One
  - ☐ b. Two
  - ☐ c. Three
  - ☐ d. Four
3. Prior to surgery, in order to make a proper treatment plan, all patients underwent a standard diagnostic protocol consisting of...
  - ☐ a. Reviewing the medical and dental history
  - ☐ b. Diagnostic casts
  - ☐ c. Radiographic evaluation
  - ☐ d. All of the above
4. Of the restorations, how many were screw-retained prosthesis?
  - ☐ a. 34.8%
  - ☐ b. 52.7%
  - ☐ c. 67.4%
  - ☐ d. 73.1%

## ORAL HEALTH CD/OCT/KHAN/PAGE 69

1. A study by Schlueter and Luka (2018) estimated the prevalence of dental erosion to be what for children?
  - ☐ a. 30-50%
  - ☐ b. 20-45%
  - ☐ c. 10-30%
  - ☐ d. 60-75%
2. In 2004, approximately how many gallons of soft drinks were manufactured for every man, woman and child?
  - ☐ a. Eight
  - ☐ b. 14
  - ☐ c. 22
  - ☐ d. 37
3. What is the hardest structure in the human body?
  - ☐ a. Dentine
  - ☐ b. Bone
  - ☐ c. Tooth enamel
  - ☐ d. Cementum
4. According to the author, dental professionals should recommend patients select beverages with a pH above what to help maintain the integrity of enamel?
  - ☐ a. One
  - ☐ b. Two
  - ☐ c. Three
  - ☐ d. Four

## ORTHODONTICS CD/OCT/MOHAMMED/79

1. Prevalence studies report approximately how much of the population have at least one sign of joint dysfunction?
  - ☐ a. 55%
  - ☐ b. 65%
  - ☐ c. 75%
  - ☐ d. 85%
2. What's the main type of temporomandibular disorder?
  - ☐ a. Myofascial pain
  - ☐ b. Disc displacement
  - ☐ c. Osteoarthritis
  - ☐ d. All of the above
3. What are some of the common signs and symptoms of TMD?
  - ☐ a. Facial pain, headaches, limited or asymmetrical jaw movement
  - ☐ b. Eye fatigue, sensitivity to light, uncomfortable to eat
  - ☐ c. Reoccurring throat infections, loose teeth
  - ☐ d. Ulcers, tongue blisters, nose bleeds
4. What do the authors recommend if pain arises during treatment?
  - ☐ a. Reduce forces
  - ☐ b. Stop using elastics
  - ☐ c. Eliminate gross interference
  - ☐ d. All of the above

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