SPRING 2026

Amsterdam, Netherlands

EDSA *Magazine*

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European Dental Students' Association

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From the Editor Team

Dear EDSA Family,

Welcome to this springs issue of the EDSA Magazine. As dental students and future professionals, we stand at an exciting point where education, research, and clinical practice intersect. This magazine aims to be more than just a collection of articles, it is a platform for sharing ideas, experiences, and knowledge from dental students across Europe.
As editor, one of my main goals is to promote academic engagement and encourage science-based research and work within our community. Dentistry is a rapidly evolving field, and maintaining a strong foundation in evidence-based practice is essential for delivering the highest standards of care to our patients. By highlighting student research, academic discussions, and innovative perspectives, we hope to inspire curiosity, critical thinking, and collaboration among our readers.
I invite students from all backgrounds and stages of their education to contribute, question, and explore. Together, we can create a space that supports academic growth, celebrates scientific inquiry, and strengthens the voice of dental students across Europe.

Thank you for being part of this journey.

Liisbet Jäätma, EE
EDSA Vice President of Public Relations

Dear readers,

The creation of this magazine was a wonderful journey that brought together many outstanding dental students and numerous exciting topics in dentistry. As dental students, I urge us all to keep an open mind when it comes to broadening our knowledge and trying new things. Dentistry is an incredibly diverse and challenging field, as it is also wonderfully rewarding and growing.
I truly hope that every reader can find something new in this issue that changes your understanding of the dental field.

Kind regards,

Nora Nõmm, EE
Co-editor

Dear readers,

I am very happy for the release of this magazine. In every article you can find the information that not only will nourish your knowledge across various fields of dentistry, but it also offers information that can be used in clinical practise.
I believe that when we read scientific articles, we become more critical, that is important for both academic and self development. It was a pleasure to work with my colleagues from the editorial board and and I'm looking forward for the future collaboration.

Happy reading!

Gabriela Gorodecka, LV
Co-editor

Dear readers,

It is with great pleasure that we present to you the EDSA 2026 Spring Edition. In this issue, you will find a diverse collection of articles reflecting both the scientific and social spirit of our community—bringing together current developments in dentistry with engaging and accessible content. For me personally, this edition holds special meaning, as it marks my third issue as part of the editorial team. I remain sincerely grateful to work alongside such a dedicated team. We hope that this issue informs, inspires, and connects you—wherever you may be reading from.

Sincerely,

Furkan Sarp Tavukcuoğlu, TR
Co-editor

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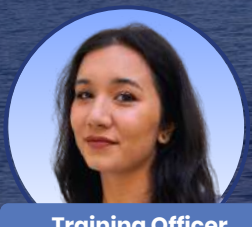

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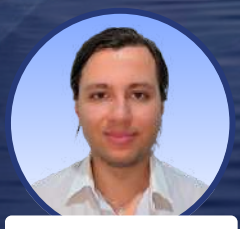

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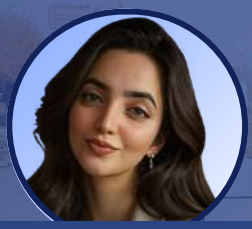

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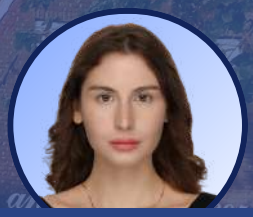

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From the President

Dear EDSA members,

As our upcoming meeting in Amsterdam approaches, I want to thank everyone whose dedication sustains EDSA and advances our work.

Thank you to the Board, delegates, members, writers, researchers, sponsors, and partner associations. EDSA functions because all these groups work together. I am grateful for this term and for the structured progress made possible by everyone's engagement.

A special thank you to Liisbet and her team for preparing this EDSA Magazine issue. Their coordinated work brings together perspectives from across our association. Thank you for your effort.

During this term, we have already seen several important initiatives. Our External Representatives have been active in representing EDSA in different organisations and meetings. We organised Policy Cafés that created space for discussion about topics relevant to dental students. We also hosted webinar weeks that allowed students to learn and exchange ideas.

Many members have volunteered and participated in oral health awareness programs. Across our network, students contribute to their communities and embody our profession's values. Mobility opportunities remain central to EDSA, with numerous exchanges, internships, and international experiences available to students. Behind the scenes, significant efforts have supported these activities. New sponsors back our projects, Board-delegate communication has improved, and our social media provides clear updates. I also acknowledge the Local Organising Committees for making our meetings possible.

As we approach the Amsterdam meeting, I look forward to seeing many of you there and continuing the work we have started together.

Thank you all for your continued commitment and for shaping the future of EDSA.

Saulė Skinkytė
President 2025-2026
European Dental Students' Association (EDSA)

LIFE IN RESIDENCY

Saulė Skinkytė
Vilnius University, Lithuania
Resident of Pediatric Denistry

Angeliki Anna Gkinosati
European University Cyprus, Nicosia, Cyprus
Resident of Orthodontics

Valters Vilis Zvaigzne
Riga Stradins University, Latvia
Resident of Prosthodontics

What does a "typical" day look like for you during residency? How did your expectations of residency differ from the reality?

S: I usually get to work early to review my schedule and look over cases before clinic starts. Once the day begins, it moves quickly with consults, procedures, emergencies, follow-ups, and paperwork. Some days go as planned, and some change completely because of a trauma case.
Before residency, I thought it would mostly be about improving technical skills. That is true, but I did not expect how much emotional responsibility comes with it. You are not just treating teeth. You are supporting anxious children and worried parents. The responsibility feels bigger than I imagined, but it is also what makes the work worthwhile.

V: There's no such thing as a typical day in residency. One day I'm treatment planning complex prosthodontic cases, the next I'm teaching crown preps and denture fabrication in preclinic, running to the emergency room as "the dentist on call," building a 100-slide seminar presentation at midnight, or shadowing specialists across departments.
Before starting, I thought I'd have a supervisor next to me for every shift, like during dental school. Residency is less "being supervised" and more "figure it out — and do it well."

A: A "typical" day in residency starts early for me. Mornings are dedicated to classes and clinical presentations. We discuss cases in depth, analyse treatment plans, and critically appraise the literature. These sessions are intellectually intense and very interactive, which I truly enjoy. It is very interesting to discuss with colleagues and exchange opinions and treatment planning ideas.
In the afternoon, we move to the clinics. We see patients, adjust appliances, evaluate progress, troubleshoot biomechanics, and constantly reflect on our decisions, with the meaningful guidance of our supervisors. Being able to translate what we learned in the morning into real patient care just a few hours later is one of the most rewarding parts of the day.
Studying orthodontics is undoubtedly demanding. It requires discipline, long hours of studying, attention to detail, and emotional strength. The expectations I had before starting residency focused mainly on the workload, and yes, it is heavy, but what surprised me mostly was the way postgraduate training differs from undergraduate training.
That said, orthodontics was always my dream. Despite the long days and the pressure, I feel genuinely grateful to live this routine. The early mornings, the lectures, the clinics, the studying. It is demanding, but it is exactly what I always pictured for myself, and I am more than happy to be living the routine I once only dreamed about.

What is your biggest time-management tip for surviving residency?

S: Write everything down and use a calendar. Do not rely on memory. Planning ahead reduces stress and helps you stay organized. It also allows you to protect your personal time.

V: Plan before the chaos begins. I use a calendar app and block weeks in advance. When you organize your time ahead of deadlines, residency feels structured instead of reactive. If you wait until the day before — you're already behind.

A: My biggest time-management tip for surviving residency is simple. Plan ahead and stay consistent. Residency moves fast, and deadlines, assignments, case presentations, and exams can accumulate before you even realise it. Having a clear weekly and monthly plan helps you keep track of responsibilities and avoid unnecessary stress. It's very important to stay on top of deadlines and not to postpone tasks. Even when the schedule feels intimidating, try to study consistently throughout the semester instead of leaving everything for the last minute. If you build a routine where you review material regularly, prepare cases in advance, and organise your time realistically, residency becomes manageable. Still demanding, but much less stressful. Consistency and forward planning truly make the difference.

Looking back, what do you wish you had known before starting residency? What advice would you give to dental students preparing to apply?

S: I wish I had known how much patience residency requires, especially with yourself. You will not be perfect. You will make mistakes. That is part of learning.
Patience comes with practice, and so does confidence. Be open to feedback and accept that growth takes time. Residency is not about being perfect. It is about improving step by step.

V: I wish I had fully understood that prosthodontics is built on trial and error. Those repeated adjustments aren't signs that you're failing — they are the work. Precision comes from repetition. Borderlines become predictable only after you've crossed them a few times.
My advice to students: choose a specialty you genuinely enjoy, not one that just sounds impressive. Shadow as much as possible. The more you observe real daily life in a department, the clearer your decision becomes.

What is one clinical "trick" or habit that has made your work significantly easier?

S: I treat kids as if they are my colleagues. I involve them in the process, make small agreements, and give them simple responsibilities. For example, I might ask them to help hold something or be in charge of counting.
When they feel involved, they cooperate more. It changes the whole atmosphere of the appointment.

V: Efficiency. A 90-minute crown prep appointment doesn't have to be 90 minutes. Small workflow adjustments add up. Clinical precision is important — but so is respecting time, yours and the patient's.
The second trick? Clarity - Patients don't say yes to technical jargon; they say yes to understanding.

A: As a demanding and rewarding speciality, you really need to be prepared for hard work. Orthodontics is not only about straightening teeth. It is firmly rooted in biology and physics. If you enjoy physics, especially biomechanics, you will truly appreciate the speciality. Understanding force systems, moments, anchorage, and tissue response is fundamental, and it makes the learning process much more exciting. Because orthodontics is a competitive speciality, preparation should start early. Most programs expect you to display sincere interest and commitment before you even apply. Previous research activity is strongly valued in many master's programs, not only to strengthen your CV but also to show that you can critically evaluate scientific evidence. In addition, most programs require an interview. This is not exclusively about your grades. It is about who you are as a person. My advice would be to prepare well, but to be yourself during the interview. Authenticity matters. Programs are not only looking for academic excellence as well as for motivated, resilient, collaborative individuals who will add value to the department.
Work hard, build your foundation early, seek research opportunities, and most importantly, make sure you truly love orthodontics. The devotion required is significant, but if it is your dream, the effort will always feel meaningful.

What has been the most challenging part of residency so far? What has been the most rewarding moment you have experienced?

S: Dental trauma cases have been the most challenging. When a child comes in after an accident, everything feels urgent. Parents are scared, the child is upset, and you have to stay calm and focused.
At the same time, those cases are also the most rewarding. Being able to tell parents that it is going to be okay and that we will do everything possible to save their child's teeth means a lot. Seeing the child return for follow-up with improvement and a smile makes the effort worth it.

V: The most challenging part wasn't clinical — it was adjusting to the system. Multiple email accounts, endless documents, new apps and portals, figuring out who to ask what, teaching in both English and my native language. It felt like learning a new country's bureaucracy before even touching a handpiece.
The most rewarding moment? The day I realized I wasn't "the student who's scared of the department doctors" anymore. I was part of the team. Being included by mentors I once found intimidating was quietly one of the proudest moments of my residency.

What clinical skills have improved the most since starting residency?

S: Dealing with dental traumas, endodontics, and caries management have improved a lot. Repetitio est mater studiorum - consistency and repetition indeed build confidence.
My communication skills have also changed significantly. I have learned how to explain procedures clearly, how to gain trust, and how to adjust my approach to each child. That has made a big difference in how appointments go.

V: You don't start residency with full-mouth rehabs handed to you (unfortunately). A lot of my early growth came from removable prosthodontics. In university, retention felt like a mysterious concept — especially with border molding and wax rims.
Now, what once felt unpredictable feels more controlled. I've moved from hoping a denture works... to knowing why it works. That shift — from guessing to understanding — has been huge.

One item you cannot survive residency without?

S: Stickers. Kids love small rewards, and it helps create a positive experience.

V: The clinic vending machine. It's reliable, available 24/7, doesn't judge my snack choices, and has seen me through more 12-hour shifts than I'd like to admit.

What routines or habits help you stay mentally and physically healthy?

S: I try to separate work from personal life. When I leave the clinic, I make a conscious effort to switch off. Going to the gym helps me manage stress. Spending time with friends keeps me grounded. Practicing gratitude helps me stay balanced, especially on difficult days.

V: By remembering that there is life outside of teeth. Socializing with friends and deliberately talking about anything but dentistry helps reset my brain.
Physically? I try, but usually it is to win small battles. I take the stairs to the fourth floor instead of the elevator. If residency makes me mentally tired, at least my step count can stay impressive.

Best advice you have received during residency?

S: It was from a Latin class: Feci quod potui, faciant meliora potentes. It reminds me to focus on doing my best with what I know at the time.

V: "Clinical efficiency is what turns a skilled technician into a successful practitioner."
My mentor reminded me that perfection is important — but productivity matters too. If you're not efficient, you'll never have time for advanced cases… or for the lifestyle you're working toward. (Yes, including the hypothetical sports car.)

One word that describes residency life?

S: Unexpected

V: Torqued.

If you could tell your pre-residency self one thing, what would it be?

S: It is going to be okay. Life is unpredictable, and you are going to be glad you chose this path.

A: If I could tell my pre-residency self one thing, it would be the following: Trust the process and trust yourself. Before starting, I think I underestimated how much I would grow not exclusively academically, but also personally. Residency challenges you in ways you cannot fully anticipate. There will be periods of doubt, fatigue, and pressure. Yet those moments are exactly what shape you into a confident clinician and a critical thinker. I would also tell myself not to be intimidated by the difficulty. Yes, the schedule is heavy. Yes, the learning curve is steep. But you are more prepared than you think. Each late night studying, every research project, every clinical case you struggled with…they all build the foundation you need. Most importantly, I would say: Enjoy it! You worked hard to get here. It was your dream. Even the stressful days are part of the journey you once hoped for. So instead of worrying about being perfect, focus on learning, improving, and appreciating the privilege of training in a speciality you truly love.

V: I'd remind myself: This phase will feel heavy because it matters. You're tired, you're stretched, and it's not always comfortable — but it's building something long-term. A few demanding years now will give you decades of freedom later.

FROM CLASSROOM TO CAREER: ERASMUS INTERNSHIP ABROAD

Bianca Gomes
University of Coimbra postgraduate
International University of Catalonia

What inspired you to apply for an Erasmus exchange during your dentistry studies?
I had already experienced Erasmus during the 2023/2024 academic year, when I completed my fourth year of dental school in Prague. It was a truly memorable experience and confirmed to me that the Erasmus programme is a unique opportunity for both academic and personal growth.
After graduating, I decided I wanted to experience Erasmus once more — this time through an **Erasmus internship** focused exclusively on clinical practice. Unlike Erasmus studies, this programme did not involve exams or academic assignments, and therefore carried fewer academic responsibilities. My goal was to enjoy one final Erasmus chapter while also ensuring a smoother transition into the job market. I wanted to refine my clinical skills under supervision and build greater confidence before fully entering professional life.

Where did you complete your Erasmus placement, and how did you choose and secure that destination?
I completed a three-month traineeship (September–November 2025) at the Universitat Internacional de Catalunya (UIC), in Barcelona.
My home university already had an established agreement with UIC, which made the application process straightforward. I was particularly interested in doing my internship in a country where I could easily communicate with patients. Spain felt like the perfect choice: I jokingly spoke "portunhol" — a mix of Portuguese and Spanish — and saw this as an opportunity to truly develop my Spanish skills. Additionally, I have always been interested in exploring Spanish culture more deeply, especially since, at first glance, it appears quite similar to Portuguese culture.
Another important reason for choosing UIC was its reputation. I had received excellent feedback about the university clinic's facilities and the opportunity to observe internationally recognised master's programmes, attended by students from all over the world.

What did a typical day look like during your Erasmus experience?
The Faculty of Dentistry is located in Sant Cugat, a small city about 30–60 minutes from Barcelona. Since I lived in the city centre of Barcelona, I divided my daily life between these two locations, which gave me the best of both worlds.
I was integrated into the 5th-year Integrated Clinic, attending 3 to 4 days per week. Clinical shifts ran either from 8:00 to 14:00 or from 15:00 to 21:00, which meant my schedule varied significantly. Midway through my traineeship, I was offered the opportunity to attend two shifts in some periods, allowing me to gain even more clinical practice.
In the Integrated Clinic, we were responsible for comprehensive treatment planning and carried out a wide range of procedures. As the name suggests, it was truly integrated: we performed restorative treatments, endodontics, prosthodontics, surgery, and periodontology. More complex cases were referred to the master's programmes, but we were always allowed to follow and observe those treatments.
Whenever I did not have scheduled patients, I could observe master's students managing advanced cases — an invaluable learning opportunity that greatly enriched my clinical perspective.

What was the biggest challenge you faced? Did language or cultural differences affect your experience?
Language was certainly the biggest challenge. The frequent use of Catalan — especially with patients who preferred not to switch to Spanish — required additional effort and adaptability. It was a cultural reality that I respected, but it demanded greater concentration to fully understand interactions around me. Although initially challenging, I gradually became more familiar with the language and gained a deeper appreciation for the cultural identity of Catalonia.
Despite this challenge, the positive experiences far outweighed any difficulties. During my traineeship, I performed procedures for the first time, such as scanning a patient with an intraoral scanner and carrying out mechanised endodontics. These moments boosted my confidence as I prepared to begin my professional career.
I also took advantage of being in Spain to attend scientific congresses, including the Dentistry Congress organised by UIC itself. These events were extremely enriching and allowed me to build stronger connections within the academic community.

What advice would you give to students considering Erasmus?
Do not overthink it — just go. You will not regret it.
However, make an informed decision. Research the universities carefully, speak with local students, and, most importantly, connect with students who have already completed Erasmus there. Erasmus students are sometimes integrated differently from local students, and bureaucratic processes can vary significantly depending on the host institution and its coordination.

Ask practical questions:
- What are the clinical schedules like?
- What procedures will you be allowed to perform?
- Do you need to bring or purchase materials?
- How are facilities organised?
- (For Erasmus studies) How do credit equivalences work?

Try to establish contact with someone at the host institution before arriving — through the Erasmus coordinator, the university website, or social media. Having a reference person can make the first days much smoother.
While city and country are important factors, the academic and clinical or pre clinical quality of the institution should weigh heavily in your decision, especially for long-term mobility programmes.

Has your Erasmus experience influenced your approach to dentistry?
Absolutely. This experience broadened my perspective, particularly regarding digital dentistry and how far innovation can take our profession. I was exposed to new workflows, materials, and treatment philosophies, all of which will undoubtedly benefit my future career.
Additionally, becoming familiar with UIC's postgraduate programmes has left the door open for future opportunities. Who knows — perhaps one day I will return for a longer academic period.

Would you recommend Erasmus to other dentistry students?
Without hesitation — yes.
Erasmus is a life-changing opportunity. Academically, it exposes you to different clinical realities and approaches, helping you become a more complete professional. Often, what we see at our home university can feel like a small bubble. Erasmus allows us to step outside that bubble and understand dentistry from a broader, international perspective.
On a personal level, living in another country is profoundly enriching. It fosters independence, adaptability, resilience, and intercultural understanding.
For me, Erasmus was not just a mobility programme — it was an experience that shaped both the dentist and the person I am becoming.

CLINICAL VOLUNTEERING ABROAD: A DENTAL INTERNSHIP IN SEYCHELLES

Anna Fedorova
Charité Universitätsmedizin Berlin

Seychelles, Yellow Roof Hospital, schools and distric clinics, Mahé

Since the first semester, I was obsessed with the thought of helping others. Student council, peer mentoring, tutoring, volunteering in refugee centers, but it wasn't enough. I wanted to help on-site, actually treat patients, and support those in need. So when I found out about the opportunity to go abroad and do the things I dreamed about already while studying, I did everything to make it come true.

In Germany there is a separate existing student national association for internship exchanges (ZAD) supported by the Free German Dentist Association (FVDZ), which provides information about countries for such internships abroad. It is advised to do the volunteering between the 4th and 5th year, so that the interns already have some clinical experience. My clinical partner and I looked up the countries that were available and contacted our 10 top picks. We have got 5 answers, but they were all great: Nepal, Cambodia, Dominican Republic, Seychelles, and Jamaica. Funnily enough, our supervisor wanted to go to the sea (I would've done the same), so we stopped at the country where the communication went the smoothest - Seychelles.

When we arrived and brought charity gifts, we started volunteering everywhere: in the main hospital, shadowing dentists in all specialisations; at schools, treating children on-site; regional polyclinics with an ambulant care focus. The schedule was very flexible, and we gave notice a week before what we wanted to do. We have treated for half the day, and the next half we relaxed at the nearest beach (sounds like paradise, right?). Nevertheless, we lived in the mountains most of our stay, and it got dark by 18:30 latest, so the time at the beach was not as long as we wanted. Depending on the place we were volunteering at, the procedures were different: extractions (very often), conservative therapy (fillings, RTCs), perio (surgical as well), and prevention measures (cleanings, giving out booklets and hygiene instructions). Honorable mention: at one of the schools we have worked at, there was a Healthy Smiles Day, where, during the long break, all kids cleaned their teeth together and learned about oral hygiene.

We were pleasantly surprised by the prevention-oriented approach of the Head of Medicine in Seychelles. The main clinic shocked us with the advanced equipment we didn't expect to see, especially in perio. Dental chairs were pretty old, but at least they were working. At schools, we also found portable dental units, which were very convenient on the road. And, thank God, ACs everywhere - a must-have at 30C and 80% humidity. But the dream is sadly still far from reality: high-risk groups like a fishing community with high levels of alcohol use, a generally low interest of Seychellois people in dental health, previous pain-oriented approach only make the shift harder to achieve.

Language barrier wasn't a big issue for us: Seychellois language is like French, but we couldn't speake it. Luckily some of the people living there spoke English, otherwise the patients were trusting enough to let us do what we needed, and we always had a supervising Seychelois person by our side to translate.

Most memorable stories - I got you. One is an interesting case: a young female patient presented with eight supernumerary teeth, all of which required extraction. Notably, the finding was non-syndromic, with no associated systemic condition or relevant medical history identified. I assisted during the extraction, and it made me fall in love with surgery even more. Another is an honorable mention (yet again): a young boy was so patient during the whole treatment, and then he started to scream and cry for no reason. We supposed he was over it, holding his mouth open (we only sealed fissures on lower molars). One single tear from his eye was dripping down from the dental chair, and we found it strangely funny.

The last one is my favourite and shows the true character of Seychelois people: during the internship, I became good friends with the surgery department. One day I mentioned that my birthday was coming up because we were speaking about weekend plans at the end of a post-OP check-up. Turns out the patient's birthday is the next day after mine. He and his wife became very excited and invited the whole surgery team, my clinical partner, and me to their villa to party. On the way there, we gossiped a bit about the clinic staff, got stuck in the jungle midway, suffered bites from millions of mosquitoes, but it was all worth it: we ate homemade traditional dishes like shark curry, breadfruit, fish stews, papaya salad, and had great discussions about religion and past, present, and future of Seychelles.

To conclude: when we worked, it was hard, but rewarding. Every time. And I would do it again in a heartbeat, but probably in another country, where people need it most.

I attended this internship during a very hard personal period in my life, so the experience will always have a subjective shadow over it. Otherwise, I am very glad we pulled through with it: communication with patients, overall view on dental care, dental work experience (especially in surgery) and overall character depth, devotion to dentistry and stress resistance grew immensely during the 4 weeks. Life in Seychelles wasn't that cheap: of course, the flights, but also, surprisingly, food, accommodation, transport. My tip: if you choose a place to go to for your time abroad, do your research very well, check on your wallet often enough and be prepare for the unexpected (that includes dental experiences as well as your own possible medical accidents: from a cold to a rare disease, so check your vaccine status!).

LA DOLCE ERASMUS VITA

Maria-Victoria Olteanu
5th Year, "Carol Davila" University of Medicine and Pharmacy Bucharest, Romania
Erasmus Student, Università degli Studi di Milano

"A student who takes part in Erasmus may not necessarily become a better professional, but he becomes a better person."
- Sofia Corradi

For as long as I can remember, I have always enjoyed meeting new people, interacting with different cultures, and understanding other perspectives. With time, I had to learn how to integrate this part of my life, the part I enjoyed so much, with my studies and, of course, make it relevant to my future career.

When I graduated from high school, I thought about studying abroad, but it felt too far, too difficult... too scary. Later, after starting university, I heard about the Erasmus Programme. It sounded interesting, so I started looking into it more carefully. Six months to a year did not seem so bad. I thought I could manage, even if I did not enjoy it (*although now, looking back, how could you not enjoy it?*). I believed it would be the perfect trial run, to see if I could manage on my own and whether I would truly enjoy studying in another country.

Applying this to dentistry, I strongly believe that our field evolves through learning from one another: different techniques, materials, tricks. In the end, the fundamentals are the same, are they not? However, it is the small things you observe from those who teach you that truly shape a great dentist and a strong character.

Probably the only "chill" shift we ever had.

I am fortunate to be part of a university that offers excellent exchange opportunities. We do not have to worry about our curriculum, as we can complete almost all of our subjects during our year abroad, without delaying graduation. "Carol Davila" University of Medicine and Pharmacy Bucharest provided us with a list of partner universities that would host us for a semester or a full academic year. I could hardly believe that my dream university was on that list. Nonetheless, Università degli Studi di Milano was right at the top.

Securing a spot was not easy, but it was certainly achievable for anyone determined enough. You need to prepare a language certificate, so completing one year of Italian was probably the most challenging part, alongside the inevitable bureaucracy. After that, we took an exam, and based on the final ranking, we were able to choose our preferred destinations.

Erasmus fantasy over, almost 2 months where the only places I have visited were libraries and study rooms. Waiting for part 2!

The university I chose is definitely the perfect fit for me, and it feels just right to call it my home for one year as a fifth-year student. However, here you can find me anywhere between the fourth and sixth years, as this is how our coursework is aligned between universities.

"Erasmus is like a holiday; studying is not part of the experience"

- a phrase you may have heard many times. However, I am here to challenge that assumption. The professors do not treat us with double standards. Therefore, I have studied harder than ever before, attending university and clinic from sunrise until evening, while still managing to create unforgettable memories. A typical weekday consists of around eight hours of lectures and clinical work, with a generous lunch break, followed by wonderful evenings spent with friends.

As a student in my final years, I now participate in most specialised clinical activities. I attend lectures for all my mandatory subjects: Orthodontics, Periodontics, Pedodontics, and more, and rotate through different departments in the dental clinic. This allows me to see and practice a wide range of procedures, learning both fundamental skills and valuable practical techniques, and most importantly, how to treat patients.

Regarding the facilities, I would not necessarily say they are better, but rather more established. My home university is still developing, whereas here, these systems have been in place for many years. This naturally creates differences in perspective and resources. I am currently working in the only public dental hospital in Lombardy, in a region where public dental care is strongly promoted. In contrast, in my hometown, dentistry is largely practiced in the private sector, and public services are less commonly used. Teaching methods here are also more practice-oriented, as students begin active clinical work as early as their fourth year.

Surprisingly, the biggest challenge was not the language, since Italian is not drastically different from Romanian. However, communication barriers still arise during patient–doctor interactions, especially in a public healthcare setting with diverse patients.

Clinically, I would proudly say that my most memorable moment was performing my first extraction. The tooth had grade III mobility, and the patient may have had periodontitis, but I did it, and I felt incredibly proud.

Regarding my future career, it is difficult to predict exactly what lies ahead. However, I am certain that exchange opportunities broaden your perspective and expand your vision of what is possible.

If you ever have the opportunity to participate in Erasmus or any exchange programme, take it! You have nothing to lose and everything to gain. Your home will always be there waiting for you. But trust me: you will not regret it. At some point, you may even feel surprised by how comfortable the unfamiliar becomes.

This is undoubtedly one of the most important decisions I have ever made. It has helped me grow not only professionally but also personally, allowing me to build lifelong connections and discover places that deepen my understanding of the world.

Do not hesitate to have fun! Take that trip, meet new people, and ask about the procedures you've always wanted to see. It's all part of the Erasmus experience!

First Trip of 2026, snowboarding in the Dolomites with my Erasmus friends. The dream destination for every mountain enjoyer.

As a football fan it's an amazing feeling to live in the same city as one of the biggest stadium names. Proud to see a coach from my country in such an important place.

Looking happy, but already feeling "saudade" as the best people in the world were done with their semester, but you are still here.

MYOFUNCTIONAL MANAGEMENT OF PARAFUNCTIONS IN ORTHODONTICS

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According to Moss's Functional Matrix Theory alteration of function reshapes the form, especially during the childhood and growth period [1]. The early detection and management of parafunctional habits contributes to more balanced development of the stomatognathic system.

Parafunctions in children

According to a 2024 International Association of Orofacial Myology (IAOM) definition, orofacial myofunctional disorders (OMDs) are "atypical, adaptive patterns that emerge in the absence of normalized patterns within the orofacial complex" [25]. OMDs can be associated with ankyloglossia, atypical deglutition, lip incompetence, mouth breathing, non-nutritive sucking habits and low tongue position.

Functional examinations

After intraoral and extraoral examination it is essential to conduct the functional examination as well. For the purpose of evaluating an atypical swallowing pattern one can request the patient to ingest their saliva and assess the contraction of perioral muscles and the position of the tongue. Additionally, during the exam of the frenum the mobility of the tongue can be recorded.
For the purpose of evaluating an atypical respiratory breathing pattern it is possible to perform Gudin nasal reflex and Rosenthal tests. Supplementarily rhino-hygrometer and Glatzel mirror can be utilized.

The approaches of parafunctions management

The principal management might include psychological approach (counselling and various types of reinforcements), myofunctional therapy (MFT) and additional myofunctional orthodontic appliances. Aiming to achieve a successful habit cessation it is necessary to establish trust and good collaboration among the dentist, the child and the parents while applying evidence-based protocol.

Myofunctional therapy

According to the study of Begnoni *et al.* (2020) in case of atypical deglutition MFT aids in shortening the muscular activation pattern and increasing the submental muscles activity therefore improving the oral function [5]. Such an example shows how it is possible to increase the treatment effectiveness of MFT by modifying it by a precise type of the OMD. In a scoping review of Stefani *et al.* (2025) OMD's were classified into categories with ascribed MFT protocols [2]. However, the significant part of the studies sample size was small, 2-thirds of studies' follow-up period was less than a year - more high-level evidence studies are required to draw stronger conclusions [2]. Yet, truth to be told, in certain circumstances MFT produces evident beneficial modifications.

Several interesting findings from this scoping review are provided with authors mentioned based on the OMD type:

Ankyloglossia-associated OMDs
The use of MFT alone for ankyloglossia management might aid in improving the tongue mobility (tongue exercises were performed 15 times for each one at a frequency of 3 times a day with minimal duration of 30 minutes for 3 weeks) [2,6].

Atypical swallowing (tongue thrust)-associated OMDs
MFT based on the Garliner method have shown improved tongue strength [2,7]. Use of Kittel's concept for atypical swallowing habit cessation was more effective among females, patients who went to group therapy and had higher parental involvement [2,8]. In a study of Toronto (1975) 75% children who had received MFT (according to Barret and Hanson concept) for tongue thrusting didn't show any type of relapse [2,9]. Speech therapy was not effective for atypical swallowing [2,10], however the combination treatment of speech therapy with MFT was effective [2,11]. In addition, a study of 20 children treated with/without MFT and a re-educating device during the day and an impediment crib device at night showed that MFT combined with the appliance group achieved a normal swallowing pattern a little earlier [2,12].

Lip incompetence-associated OMDs
According to Stefani *et al.* (2025) review results 4 studies showed that MFT (lip exercises) compared with no treatment for lip incompetence suggested improvement in lip strength, function, height, and seal [2]. While summarizing results authors noted that MFT could increase lip strength [2,13], though this factor is not associated with a habitual closed lip posture [2,14].

Mouth breathing-associated OMDs
Comparing control and OMT for mouth breathing groups no statistical differences were found, however a larger part of MFT group patients achieved a closed lip position (38% of MFT group and 25% of control group) [2,15]. In the review of non-RCT studies it was noticed that after MFT designed to achieve lip competence muscular activity shown in EMG decreased [2,16]. In another study MFT combined with preformed orthodontic appliances helped to slow down the vertical growth and promoted transversal expansion [2,17].

Non-nutritive sucking habits-associated OMDs
According to a 2015 Cochrane review, orthodontic appliances (palatal arch and palatal crib) and psychological interventions (positive and negative reinforcement) might be effective at improving non-nutritive sucking habit termination in children [2,18]. In Stefani *et al.* (2024) review counselling and rewards provided high cessation rates [2]. It is also beneficial to use a MFT approach (such as tongue exercises with counselling [2,20]) or perform MFT in group dynamics rather than individually [2,21].

Additional supportive devices

In 1945 dr. H.D. Kesling created a positioner – a removable appliance from rubber material which can be deformed during muscle contraction. Later more appliances were created with the aim to disengage harmful habits and to help establish a more physiologic teeth eruption pathway. The scientific discipline of these myofunctional appliances can be called elastodontics. The rubber material is also more appropriate for patients who have heart diseases, hemophilia, immune deficiencies, disabilities, teeth development discrepancies such as amelogenesis imperfecta and dentinogenesis imperfecta. Many devices' purpose is to reach a head-to-head rapport of incisors to create a "lip-bumper effect": muscles retraction reduces their hyperactivity and creates altered muscular corridors which would allow more proper path of eruption of permanent dentition elements [4].

Some of examples of the elastodontic appliances found in the market

Appliance	Dentition	Recommended start of the application	Action	Time
Trainer® T4K	Mixed/primary dentition	4-8 years	Retraction of tongue and lips	During night and 1 hour per day
Myobrace®	Mixed/permanent dentition Deciduous dentition (J-series)	Late mixed dentition	Two types of materials (core is rigid, while outside is more flexible) allows the appliance to be stretched	During night and 2 hours per day
Nite-Guide®	Deciduous dentition	5-7 years	It guides the eruption of permanent lower incisors	During night
Occlus-o-Guide®	Mixed dentition (G-series) Mixed dentition accompanied by the overjet (H series) Permanent dentition (N-series)	-	It restores tongue posture, retrains atypical deglutition and establishes a more correct breathing pattern	-
Habit-Corrector®	Mixed dentition Deciduous dentition	-	Tongue position is changed. Used more often with parafunctions associated with thumb/pacifier sucking, oral breathing and an atypical deglutition	During night and 2-3 a day
Froggymouth®	Correction for atypical deglutition, tongue interposition, mouth breathing	-	Elimination for bilabial contact and negative pressure of inside of oral cavity	15 min. every day
Lip trainer®	Atypical swallowing	-	Stretching and strengthen the muscles of the lip	5 min. twice a day
LM activator®	Deciduous dentition Mixed dentition	6-12 years	Used for mouth breathing, incorrect tongue position	During night and 1-2 hours during day

It is necessary to diagnose and manage parafunctions as early as possible in order to sustain a healthy stomatognathic system development. A Dentist can not only encourage habit discontinuation, but also provide the information about MFT and possible additional myofunctional appliance use.

For References

PALATAL EXPANSION INDICATIONS AND OPTIONS FOR CHILDREN IN MIXED DENTITION

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Palatal expanders are widely used in clinical orthodontics, especially for the correction of transverse maxillary deficiencies and posterior crossbites. These conditions are common in children with mixed or deciduous dentition, with a reported prevalence of approximately 8–22%. Over the last decades, research interest in palatal expansion has increased significantly, with rapid palatal expansion (RPE) accounting for the majority of published studies. Clinical surveys also show that banded RPE appliances are among the most frequently used devices in everyday orthodontic practice (14). This article aims to highlight the importance of understanding how palatal expanders work and to describe several expansion device options suitable for children with mixed dentition.

History of palatal expanders

The concept of maxillary expansion dates back to the mid-19th century. Rapid palatal expansion was first described by Emerson C. Angell in 1860. His observations introduced the idea that transverse maxillary deficiency could be corrected by opening the midpalatal suture (1).

Almost one hundred years later, in 1958 and 1961, Andrew J. Haas introduced the Haas expander, a tooth- and tissue-borne appliance. Compared to earlier designs, this appliance showed clearer clinical effects and gained wider acceptance. Following Haas' work, several other expansion devices were developed, including the Hyrax expander, Quad-helix, and W-arch appliances (2).

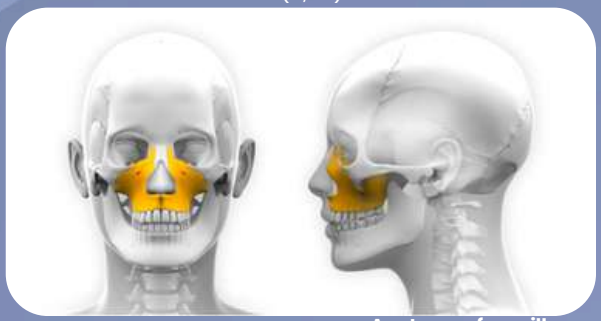
Around the year 2000, more advanced designs were introduced, such as microimplant-assisted rapid palatal expansion (MARPE). These appliances represent a newer generation of expanders, aiming to achieve more skeletal expansion, especially in older patients.

Why Consider A Palatal Expander

Palatal expansion is usually indicated when the upper jaw is too narrow in relation to the lower jaw. Under normal conditions, the maxilla should fit outside the mandible to allow proper occlusion and function. When the maxilla is constricted, functional problems such as posterior crossbite and altered mandibular positioning may occur. From a craniofacial growth perspective, mouth breathing plays an important role in the development of a narrow palate, but a crossbite or narrow upper jaw doesn't cause breathing problems. Normally, the tongue rests against the palate and stimulates transverse maxillary growth. In mouth-breathing patients, the tongue is positioned lower in the oral cavity, reducing lateral support to the maxilla. This can lead to a narrow and high-arched palate and may create a cycle of impaired nasal breathing and further maxillary constriction. Over time, these changes may contribute to posterior crossbite, increased anterior facial height, and a dolichofacial growth pattern (6). Breathing problems are caused by insufficient upper jaw growth, not the other way around. Expanding the upper jaw affects the midpalatal suture, which in young children has not yet ossified, but gradually ossifies as they grow.

Indications for palatal expansion in mixed dentition

One of the most common indications for palatal expansion in mixed dentition is a narrow maxilla. When the transverse width of the maxillary arch is insufficient compared to the mandibular arch, arch harmony is disturbed. If this condition is not treated in time, the narrow palate may persist and contribute to breathing problems, lack of space for erupting teeth, and dental crowding (3, 4). Discrepancies between the upper and lower jaw sizes can impact facial aesthetics and function, meaning the jaw asymmetry can develop during time (3). Expansion of the maxilla increases arch perimeter and can help create space for erupting permanent teeth, potentially reducing the severity of crowding during mixed dentition.
(4, 5).
Another important indication for palatal expansion is unilateral or bilateral posterior crossbite. Clinical studies show that untreated posterior crossbite may lead to asymmetric mandibular growth, facial asymmetry, condylar changes, and neuromuscular adaptations. Early correction during mixed dentition is therefore recommended (9, 10).



Anatomy of maxilla.

Options for palatal expanders

Most commonly used Rapid Palatal Expanders types for transverse discrepancies in mixed dentition are Haas and Hyrax expanders. They are used in mixed or early permanent dentition for skeletal correction in order rapidly expand the maxillary arch by opening the midpalatal suture (12). RPE works with the repeated turning of the jackscrew, force is transmitted to the teeth and to the suture, thereby getting both dental and skeletal expansion.

Options for palatal expanders

Most commonly used Rapid Palatal Expanders types for transverse discrepancies in mixed dentition are Haas and Hyrax expanders. They are used in mixed or early permanent dentition for skeletal correction in order to rapidly expand the maxillary arch by opening the midpalatal suture (12). RPE works with the repeated turning of the jackscrew, force is transmitted to the teeth and to the suture, thereby getting both dental and skeletal expansion.

Here are some types of palatal expansion options that work for children with mixed dentition.

Hyrax expander

It is designed completely from a metal frame with bands around the molar teeth.

The Hyrax features bands cemented to molars for stability and it is used for both dental and skeletal expansion needs. The advantage is that it can be easily cemented during the mixed dentition stage, when retention from other appliances can be poor.

The main advantage of this expander is that it does not irritate the palatal mucosa and is easy to keep clean.

The Haas expander

The Haas expander is similar in design to the Hyrax appliance but includes acrylic pads that are bonded to the metal framework and rest against the palatal vault.

These acrylic pads allow part of the expansion force to be transmitted directly to the palatal tissues. Clinical evidence shows that the Haas expander effectively increases maxillary transverse dimensions and improves posterior crossbite relationships, particularly when treatment is initiated before the age of 7 (11). Constricted maxilla without obvious crossbite but with arch form disharmony, space issues leading to crowding of the teeth can be fixed with Haas expander (12). Haas expander is similar to a Hyrax expander but there are acrylic pads bonded to the metal framework that pushes on the palatal vault (12).

Quad Helix Expander

The advantage of this appliance is that the length of the palatal arms of the appliance can be altered depending upon which teeth arch in crossbite.

Due to its superelastic properties, especially when fabricated with nickel-titanium, it may allow more physiological tooth movement and gradual correction of transverse discrepancies (15).

When is the best time for palatal expansion?

Expanding the upper jaw affects the midpalatal suture, which in young children has not yet ossified, but gradually ossifies as they grow.
The upper jaw can be expanded more easily and with less force at a younger age. Later on more force is needed, and for adults, an orthognathic surgery or MARPE is required. Expansion appliances are activated or screwed depending on the ossification stage of the suture, which varies greatly among patients (16).

The effectiveness of palatal expansion is directly influenced by the degree of maturation of the midpalatal suture, which is most elastic and open during the growth spurt phase. The growth spurt is a period of increased body height, intensive growth of the facial skeleton and jaws, and hormonal changes. With increasing age during the typical 7-year window of RPE treatment, the percentage of skeletal expansion decreases whereas the percentage of dental expansion increases, meaning the when the palatal expansion is done between the ages of 7 to 14, there is usually a possibility that braces will be needed after the palatal expansion.

Take home message

Maxillary and maxillary dental expansion can be achieved using different types of appliances. The choice of expansion method depends on the patient's skeletal and dental pattern, age, and treatment objectives. Each appliance has its advantages and limitations, but all aim to correct transverse discrepancies and improve function and occlusion.
All dentists should know that in the case of a narrow upper jaw in the early age or in a period of mixed dentition, to perform upper jaw expansion is easier and cheaper. For dental students who want to pursue a dream of becoming an orthodontist it is crucial to understand how palatal expanders work and what indications and how many options are there for children with mixed dentition. Understanding palatal expanders and their indications during mixed dentition allows clinicians to choose the most appropriate treatment and improve long-term outcomes.

For References

Disclamer: Artificial intelligence tools were used for language editing and stylistic refinement. The scientific content and structure were developed by the author.

TOOTH AVULSIONS: WHAT TO DO AND WHEN?

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Tooth avulsions are one of the few true emergency situations that dentists can expect to encounter during their career. A positive prognosis requires excellent communication and cooperation between the dentist and the patient, as well as quick actions at the time of the trauma and systematic long-term care.

The International Association of Dental Traumatology generally divides tooth traumas into three groups: dental fractures, luxations and avulsions. The prevalence of traumatic dental injuries disproportionately affects different age groups and genders. A 20-year retrospective study of the prevalence of dental injuries in permanent dentition found that males are more prone to dental traumas, with **the most common type of injury being avulsions, closely followed by uncomplicated enamel-dentin fractures.** A different study, analyzing data from the University Medical Center Mainz in Germany found that young people are more frequently affected by dental trauma, as the average age of patients was 14.7 years old. The most common reason was falls and the study found that injuries occurred most frequently on weekends. Dental trauma most commonly affects upper central incisors.

The following evaluation and treatment instructions are based on the 2020 International Association of Dental Traumatology (IADT) Guidelines for the Evaluation and Management of Traumatic Dental Injuries. Dental traumas can greatly vary in severity and in their inclusion of surrounding structures. Clinical cases can involve several types of injuries, which increases the possibility of negative treatment outcomes. The prognosis of avulsions is dependent on taking prompt action immediately following the injury. Replantation is usually the treatment of choice at the site of the accident.

First aid for avulsed teeth - what can the patient do?

As dentists, we should be ready to instruct patients in case of an avulsion, usually by telephone. Also, it is important to inform the public about dental first aid. To help with awareness, IADT has provided a "Save Your Tooth" poster, which is available on their website in 63 languages. The poster includes clear instructions for the patient, which are also understandable for children.

To replant or not to replant?

There are conditions in which replantation is not indicated. These situations should be evaluated individually by the dentist, as they tend to be complicated scenarios. Primary teeth should not be replanted. Consider not replanting the permanent tooth if:

1. The tooth has severe caries or acute periodontal disease is present
2. The patient is sedated, unconscious or uncooperative
3. The patient has comorbidities such as immunosuppression or severe heart conditions

It is important to consider whether the tooth has a good prognosis. If the replanted tooth has a possible positive outcome, it should be replanted.

Patient Instructions for First Aid

1. **Find the tooth:** Find the tooth (or the tooth fragment in case of a fracture) and pick it up from the crown. Avoid touching the root.
2. **Clean the tooth:** If the tooth is visibly contaminated, clean it by rinsing it with saline, saliva or milk. Be gentle with the rinsing.
3. **Replant**: Try to replant the tooth into its socket as soon as possible. It is vital to limit the time that the tooth is exposed to the outside environment. Do not replant the tooth if the patient is unconscious.
4. **Fix the tooth in place**: When the tooth is replanted, bite on gauze or a napkin to fix the tooth in place
5. **Immediately turn to a dentist**

If replantation is not possible, immediately place the tooth into a liquid to keep the tooth hydrated. Place the tooth into milk, HBSS (Save-a-Tooth solution), saliva, or saline. Even though water is not recommended, it is still better than leaving the tooth dry.

How to evaluate tooth avulsions?

First aid for avulsions is always replantation of the tooth. However, the treatment strategies differ based on the condition of the periodontal ligament and the maturity of the tooth. Additionally, there are specific scenarios where replantation is not indicated. Before starting treatment, a medical history should be collected from the patient.

Evaluate the following factors to choose the correct treatment plan:

1. **The viability of the periodontal ligament (PDL) cells.** This is determined by the time that the tooth has spent out of the oral cavity:
   a. Less than 15 minutes → the PDL cells are very likely still viable
   b. Less than 60 minutes (or the tooth has been placed in a storage medium) → the PDL cells may be viable
   c. More than 60 minutes → the cells are likely non-viable
2. **The maturity of the root apex** - whether the apex is open or closed.

Treatment guidelines for avulsed teeth

If the tooth has been replanted before arrival at the clinic

1. Clean the injured area with water, saline or chlorhexidine (CHX)
2. Make sure that the tooth is in a correct position - this can be confirmed both clinically and with radiographic evaluations. If the position is incorrect then the tooth can be repositioned up to 48 hours after the accident.
3. Administer local anesthesia if needed, but preferably without a vasoconstrictor. Using a vasoconstrictor may compromise the healing. Depending on the extent of injuries, regional anesthesia can be used.
4. Stabilize the tooth with a splint
5. Suture any lesions if necessary
6. Administer antibiotics, check tetanus status (refer the patient to a tetanus immunization if necessary), provide post-op instructions and secure follow-up appointments.
7. For teeth with closed apices, start root canal treatment (RCT) 2 weeks after the trauma

If the tooth has been stored outside of the mouth or has been dry for less than 60 minutes

1. Check the tooth for debris or contamination. You can clean the tooth by gently rinsing it with saline or agitating it in the liquid it has been stored in
2. Administer local anesthesia
3. Examine the alveolar socket - check it for alveolar wall fractures. You can reposition alveolar fragments if necessary
4. Irrigate the socket with sterile saline. If a coagulum has formed, you can remove it with the saline stream
5. Place the clean tooth into the socket with your fingers - use gentle pressure and place the tooth slowly
6. Verify the correct position of the tooth
7. Stabilize the tooth with a splint
8. Administer antibiotics, check tetanus status, provide post-op instructions and secure follow-up appointments
9. For teeth with closed apices, start root canal treatment 2 weeks after the trauma

What to do if the extra-oral dry time has been more than 60 minutes?

Replantation should still be attempted, but by that time the PDL has already deteriorated and is unlikely to repair itself. Root resorption is a common outcome of delayed replantation. However, replantation in these scenarios temporarily restores aesthetics of the tooth and helps to preserve alveolar bone until a prosthetic treatment option is found. Therefore, replantation after 60+ minutes of dry time is a useful tool for future treatment planning. A replanted tooth can be extracted at a later time.

Treatment nuances of immature teeth with an open apex

After replantation, root canal treatment should not be immediately started, because immature teeth still have the ability to repair their pulp. When the pulp revascularizes, root development can continue. When revascularization does not occur and pulp necrosis is detected, RCT should be performed. Also, immature teeth are prone to inflammatory root resorption, which takes place rapidly. The patient should be informed of these possible outcomes. Follow-up visits should also be more frequent to monitor the tooth for pulp necrosis, root resorption and bone loss as these processes develop quickly.

Antibiotics & Tetanus Status

Antibiotics are recommended to treat the contamination of the PDL. This prevents inflammatory root resorption and other inflammatory reactions. Sometimes, the patient's medical history already warrants antibiotic coverage. The first option for antibiotic treatment should be penicillin or amoxicillin.

If the patient is allergic to penicillin, tetracycline has shown positive results. Tetracycline is however not recommended for patients under 12 years old and it may cause tooth discoloration in pediatric patients.

Always ask the patient about their last tetanus vaccination. If necessary, refer the patient to their physician to evaluate their need for a tetanus booster.

How to splint?

The splint should be moderately flexible, as studies have shown that slight mobility of the replanted tooth aids in the regeneration of the PDL. Most suitable options for this are using a stainless steel wire 0.4 mm in diameter or nylon fishing line (0.13-0.25 mm). Fishing line is not recommended for pediatric patients, as there are only a few permanent teeth to use for splinting and deciduous teeth can move the splint. Use a more rigid splint for alveolar or jaw bone fractures; in these cases, the splint should be kept on for 4 weeks.

The splint should be placed labially and bonded to the tooth with composite resin. Keep the splint away from the gingiva to allow the patient to clean their gums properly.

Within 2 weeks, the PDL is strong enough for the splint to be removed. The tooth might be slightly more mobile after removing the splint. If necessary, the splint can be reapplied for another week. After removing the splint, check the mobility of the tooth and its occlusion.

Labially splinted teeth. Notice how the lateral incisors have been left out of the splint to minimize the risk of splint movement or interference with eruption
Authors: R. Leith, A. O'Connell. Tips for splinting traumatised teeth (2017)

After the emergency visit

At the end of the replantation and splinting visit, the patient should be instructed to avoid contact sports, eat a soft diet for up to 2 weeks, brush their teeth with a soft brush after every meal and use a 0.12% CHX mouth rinse twice a day until the 2-week appointment.

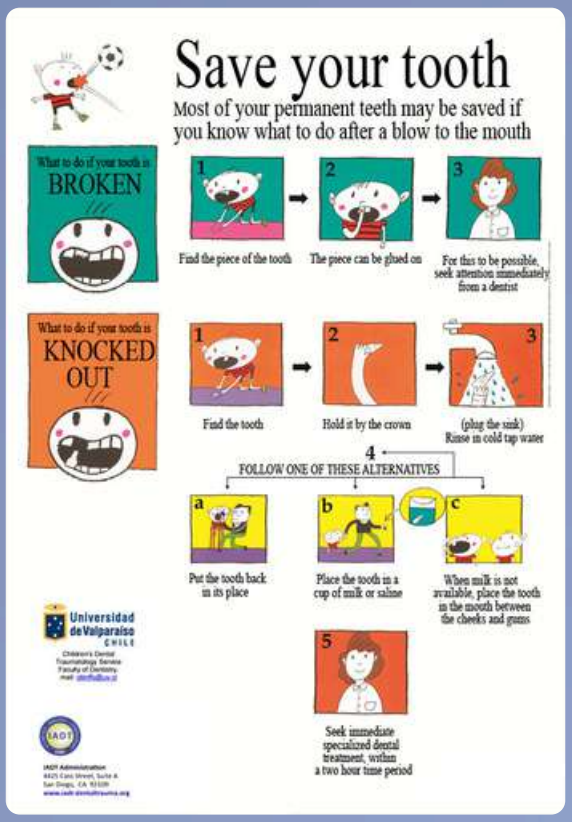
Schedule follow up visits. At the visit, the tooth should be evaluated both clinically and radiographically. The splint is removed and root canal treatment started if necessary, at the 2 week appointment.

The tooth should be asymptomatic, functional, not sensitive to percussion, have normal mobility and have a normal percussion sound. Radiographically, there should be no radiolucencies and an intact lamina dura. Immature teeth should have normal root formation and eruption. During a year after trauma, pulp canal obliteration can be visible.

Follow-up appointments:

1. **For closed apices:** at 2 weeks, 4 weeks, 3 months, 6 months, 1 year; then continue yearly visits for at least 5 years
2. **For open apices:** at 2 weeks, 1 month, 2 months, 3 months, 6 months, 1 year; then continue yearly visits for at least 5 years.

At the appointments, the tooth should be monitored for both inflammatory and ankylosis-related resorption, as well as pulp necrosis



"Save Your Tooth" Poster in English, available for downloading at the IADT website
Source: International Association of Dental Traumatology (IADT)

To handle avulsions effectively, the dentist needs to be prepared to instruct the patient remotely, provide effective care immediately following the accident and to work with the patient during various follow-up treatments and evaluations. Therefore avulsions are unique clinical situations, combining urgent and long-term care. While this article discusses avulsions, IADT also provides thorough guidelines for fractures and luxations. The guidelines are available on the IADT website as open-access articles to educate current and future dentists on the diverse field of dental traumatology.

For References

OPTIMIZING NON-PREP VENEERS BONDING

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The evolution of adhesive systems has made it possible to pursue more conservative options in restorations and prosthodontics. These less invasive options have also been favoured by patients, who benefit from the advantages of preserving the natural tooth structure.
Although most bonding techniques are highly operator-sensitive, achieving good adhesion between the interfaces remains a limiting factor for the long-term survival of the restoration. Optimising a restoration's bonding requires a good understanding of the substrates involved.

Advantages and Disadvantages

Even though composite veneers are also referred to in the literature as non-prep veneers, this article focuses on ceramic veneers, as bonding them to the teeth is far more complex and also achieves superior results when compared to composites.

Ceramics have a remarkable ability to mimic tooth structure in both aesthetics and mechanical properties. For non-prep veneers, glass ceramics are the material of choice due to their outstanding optical properties; they can be reinforced with other crystalline materials to enhance strength—for example, feldspathic porcelain or leucite-reinforced variants [1]. These veneers are also notably thin—no thicker than 0.5 mm—making careful handling essential during the bonding process [2]. The primary failure mode for these restorative materials is chipping, followed by debonding and then marginal discoloration [3]. These issues can be greatly mitigated through proper bonding techniques and the selection of high-quality agents.

Bonding agent

These restorations imply that the tooth interface will consist entirely or almost entirely of enamel, which allows for stronger bonding than dentine due to its higher mineral content and lower moisture levels.
Regardless of the chosen adhesive system, the surface must be etched with phosphoric acid to create an adequate micro-retention pattern, enabling penetration of the adhesive system and resulting in a mechanically retentive interface [4], [5].

Similar to how acid etching creates micro-retentions in enamel, etching the inner surface of the veneers selectively dissolves the glass component of the ceramic, producing comparable retentions. Vitreous ceramics do not require sandblasting with aluminium oxide (Al_2O_3), as adequate retention is readily achieved through acid etching [6], [7].

One must also consider that the veneer's reduced thickness makes it prone to weakening from over-etching; thus, this step should be performed carefully to avoid dissolving excessive amounts of ceramic [7].
The bonding agent of choice for vitreous ceramics is silane, owing to its ability to chemically bridge the ceramic's inorganic component to the cement's organic component [7].

Luting agent

According to the Dental Materials Journal, resin cements are the primary choice for these restorations owing to their low solubility in the oral cavity and low film thickness, as well as their ability to bond both chemically and mechanically to ceramics, thereby providing greater retentive strength [8].

The thinness of the veneers even permits light-curing, which achieves greater polymerisation compared to chemical- or dual-curing alternatives. The latter two are also unsuitable, as they exhibit significant colour change over time; since the lack of thickness renders them translucent, the resin's colour and opacity must be carefully considered [8], [9].

Additionally, some resin cements include try-in pastes, enabling precise fitting of the veneers and ensuring an optimal result prior to permanent cementation [10].

Bonding protocol for ceramic veneers

1. Preparing the tooth substrate
1.1. Apply Phosphoric Acid (37%) for 60 seconds
1.2. Rinse thoroughly for 60 seconds
1.3. Dry*
1.4. Apply the adhesive system according to manufacturer's instructions

*If the dried surface is not opaque, the tooth surface was not well-etched

2. Preparing the veneers
2.1. Apply Fluoridric Acid (9-10%)*
2.2. Wash for as long as the acid etched the surface
2.3. Dry
2.4. Apply 2 layers of Silane
2.5. Dry with hot air for 60 seconds

*The etching time is highly dependent on the glass component of the ceramic, therefore, it depends on the type of ceramic being used. In general, Feldspathic Porcelain is etched for 90 seconds. The manufacturer's instructions must be followed accordingly.

3. Cementing
3.1. Apply the resin on the veneer's inner surface
3.2. Carefully insert the veneer over the teeth
3.3. Remove the excess resin
3.4. Photopolymerize for 40-90 seconds*

* According to the manufacturer's instructions

Bonding to enamel is highly advantageous, provided there is a clean surface and appropriate acid-etching time. The thinness of no-prep veneers presents significant challenges, such as over-etching and translucency. It is essential to identify the type of ceramic being used in order to prepare its surface correctly, thereby optimising the process. Additionally, it is imperative to choose high quality bonding materials, adequate for veneers.

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COMPARISON OF SINGLE-UNIT CROWNS AND ONLAYS MADE OF DIFFERENT MATERIALS; ADVANTAGES AND DISADVANTAGES, CLINICAL CHOICE.

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For every prosthodontic specialist one of the main responsibilities in daily work is to decide on an individualized treatment plan for every patient in order to provide the highest possible quality of care, but at the same time taking into consideration every patient's socioeconomic status, daily habits and aesthetic expectations.

When the topic is single-tooth fixed restorations, treatment planning is not limited to just the selection of restoration type - crown, overlay, onlay or inlay. It is important to understand that every restoration has specific material requirements including mechanical properties, biocompatibility, the potential of preserving remaining tooth structure, abrasiveness, cementation technique, long term prognosis and aesthetic [1].

With each passing decade fixed prosthodontics as a multifactorial subspecialty of dentistry continues to develop, primarily due to the development of new cementing techniques and the invention of new materials. As a result - clinical possibilities continue to expand by allowing a transition from conventional principles based on mechanical retention toward minimally invasive approaches[1]. The aim of this article is to compare the advantages and disadvantages of single-unit crowns and onlays made from different materials, taking into consideration their biomechanical, biological and clinical properties.

Advantages and disadvantages of single-unit crowns depending on the material.

A single-unit crown is a fixed partial prosthesis that replaces lost tooth structure. Its purpose is to replicate the natural anatomy and function of the tooth while protecting remaining dental tissues from further loss [1].

Full-metal crowns:
Full-metal crowns are made from noble metals and their alloys (gold, platinum, palladium, silver) or from base metals (copper, titanium, stainless steel, cobalt-chromium, nichel-chromium (nichel may cause allergic reaction)). These crowns demonstrate not only high mechanical strength, but also long term durability and performance. Also their elasticity modulus is similar to that of tooth dentin, which helps distribute occlusal forces evenly. Studies show that full-metal crowns are less abrasive to antagonist enamel in comparison to ceramic restorations.
However due to their poor aesthetics, in modern days full-metal crowns are rarely made and used in developed countries. If a dental clinicist decides on using a full-metal crown, then it is limited to the posterior region particularly to molars or to patients with parafunctional habits.

Metal-ceramic crowns:
Metal-ceramic crowns combine the mechanical strength of metal core and aesthetic properties of porcelain. Feldspathic porcelain provides translucency and a natural tooth like appearance. Also studies show high clinical survival rates for these restorations. Nevertheless, the hardness of porcelain and an increased surface roughness following glaze layer wear-off may contribute to the abrasion of antagonist enamel. In addition metal-ceramic crowns require relatively invasive tooth preparations (1,5-2mm) that results in significant loss of natural tooth structure. Another disadvantage of metal-ceramic crowns is their complex and time consuming making process.

All-ceramic crowns:
All-ceramic crowns are fully made of ceramic materials such as glass-matrix ceramics, polycrystalline ceramics or resin-matrix ceramics. Monolithic ceramic crowns may be fabricated from zirconia dioxide or lithium disilicate, with or without porcelain outer layer (leucite, aluminium dioxide or feldspathic porcelain)[2].
Ceramic crowns provide excellent aesthetic properties and high biocompatibility. For example lithium disilicate provides both a great toughness and adhesive bonding potential, but zirconium dioxide is characterized by very high mechanical strength.
One of the disadvantages is that monolithic zirconia crowns may appear opaque. When an outer porcelain layer is added, there is a risk of it chipping, especially in the posterior region. For this reason all-ceramic crowns are often recommended primarily for the anterior region. Special attention must also be given to the abrasiveness of ceramic materials towards antagonist teeth due to their mechanical properties.

Advantages and disadvantages of onlays depending on the material.

An onlay is an indirect dental restoration that covers one or more, but not all cusps of a tooth. It can be made from noble metal alloys (gold–platinum, gold–palladium), ceramics (including hybrid ceramics), or composite materials.

Gold alloy onlays:
According to various literature sources, gold alloy onlays are considered one of the most durable partial-coverage restorations [3]. Gold restorations are characterized by excellent malleability, precise marginal adaptation and low abrasiveness against antagonist enamel. But similarly to full-metal crowns due to their poor aesthetic properties, metal onlays In modern days rarely used in clinical practice.

All-ceramic onlays:
Lithium disilicate ceramic onlays are characterised by high mechanical strength and excellent aesthetics when adequate adhesion is achieved during cementation. In contrast leucite-reinforced ceramic onlays are associated with lower mechanical strength [4]. It should also be emphasized that ceramic restorations maintain abrasiveness toward antagonist enamel.

Composite onlays:
Indirect composite onlays are characterized by a lower elasticity modulus which resembles tooth dentin. This allows for better absorption and distribution of occlusal forces. However, compared with ceramic onlays - composite restorations show lower wear resistance.

Advantages of crowns:	Disadvantages of crowns:
• Better tooth protection; • Suitable when less than 50% of the natural tooth structure remains; • Depending on the material, applicable for both anterior and posterior teeth; • Moderately good to very high aesthetics (metal-ceramic and all-ceramic crowns); • Very high mechanical strength (depending on the material); • Crowns allow modification of the occlusal plane; • Suitable for teeth with remaining wall thickness <2 mm; • Protect endodontically treated teeth.	• **More invasive;** • Very poor aesthetics (full-metal crowns); • Larger pulpal irritation; • Relatively higher cost (especially zirconia crowns); • Possible allergic reactions (nickel containing crowns); • Ceramic and metal-ceramic crowns are abrasive to antagonist enamel.
Advantages of onlays:	**Disadvantages of onlays:**
• **Less invasive;** • Very high aesthetics (ceramic onlays); • High mechanical strength (depending on the material); • Less pulpal irritation; • Relatively lower cost; • Protect endodontically treated teeth.	• Less overall tooth protection; • Not suitable when less than 50% of natural tooth structure remains; • Rarely used for anterior teeth; • Poor aesthetics (metal onlays); • Not suitable if remaining tooth wall thickness is <2 mm.

Degree of invasiveness in tooth preparation for restoration

Several volumetric studies have demonstrated that tooth preparation for a full crown is much more invasive compared to preparation for onlays. Preserving the maximum possible amount of dentin during tooth preparation improves the biomechanical stability and long-term prognosis of the tooth [5].
In addition to reduced invasiveness, pulpal irritation is decreased as mechanical and thermal stimuli influence decreases on the pulp during conventional preparation.

Cementation strategies and retention

Crowns and onlays are cemented depending on the material the restoration was made of. Metal restorations rely on mechanical retention and resistance form and are cemented conventionally. In case of ceramic and composite restorations cementation depends on adhesive luting agents, which reduce the need for extensive retention and resistance form. This is referred to as non-conventional cementation.'However, it should be noted that adhesive cements have a larger chemical and thermal effects on the pulp [6].
The key advantage of adhesive cementation is that it reduces the need for retention and resistance form preparation. As a result - more volume of natural tooth structure can be preserved leading to reduced invasiveness.

Conclusion

Different materials used for crowns and onlays offer different aesthetic, biomechanical and biological properties. Metal crowns provide high mechanical strength,but they lack an aesthetic component. Metal-ceramic crowns are complex to make, but they offer a balance between mechanical strength and aesthetics. Yet their high invasiveness requires consideration of alternative restorative options. All-ceramic crowns are characterized by superior esthetic properties and high biocompatibility, but the abrasiveness of ceramic materials toward antagonist enamel must be always taken into account.

Finally, onlays ensures a less invasive approach resulting in a lower biological cost and reduced pulpal irritation, but onlays are not indicated for every patient. If a question arises regarding which material and type of restoration should be chosen for patient treatment, the answer is as follows: it depends on the clinical situation. The clinician must evaluate the remaining amount of natural tooth structure, the patient's financial possibilities and functional demands in addition to the biomechanical, biological and aesthetic properties of the restorative materials.

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This Article is composed with Editorial Assistance via AI: a language model was used in order to ensure a more smooth flow of the paper, all ideas and scientifical data interpretation are the author's own work.

ENDOCROWNS AS AN ALTERNATIVE TO POST- AND- CORE RESTORATIONS

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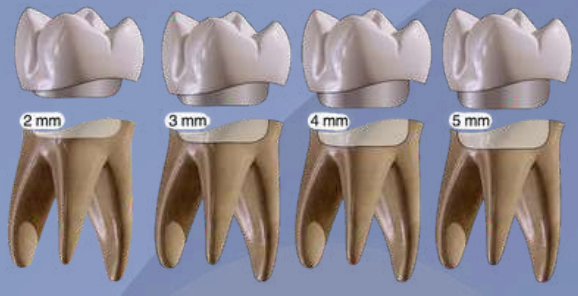
Restoring severely damaged endodontically treated teeth is a challenging procedure due to their compromised structural integrity, which may affect the long-term prognosis of the tooth. A conventional method of rehabilitation of endodontically treated teeth involves the use of post-retained foundations and crowns. With advances in adhesive techniques and a shift towards minimally invasive dentistry, endocrown restorations have been established as a solution for restoring endodontically treated teeth, particularly when post-and-core restorations cannot be applied due to anatomical and clinical contraindications. Endocrowns are essentially adhesive monoblock restorations anchored within the pulp chamber that utilise their walls for micromechanical retention. They eliminate the need for radicular posts, thereby reducing the necessity for invasive procedures that may render the tooth more susceptible to fracture.

Indications and Contraindications

Endocrown restoration is recommended in cases where there is limited interocclusal space, making it difficult to achieve adequate material thickness for conventional crowns. It may also be an option for teeth with short clinical crowns or substantial tissue loss, as achieving an adequate ferrule in such cases can be challenging, often necessitating surgical crown lengthening. Teeth with calcified or curved root canals, as well as those with slender roots, may also benefit from endocrowns, as this approach eliminates the need for radicular posts.

Endocrowns are contraindicated in cases of severe loss of tooth structure that prevents reliable adhesion, or when the pulp chamber is shallow. As endocrowns utilise the pulp chamber for both micromechanical and macromechanical retention, a minimum depth of 2 mm is required to ensure adequate adhesion (1).

Although endocrowns have been shown to be effective in molars, several studies have reported higher failure rates in premolars and anterior teeth (2, 3). This increased failure rate has been attributed to the smaller dimensions of the pulp chamber compared to molars, which reduces the surface area available for bonding. In addition, a greater preparation-to-crown height ratio generates increased leverage, leading to reduced resistance to fracture.



Pulp chamber depth in endocrown preparation contributing to restoration retention
Authors: Gaafar SS, El Ballouli D, Rayyan M, Sayed M, Basta DG, Fouad M.

Materials and mechanical properties

Lithium disilicate glass ceramic has been proven to be the most successful material for endocrown fabrication (4). This is due to its mechanical properties, aesthetic outcomes, as well as its high bonding capacity. Nevertheless, other materials such as zirconia and composite resins exhibit good behavior in particular situations. For instance, resin-based printable hybrid materials can be used to fabricate additively manufactured endocrowns (5).

Lithium disilicate endocrowns perform in most cases similarly or even better compared to post-and-core restorations (6). When these two designs are fabricated from the same material and compared, endocrowns have lower possibilities of yielding, since they are more effective in distributing occlusal forces. Endocrowns are better in withstanding stretching forces and demonstrate reduced shear stress, which implies a more reliable adhesive bond between the restoration and the abutment tooth and a decreased possibility of debonding. In both restoration designs, the stress distribution within the abutment tooth is similar, while in endocrowns lower stress is concentrated within the crown. This is mainly attributed to its monoblock structure.

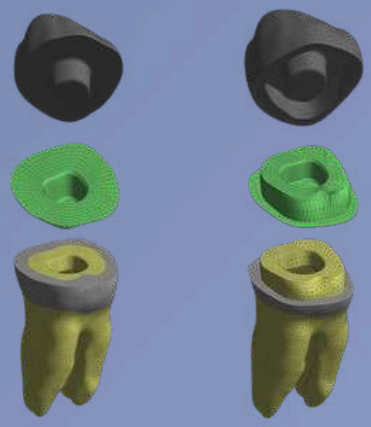
Endocrowns integrate the crown and core into a single unit, a design that promotes more uniform stress distribution, thereby reducing the risk of material failure (7). Preparation of the abutment tooth for an endocrown preserves a greater amount of tooth structure. In contrast, post-and-core restorations require removal of radicular dentin, increasing the risk of strip perforation, particularly when an oversized post space is prepared. Moreover, in some cases surgical crown lengthening is needed which necessitates gingival and supporting bone removal to expose additional tooth structure, which further compromises the structural integrity of the tooth in order to create the ferrule (8).

Preparation

Endocrowns require a specific preparation design that differs from that of conventional crowns. The literature indicates that the design of the endocrown preparation depends on the restorative material used as well as the specific clinical situation.

A minimum occlusal reduction of 2 mm for ceramic and 1–1.5 mm for composite materials is generally recommended. The thickness of the restoration, measured from the margins of the axial wall to the maximum occlusal limit, typically ranges between 3 and 7 mm, with several studies concluding that a lower thickness enhances mechanical performance (9).

Regarding margin design, a 90° circumferential enamel margin (butt joint) is typically prepared. A butt joint margin provides a wide flat surface that better withstands compressive loads. An alternative design may incorporate a ferrule effect, which is usually not involved in endocrown preparation, with a shoulder finish line. However this approach thins the dentine between the cervical extension and ferrule.



Endocrown preparation, margin design (butt joint and shoulder finish)
A*uthors: Ziting Zheng, et al.*

Endocrowns are anchored within the pulp chamber or at the canal orifice without extending into the root canal. Increasing the depth of the pulp chamber has been reported not to improve fracture resistance and may increase the risk of catastrophic failure (10). The pulp chamber is shaped using a cylindrical conical bur with a 6–7° occlusal taper.

In areas where aesthetics are not critical, supragingival margins are suggested.

Manufacturing

Endocrowns can be fabricated using conventional or digital workflows. Conventional fabrication involves taking a conventional impression, performing a wax-up, processing the restoration by pressing or casting, and finally adhesive cementation.

The digital workflow begins with acquiring data from the prepared tooth using an intraoral scanner, which are subsequently transferred to CAD (Computer-Aided Design) software for 3D design. The endocrown may then be fabricated using either additive manufacturing (AM) or subtractive manufacturing (SM). Additive manufacturing is based on layer-by-layer fabrication of the restoration according to the CAD design, whereas subtractive manufacturing involves milling the restoration from prefabricated blocks.

In both techniques, the accuracy of the endocrown is influenced by the extension into the pulp chamber, margin configuration and material selection. Regarding fabrication trueness, AM endocrowns demonstrate higher trueness of the external surface, although intraoral occlusal and interproximal adjustments may be required. Conversely applies to SM endocrowns (5). According to the literature, both AM and SM endocrowns present mean marginal gaps within the clinically acceptable threshold of 120 µm.
The complexity of the endocrown surface may affect the milling accuracy of CAD/CAM blocks (11). Therefore, a butt-joint margin configuration is recommended to simplify the design and improve manufacturing accuracy.

Cementation

Adhesive cementation plays an important role in the performance and longevity of endocrowns, as it provides micromechanical retention. Loss of adhesion can compromise marginal adaptation, leading to microleakage and failure to distribute stress evenly. The cementation procedure does differ according to the restorative material mainly regarding surface treatment and material selection. The procedure for endocrowns fabricated from lithium disilicate- a material that is preferred for its inherent properties- involves preparation of both the restoration and the abutment tooth. The surface of the endocrown is etched with hydrofluoric acid, followed by application of a bonding agent and adhesive resin cement. The abutment tooth is etched with orthophosphoric acid, after which a bonding agent is applied (12).

Conclusions

Endocrowns are a promising treatment option for restoring endodontically treated molars, constituting an aesthetically pleasing restoration that combines adequate retention and excellent mechanical properties.

Their preparation preserves the remaining tooth structure, aligning with the principles of minimally invasive dentistry. From a mechanical perspective, endocrowns equal or exceed the performance of conventional post- and- core restorations, making them an alternative for restoring teeth with extensive coronal loss. The success of these restorations is multifactorial, relying on careful case selection and diligent implementation of adhesive procedures. While current evidence strongly recommends their use in molars, further research is required to evaluate their potential in premolars and anterior teeth. Moreover, ongoing studies are investigating the longevity and clinical behavior of endocrown fixed dental prostheses (FDPs) and indicate that they may serve as an alternative to post- and- core FDPs (13). Additional clinical data will be helpful in establishing their indications.

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ORAL HEALTH PROBLEMS AND DENTAL CARE IN INDIVIDUALS WITH INTELLECTUAL DISABILITIES

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Intellectual disability is defined as a developmental condition characterised by impaired cognitive and social functioning that begins during childhood and persists throughout life [1]. Although this condition affects many aspects of daily living, oral health remains overlooked. Yet oral health plays a crucial role in overall wellbeing, influencing nutrition, speech, social interaction and self-esteem. Individuals with intellectual disabilities experience a disproportionately high burden of oral disease and face multiple barriers to receiving adequate dental care. Understanding these challenges is essential for strengthening preventive strategies and ensuring accessible oral care [2].

Increased Oral Disease Burden

ENumerous international studies have shown that individuals with intellectual disabilities have significantly poorer oral health compared to the general population. Higher prevalence of periodontal disease and dental caries is consistently reported [3,4]. One longitudinal study demonstrated that training direct care staff to improve daily oral hygiene routines led to measurable improvements in plaque control and gingival health, highlighting inadequate daily hygiene as a major contributing factor to oral disease in this population [5].

Limited motor coordination, reduced attention span and difficulties understanding oral hygiene instructions make independent tooth brushing challenging. As a result, many individuals depend on caregivers for daily oral care. However, caregivers often face competing responsibilities and may lack sufficient training or motivation to prioritise oral hygiene [5].

Dietary habits further exacerbate oral health problems. Individuals with intellectual disabilities have been shown to present with higher body mass index values than the general population, partly due to frequent consumption of processed foods and the side effects of psychotropic medications. Sugary snacks are also commonly used as behavioural rewards, increasing the risk of dental caries. Refined carbohydrates and sugar remain major contributors to both caries development and periodontal inflammation [3].

Why Oral Health Matters

Oral health has a direct impact on general health and daily functioning. Chewing, swallowing, speech and saliva production all depend on healthy dentition and periodontal tissues. In individuals with intellectual disabilities, oral disease may have an even greater systemic impact than in the general population due to comorbidities and long-term medication use [6].

Many commonly prescribed medications are associated with adverse oral side effects. Xerostomia is frequently linked to psychotropic drugs with anticholinergic effects, including tricyclic antidepressants (e.g., amitriptyline) and several antipsychotics (e.g., olanzapine, clozapine), which reduces the protective role of saliva and increases susceptibility to infection and caries [6–8]. Gingival irritation or enlargement can also occur with certain long-term medications, notably phenytoin [6,9]. Altered taste perception has been reported with antidepressants, including SSRIs [6,8]. In addition, antipsychotics may cause extrapyramidal symptoms, including acute muscle spasms and dystonia, which can complicate oral hygiene and tolerance of dental procedures [6,10].

Beyond physical health, oral health strongly influences psychological wellbeing and social participation. Chronic dental pain may trigger behavioural problems and sleep disturbances. Poor dental appearance and halitosis may contribute to social withdrawal, reduced self-confidence and stigma. Conversely, effective oral care can improve comfort, appearance and quality of life [6].

Common Dental Conditions

Periodontal disease represents the most prevalent oral health problem among individuals with intellectual disabilities. Its high prevalence is primarily linked to inadequate plaque control rather than the disability itself. Dental caries is also frequently observed and often remains untreated until advanced stages due to limited access to routine dental care [4].

Certain craniofacial syndromes associated with intellectual disability, such as Down, Cornelia de Lange syndrome, and Williams syndromes, are associated with a higher likelihood of malocclusion and dental anomalies (e.g., hypodontia, delayed eruption, abnormal tooth morphology) [11-13]. Additionally, harmful oral habits such as bruxism and tongue biting are common and may lead to enamel wear, tooth fractures and soft tissue injuries [6].

Barriers to Dental Treatment

Dental visits often provoke anxiety and fear in individuals with intellectual disabilities. Clinical environments, unfamiliar instruments and previous negative experiences may trigger stress responses. Studies indicate that frequent dental visits are associated with increased anxiety in this population [6].

Behavioural challenges present additional obstacles. Hyperactivity, impulsivity and limited ability to remain still complicate dental procedures. Some patients display self-injurious behaviour or resist treatment, increasing safety concerns for both patients and clinicians [6].

Socioeconomic factors also contribute to reduced access to care. Many adults with intellectual disabilities experience unemployment and lack comprehensive dental insurance, limiting their ability to seek preventive services. At the same time, some dental professionals feel inadequately trained to manage special care patients and may avoid providing treatment in general practice settings. As a result, tooth extraction is often chosen over conservative restorative care, contributing to early tooth loss and long-term functional impairment [6].

Behaviour Management Strategies

Although clinical procedures for individuals with intellectual disabilities are similar to those performed in the general population, behaviour management remains the key challenge. Proper appointment planning can significantly improve cooperation. Short morning visits are often more successful due to improved attention and reduced fatigue [6].

Collecting detailed medical and behavioural histories before treatment allows clinicians to anticipate potential challenges. Understanding communication abilities, medication use and previous dental experiences helps tailor treatment approaches [6].
Creating a calm and supportive environment is equally important. Soft lighting, reduced noise and minimal visual stimuli can help decrease anxiety. A gentle communication style, slow movements and positive reinforcement improve patient cooperation [6].

The "tell-show-do" technique has proven particularly effective. Explaining procedures, demonstrating instruments and gradually introducing treatment steps help reduce fear and improve understanding. Reward-based motivation, such as verbal praise or small incentives, further reinforces positive behaviour [6].

When behavioural techniques are insufficient, sedation or general anaesthesia may be necessary to ensure patient safety and treatment success. Physical restraints should only be used when absolutely required to prevent injury and must never be applied as punishment. Informed consent from caregivers is essential in such cases [6].

Prevention as Priority

Preventive care represents the most effective strategy for improving oral health outcomes in individuals with intellectual disabilities. Reducing the need for complex and stressful procedures should be a primary goal for dental professionals [3,6].
Caregivers play a central role in daily oral hygiene. Specially designed toothbrushes with adapted handles (Figure 1) or triple-headed brushes (Figure 2) can compensate for limited motor skills and improve plaque removal. Floss holders (Figure 3) and interdental aids further facilitate daily cleaning [3].

Figure 1. Example of a customized (built-up) toothbrush handle to improve grip in individuals with limited manual dexterity. Adapted from Colvenkar *et al.* [14]

Figure 2. Triple-headed (three-sided) toothbrush designed to facilitate plaque removal from buccal, lingual and occlusal surfaces simultaneously. Adapted from Doğan *et al.* [15]

Figure 3. F-shaped floss holders. Adapted from Nimmanon *et al.* [16]

Chemical plaque control agents such as chlorhexidine mouthwash or gels may supplement mechanical cleaning in patients with poor brushing ability. Fluoride therapy remains a cornerstone of caries prevention. Fluoridated toothpaste, fluoride varnish and topical gels strengthen enamel and significantly reduce decay risk [3].
Dental sealants applied to newly erupted teeth provide additional long-term protection. Regular dental check-ups allow early detection of disease and reinforcement of preventive habits [3].
Dietary counselling is equally important. Reducing sugar intake and limiting processed foods can substantially lower caries risk. Caregivers should be educated on healthier reward alternatives that do not compromise oral health [3].

Conclusions

Individuals with intellectual disabilities face a significantly higher burden of oral disease due to a combination of biological, behavioural and social factors. Poor oral hygiene, unfavourable dietary habits and limited access to dental services contribute to increased prevalence of periodontal disease and caries. Behavioural challenges and systemic barriers further complicate dental treatment delivery.

However, targeted prevention strategies, caregiver involvement and appropriate behaviour management techniques can significantly improve outcomes. By prioritising preventive care and developing inclusive dental services, future dental professionals can help reduce oral health inequalities and improve quality of life for this vulnerable population.

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IMPLANT OR ENDODONTIC TREATMENT? WHEN TO CHOOSE EACH OPTION


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With the continued development of implant dentistry, clinicians are increasingly faced with the dilemma between preserving a natural tooth through non-surgical root canal treatment or extracting it and replacing it with a single-tooth implant. This article presents a comparison of these two treatment approaches and outlines the factors that influence the choice between the two.

Endodontic treatment vs implants

Several studies have reported and compared outcome data for both non-surgical root canal treatment and single-tooth implants evaluating both the success rates and long term survival of these treatments. Vahdati *et al.* (2019) reported similar survival rates for the two treatment approaches, with both endodontically treated teeth and implant-supported single crowns placed in the same patients, demonstrating success rates of approximately 95%, with a follow-up period exceeding 5 years. These findings describe the long-term performance of both modalities under clinical conditions. The comparable success and survival rates indicate that both treatment options can be effective when performed according to appropriate clinical criteria and protocols.

The value of preserving the tooth

Preserving a natural tooth whenever possible remains a fundamental principle in dental treatment. Retaining the tooth helps maintain the patient's natural oral anatomy, including the periodontal ligament and alveolar bone, which contribute to proprioception and overall oral function. Endodontic treatment eliminates infection and inflammation while preserving the natural tooth structure, providing a durable and cost-effective solution. Additionally, preserving natural teeth can avoid some of the surgical risks, longer healing times and the increased number of clinical appointments associated with implant placement. While advances in implant dentistry have expanded treatment options, the biological and functional advantages of a natural tooth support the efforts to preserve them, when clinically feasible. This is particularly relevant in patients over 60 years of age in whom the extraction of each natural tooth may contribute to increased dental fragility and a higher risk of functional and structural deterioration.

When endodontic treatment is the preferred option

Endodontic treatment is often the preferred option when the natural tooth has sufficient remaining structure and the surrounding periodontal tissues are healthy, or can be controlled. This approach is generally favoured in younger patients, whenever feasible, as preserving natural teeth and avoiding extractions helps maintain long term oral function. In cases where the tooth can be properly disinfected, shaped, and sealed to eliminate infection, root canal therapy can successfully preserve function and aesthetics.

An important requirement for proceeding with endodontic treatment is the ability to achieve adequate isolation of the tooth, typically using a rubber dam, to prevent contamination during the procedure. Moreover, proper restoration following endodontic therapy plays a crucial role in the long-term success of the tooth. A key factor in restoration durability is the presence of a ferrule effect, which requires a vertical length of the remaining dentin above the preparation margin to reinforce the tooth and prevent fracture. Ideal results are obtained when the ferrule height measures between 1.5 and 2 millimeters. Without sufficient ferrule, the risk of restoration failure and root fracture increases significantly.

Advantages of dental implants

Dental implants provide a predictable and effective method for single-tooth replacement when the natural tooth is deemed non-restorable. Unlike conventional fixed dental prostheses, implants do not require alteration of adjacent teeth and preserve their structural integrity.

Additionally, implant placement supports alveolar bone preservation by providing functional stimulation that mitigates post-extraction bone resorption. Advances in implant surface technology and surgical protocols have contributed to improved osseointegration and long-term survival rates, making them a reliable option in treatment planning.

When extraction and implant placement is the preferred option

Extraction followed by implant placement is often considered when the natural tooth is severely compromised or unlikely to respond to endodontic treatment. Situations such as extensive structural damage or persistent infection after repeated root canal therapy may render tooth preservation unfeasible. Furthermore, the presence of vertical root fracture is an important factor that often favours extraction over endodontic treatment. When vertical fractures are detected, the prognosis for endodontic therapy is poor, and preservation may lead to persistent symptoms. Moreover, evaluating the periodontal status is an essential step in treatment planning. This assessment primarily involves examining horizontal bone loss around the tooth, where bone loss exceeding two-thirds of the root length is generally considered a poor prognostic factor. Additionally, probing depth and tooth mobility are important factors; third-degree mobility indicates severe attachment loss and is usually associated with a poor prognosis. However, these findings are always considered in combination with other clinical factors, and a comprehensive evaluation is necessary. In these cases, implants provide a viable alternative with predictable functional and aesthetic outcomes. Furthermore, implants can be advantageous in teeth with poor restorative prognosis, for example teeth with no ferrule effect. Also, they can be advantageous in teeth where endodontic treatment is considered very challenging—such as in a removal of a separated instrument or in a removal of an intracanal post. However, careful evaluation of patient-specific factors, including bone quality, systemic health, and patient preferences, is essential before deciding on extraction and implant placement.

Both non-surgical root canal treatment and implant placement demonstrate high and comparable long-term survival rates. Whenever sufficient tooth structure, an adequate ferrule, and manageable periodontal conditions are present, endodontic treatment is generally preferred, since preserving the natural tooth maintains biological and functional integrity. However, in cases of non-restorable teeth, vertical root fractures, or severe periodontal compromise, extraction followed by implant placement represents a predictable and effective alternative. Ultimately, the decision should be based on careful clinical evaluation and individualized patient needs.

For References

Discover iTOP in Budapest

Preventioninpracticeatthe78thEDSA Meeting

This summer, Budapest will welcome dental students from across Europe on **17–21 August 2026** for a week of learning, exchange and new perspectives on modern dentistry.

A highlight of the programme is the **iTOP concept**, focusing on prevention and effective biofilm management. Through hands-on sessions, students will work with preventive tools from **Curaprox**, translating theory into practical skills.

What is iTOP?

iTOP (Individually Trained Oral Prophylaxis) is a science-based educational concept focused on **prevention**, **precise biofilm control** and **long-term behaviour change**. It emphasises what truly sustains oral health: correct technique, patient motivation and effective daily oral hygiene. For dental students, iTOP offers practical skills that can be applied in clinical practice and later transferred to patients.

Why It Matters

Prevention is becoming one of the defining competencies of modern dentistry. Guiding patients toward **effective daily oral hygiene** is just as important as clinical treatment and plays a key role in maintaining **long-term oral health**.
The iTOP sessions in Budapest give students the opportunity to experience **prevention in practice**, strengthening skills they will use in their future clinical work.

Hands-on Touch to Teach Sessions

Students will have the opportunity to participate in **two Touch to Teach (T2T) workshops**, each lasting 1.5 hours and conducted in small groups of approximately eight students per instructor, allowing for close guidance and individual feedback.

Participants will practise essential oral hygiene techniques such as the **Bass technique**, the **Solo (single brush) technique**, and the correct use of **Curaprox interdental brushes.** Each participant will receive a **free Curaprox Hydrosonic device**, offering the opportunity to explore how powered brushing can support effective biofilm management and daily self-care.

Through the **T2T methodology**, students learn by feeling the correct pressure, angulation and movement — developing precision that cannot be achieved through lectures alone. The workshops will be led by Hungarian iTOP instructors **Dr. Virág Rákász**, **Dr. Fanni Török** and **Dr. Attila Fenyő**, and the programme will also include a lecture by **Dr. Dóra Tihanyi** on prevention, patient education and biofilm management in modern dental practice.

Registration

Places in the iTOP workshops are limited. Students interested in participating are kindly asked to **register directly with the local EDSA team**.

Curious to explore the concept further?

Scan the QR code to learn more about the iTOP approach, its scientific foundation and how prevention-oriented oral health education supports modern dental practice.

Learn more

about iTOP

THERAPEUTIC MANAGEMENT OF LATERAL INCISOR AGENESIS: A COMBINED ORTHODONTIC AND RESTORATIVE APPROACH

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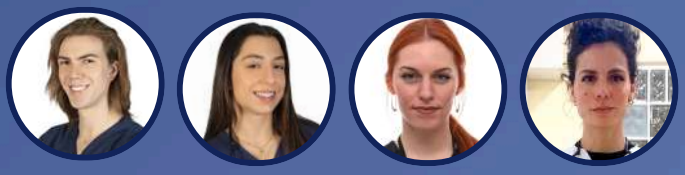

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The congenital absence of one or both maxillary lateral incisors, known as maxillary lateral incisor agenesis (MLIA), represents one of the most common developmental dental anomalies. According to Kiliaridis *et al.*, maxillary lateral incisor agenesis is the second most common form of dental agenesis, following third molar agenesis. This condition has significant functional and aesthetic consequences, affecting smile symmetry, anterior guidance, occlusal relationships, and patient's self-esteem, particularly in adolescents and young adults [1–3]. MLIA often coexists with microdontic or peg-shaped contralateral incisors (Mi or Peg MLI), which further complicates clinical management and necessitates a carefully coordinated orthodontic and restorative approach [2,4].

The etiology of MLIA is multifactorial, involving genetic, epigenetic, and environmental factors. Mutations in genes such as MSX1, PAX9, WNT10A, SPRY2, and SPRY4 have been associated not only with agenesis but also with anomalies in tooth size and shape [1,2]. Local factors, including trauma or infection affecting the dental lamina, may also contribute, while it can be part of syndromic presentations such as ectodermal dysplasia or cleft lip and palate [5,6]. Due to its functional and aesthetic implications, MLIA requires individualized, multidisciplinary treatment plan, combining orthodontic space management with restorative interventions to achieve optimal outcomes in smile aesthetics, periodontal health, and occlusion [7,8].

Management Strategies for Congenitally Missing Maxillary Lateral Incisors

Management of MLIA requires a coordinated interdisciplinary approach. The main treatment strategies are orthodontic space closure with canine substitution and space opening followed by prosthodontic rehabilitation. The choice between them is guided by factors such as patient age, skeletal growth, occlusal relationships, smile line, and canine morphology.

Orthodontic Space Closure with Canine Substitution

Management of MLIA requires a coordinated interdisciplinary approach. The main treatment strategies are orthodontic space closure with canine substitution and space opening followed by prosthodontic rehabilitation. The choice between them is guided by factors such as patient age, skeletal growth, occlusal relationships, smile line, and canine morphology.

Smile at 13 years of age. Case treated with space closure, with maxillary canines replacing the missing maxillary lateral incisors.
Author: Schroeder, Daniela Kimaid *et al.* "Agenesis of maxillary lateral incisors: diagnosis and treatment options." Dental press journal of orthodontics vol. 27,1 e22spe1. 6 Jun. 2022, doi:10.1590/2177-6709.27.1.e22spe1

Indications for space closure include favorable skeletal profiles, mild mandibular crowding, and malocclusions compatible with mesial tooth movement. Class I molar relationship with minor crowding in the mandibular anterior segment or Class II/end-to-end relationship without crowding and dental protrusion in the lower arch are particularly suitable when canine and premolar morphology allows effective recontouring [1,10].

This technique involves specific tooth and gingival modifications aiming to achieve a harmonious aesthetic result. Canines are recontoured to reduce labial and proximal convexities, eliminate the lingual cingulum, and approximate the size and shape of a lateral incisor. Vertical orthodontic movements (canine extrusion and first premolar intrusion) align gingival margins to reproduce natural contours. After orthodontic movement, the teeth are restored with direct composite veneers or ceramic veneers to refine tooth shape and color [2,4,6].
Clinical studies demonstrate that space closure preserves periodontal health better than prosthetic alternatives, with lower plaque accumulation and reduced gingival inflammation. Aesthetically, space closure is generally well accepted by patients. Functionally, group function occlusion is typically achieved, and the absence of canine guidance does not significantly increase the risk of temporomandibular disorders. Long-term stability is enhanced with fixed lingual retainers or removable appliances, which prevent relapse and protect the dentition from parafunctional forces [11,10].

Space Opening with Prosthodontic Rehabilitation

In cases where space closure is contraindicated, such as unfavorable skeletal profiles, significant dental protrusion, or when the patient's preference is to preserve natural tooth positions, orthodontic space opening followed by prosthodontic rehabilitation is indicated. Orthodontic treatment aims to achieve adequate interradicular space and parallel root alignment, allowing placement of implants or fixed prosthetic restorations [1,12,13].

Prosthodontic options include tooth-supported restorations such as one-wing or two-wing resin-bonded bridges, cantilevered or conventional three-unit fixed partial dentures, as well as single-tooth implants. Resin-bonded restorations are minimally invasive and preserve adjacent teeth, whereas cantilevered and full-coverage fixed partial dentures are suitable when occlusal demands are greater or adjacent teeth require extensive restorative work [12,13].

Single-tooth implants are increasingly utilized because they do not require preparation of adjacent teeth. However, implant placement should be delayed until skeletal growth is complete to prevent infraocclusion. Adequate alveolar bone volume and interradicular spacing are critical, and adjunctive orthodontics is often necessary to ensure optimal implant positioning [13,10].

Although prosthodontic rehabilitation achieves predictable occlusion and aesthetics, it carries higher risks of plaque retention and gingival inflammation compared to space closure. Implants may face long-term challenges including gingival recession, papilla loss, and infraocclusion, particularly in the anterior aesthetic zone. Patient aesthetic perception generally favors space closure over prosthodontic replacements, however space opening remains a valid therapeutic option and can be combined with a variety of restorative solutions [11,10].

A. Image of adult patient with low smile, after orthodontic space opening for implant placement in the regions of maxillary lateral incisors.

B. The presence of bone dehiscence on the buccal walls of teeth #12 and #22 could compromise the smile esthetics, if there was any degree of gingival exposure

Author: Schroeder, Daniela Kimaid *et al.* "Agenesis of maxillary lateral incisors: diagnosis and treatment options." Dental press journal of orthodontics vol. 27,1 e22spel. 6 Jun. 2022, doi:10.1590/2177-6709.27.1.e22spel

Management of Contralateral Microdontic or Peg-Shaped Lateral Incisors

Contralateral Mi or Peg MLI can be restored with direct composite or ceramic veneers to improve symmetry and aesthetics. In selected cases, extraction may be considered to facilitate bilateral space closure. Ceramic restorations provide superior optical properties, durability, and long-term color stability, whereas composite veneers are minimally invasive and easily repairable. Digital tools such as wax-ups, mock-ups, and digital smile design facilitate planning and patient communication [3,7].

Aesthetic, Periodontal, and Functional Outcomes

Both space closure and space opening with prosthetic rehabilitation can achieve satisfactory aesthetic outcomes. Space closure better preserves gingival contour and interdental papillae, resulting in more natural soft tissue appearance. Periodontal health is generally superior with space closure, showing lower plaque and bleeding indices [4,5].

Functionally, both strategies can provide occlusal stability when properly planned and executed. In space closure, anterior guidance is usually achieved through canine substitution and group function, whereas in space opening it is provided by prosthetic restorations supported by teeth or implants.

The management of maxillary lateral incisor agenesis should be individualized and based on a multidisciplinary approach, taking into account skeletal and dental malocclusion, available space, alveolar bone volume, facial profile, gingival display, tooth morphology, symmetry, and patient growth potential. Accordingly, the decision between orthodontic space closure and space opening should be guided by a comprehensive evaluation of skeletal, dental, and aesthetic parameters, as well as patient preferences.

For References

THE PRESENT AND FUTURE LANDSCAPE OF REGENERATIVE ENDODONTIC THERAPY

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Each year, approximately one in seven newly graduated dentists pursues specialization in endodontics (root canal therapy). Concurrently, an estimated 15 million root canal treatments are performed annually, a figure that continues to rise year after year. This simultaneous rise in both professional interest and the volume of clinical endodontic cases underscores the need for continued improvement and advancement within this specialized field.

Studies conducted over the past decade by leading universities and research centers have demonstrated that regenerative endodontics, as a comprehensive therapeutic concept, is not only feasible but also clinically applicable, offering significant advantages over conventional treatment protocols. Emerging technologies—including stem cell–based regeneration, controlled apexification, and pulp–dentin regeneration through cell transplantation—are currently under extensive investigation. Ongoing advancements have demonstrated that such alternative therapeutic protocols are not only feasible but increasingly viable. Accordingly, this article will present and critically examine these innovative techniques, which have the potential to fundamentally transform the way endodontics is perceived and practiced.

Dentin renaissance: Building Dentin with Stem Cells

The concept of regenerative endodontics is far from being a recent innovation. In fact, its origins can be traced back to the 1970s, when Dr. Birger Nygaard-Østby conducted pioneering experiments in pulp revascularization. At a time when endodontic treatment was largely focused on the complete removal of diseased pulp tissue, Nygaard-Østby's work demonstrated that the dental pulp has the inherent potential for healing and regeneration. His experiments provided early evidence that endodontics could extend beyond mere pulp extirpation to include the revival and functional restoration of pulp tissue, laying the conceptual foundation for the modern approaches to regenerative therapies that we continue to develop and refine today. Although the first cases of pulp revascularization were documented as early as the 1970s, it was not until the early 2000s that the concept began to attract significant attention from the clinical community. This renewed interest has since catalyzed a surge of research, driving continuous advancements and innovations within the field of regenerative dentistry that are shaping contemporary endodontic practice.

Stem cells are undifferentiated cells characterized by their capacity for self-renewal and their potential to differentiate into specialized cell types, thereby playing a pivotal role in tissue development, repair, and regeneration. The source of mesenchymal stem cells (MSCs) varies according to the intended therapeutic application and the type of tissue targeted for regeneration. These cells can be harvested both prenatally, during intrauterine development, and postnatally, after birth.

Among the most common collection sites are the bone marrow, developing teeth and dental tissues in the deciduous stage, and the amniotic sac or amniotic fluid during prenatal development. Initial attempts at pulp regeneration using stem cell transplantation involved autologous cells harvested from the dental pulp of other teeth. These cells were subsequently implanted in combination with either synthetic or natural scaffolds. Both preclinical and clinical studies have demonstrated that such cells are capable of regenerating pulp tissue through revascularization, forming pulp-like tissue with a dense capillary network, and promoting the healing of periapical lesions—even in fully developed teeth affected by pulp necrosis. Among the various stem cell sources, bone marrow mesenchymal stem cells (BMMSCs) have shown greater potential for remineralization and differentiation compared to dental pulp stem cells (DPSCs). Alternative scaffold-free approaches are also currently being explored, including spherical or three-dimensional cell sheets. However, the success of these strategies ultimately depends on the intrinsic ability of the cellular units to integrate and form larger, functional tissue constructs.

Although stem cell–based protocols for pulp regeneration hold considerable promise, their clinical applicability remains limited due to the high logistical demands and the absence of standardized protocols for cell isolation, handling, and cultivation.

Layer by Layer: 3D Bioprinted Pulp

Bioprinting and tissue printing, as standalone concepts, are by no means new to medicine or dentistry. The production of printed organs and biological structures—ranging from tissues and bone to ligaments—has already been incorporated into regenerative strategies, owing to the high effectiveness and precision of these techniques. By enabling the fabrication of complex, three-dimensional biological constructs, bioprinting offers unparalleled opportunities to mimic natural tissue architecture, enhance healing, and potentially replace or repair damaged structures. Over the past decades, advances in printing technology and bio-ink formulation have progressively expanded the scope of bioprinting, making it a cornerstone of modern regenerative medicine.

Among the various bioprinting approaches, inkjet-based bioprinting remains one of the earliest and most widely utilized methods. This technique relies on additive, layer-by-layer tissue construction using bio-inks that not only exhibit excellent biological compatibility but can also replicate tissue-specific properties and functions. In the context of regenerative dentistry, modern bioprinters are now capable of recreating highly precise dentin–pulp cell matrices that are tailored to the individual patient. These constructs preserve key characteristics of the patient's native tissue, including porosity, surface texture, wettability, and viscosity, thereby optimizing the integration and functional performance of the regenerated pulp–dentin complex.

Hormonal Pathways to Pulp Healing

Dentinogenesis is the biological process by which dentin is produced during both embryonic and post-embryonic stages. Dentin is a highly mineralized tissue (less so than enamel) that constitutes the majority of the tooth. It serves multiple functions, including acting as a communication medium between the avascular enamel and the highly vascularized pulp. This process is orchestrated by odontoblasts, specialized cells derived from the neural crest, which deposit an organic matrix that subsequently mineralizes to form mature dentin. Dentin can be classified into three types: primary dentin, formed during embryonic development; secondary dentin, deposited after the eruption of deciduous teeth; and tertiary dentin, produced as a defense mechanism in response to irritative stimuli.

Human growth hormone (HGH), secreted by the anterior pituitary gland, directly influences dentinogenesis. HGH stimulates the liver to produce insulin-like growth factor 1 (IGF-1), a key mediator of cellular proliferation and differentiation, including that of odontoblasts. HGH-based regenerative protocols exploit this mechanism by inducing the controlled release of IGF-1 and TGF-β1 (Transforming Growth Factor Beta 1), either locally or systemically. When incorporated into collagen-based hydrogels, these growth factors recreate biological conditions (such as slightly alkaline pH) that mimic the natural environment of dentinogenesis, effectively stimulating bone marrow mesenchymal stem cells (BMMSCs) to differentiate into fully functional odontoblast-like cells and produce new dentin.

Despite these promising approaches, gene therapy and hormone-induced dentinogenesis remain largely experimental. Most results have been achieved under controlled laboratory conditions, and clinical applicability is still limited. While the data are encouraging and ongoing research is likely to bring significant advancements, in my view, HGH-based regenerative endodontics is not yet ready for routine clinical use.

From Bench to Chairside: Clinical Consideration and Conclusions in Regenerative Endodontics

Regenerative endodontics aims to restore the natural biology of the tooth rather than replace it with inert materials. Despite its promise, regenerative endodontic protocols (REPs) remain largely experimental due to the stringent requirements needed to ensure success and justify their logistical complexity.

Several factors critically influence REP outcomes. The apical diameter (ideally 0.5–1.0 mm) affects pulp revascularization, while patient age and systemic health influence cellular response. The quality, source, and preservation of stem cells and HGH are essential for gene- and cell-based protocols. Common endodontic irrigants, such as EDTA, may inhibit regenerative factors, further affecting success. Given the many interdependent variables that must be controlled, REPs are not yet routine in clinical practice. While theoretically advantageous, their complexity and sensitivity currently limit widespread adoption.

I would like to express my heartfelt gratitude to Professor Marco Bottino and Dr. Lais Cardoso (University of Michigan, School of Dentistry, USA) for their invaluable mentorship, guidance, and expert insights, which were instrumental in the development and preparation of this paper.

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MANAGING DRY MOUTH IN POLYPHARMACY

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According to the World Dental Federation and the European Association of Oral Medicine, xerostomia refers to a subjective sensation of oral dryness that may occur independently of hyposalivation, meaning an objectively reduced salivary flow (1,2). Polypharmacy, in line with WHO-linked work and geriatric medicine literature, is often operationalised as the regular use of five or more medications (3,4).

These two concepts intersect in daily dental practice: xerostomia reflects the disturbance of saliva, while polypharmacy demonstrates the complexity of systemic care in ageing populations (3,5). Among dental students engaged in clinical training, understanding these shared definitions is a crucial first step to recognising and managing medication-related dry mouth as a predictable and potentially preventable clinical problem rather than an inevitable side effect (2,4,7).

Why polypharmacy dries the mouth

Xerostomia is a symptom, but systemic drugs are one of its major causes, especially in older adults who are routinely treated in dental clinics (1,2,7). Case-control and register-based studies show that patients exposed to polypharmacy have significantly higher odds of reporting dry mouth than those on fewer drugs, even after adjustment for age and comorbidities (4,5,8). The risk appears to increase in a dose–response fashion, with xerostomia becoming more common as the number of medications rises beyond five or more (3,4,8). Certain pharmacological groups stand out as contributors, including antidepressants, antipsychotics, antihypertensives, diuretics and antihistamines. These agents often result in dry mouth because they raise anticholinergic levels, reduce the parasympathetic signals that trigger saliva production, or lead to overall dehydration. (1, 7, 9).

Clinical work on polypharmacy emphasises that both the absolute number of medicines and the presence of xerogenic classes matter when predicting xerostomia (3, 5, 9). For dental students, this means that simply counting drugs is useful, but pairing that count with a quick scan for typical "dry mouth drugs" gives a much clearer picture of risk in each patient (4,7,8).

Recognising xerostomia in the clinic

Patients with medication-related xerostomia often report a sticky or burning sensation, difficulty swallowing dry food, the need to sip water at night, or problems with dentures that suddenly feel less stable (1, 2, 6). Clinically, findings may include dry or erythematous mucosa, minimal or no pooled saliva, a fissured tongue, angular cheilitis, and an increased prevalence of cervical and root caries (1, 9). When feasible, objective assessment can support clinical suspicion. Measuring unstimulated whole salivary flow can help assess dryness; values under roughly 0.1 ml per minute usually suggest hyposalivation and the need for treatment. (2, 7). Significant dry mouth can develop even without a major drop in saliva production, which underlines the need to evaluate symptoms, not just flow rates.

Population-based studies show that xerostomia is more frequent in women and in older adults with multiple chronic conditions, who are also the patients most likely to meet criteria for polypharmacy (4, 5, 11). A pragmatic, student-friendly screening approach can therefore include three simple steps: taking a brief history focused on dry mouth symptoms, reviewing the medication list for both polypharmacy assessment and xerogenic classes, and visually assessing salivary pooling and caries patterns (1, 3, 4). The approach suits the typical time constraints in student clinics and supports early detection of important clinical cases. (4,5,8).

Stepwise management strategies

International guidelines and narrative reviews recommend a stepwise approach to xerostomia management. It begins with non-pharmacological strategies aimed at preserving residual salivary function and protecting oral tissues. (1,2,7). Basic measures include encouraging regular water intake, avoiding alcohol and caffeine, using sugar-free chewing gum or lozenges to stimulate saliva, and maintaining meticulous oral hygiene with high-fluoride toothpaste or additional fluoride products to counteract the increased risk of dental caries (1, 7, 12). In the student setting, these interventions are particularly valuable because they are low-cost, easy to explain, and can substantially improve patient comfort when reinforced consistently (7,12).

When basic measures fail to relieve symptoms, saliva substitutes and stimulants offer the next steps. Products like lubricating gels, sprays, or rinses with bioadhesive properties provide temporary oral coating and better moisture. Reviews confirm better patient-reported xerostomia in elderly users (7, 12, 13). In selected patients with residual salivary gland function, systemic muscarinic agonists such as pilocarpine or cevimeline may be beneficial. These agents have demonstrated efficacy in reducing xerostomia and improving salivary flow, particularly in conditions associated with gland hypofunction, such as Sjögren's syndrome or following radiotherapy (2,7,14). Their use, however, requires careful patient selection and medical supervision.

Level of Strategy	Exaples	Main Aims
Behavioural	Water intake, avoid alcohol and caffeine, sugar-free gum	Support residual salivary function and comfort (1,7,12)
Topical	Saliva-substituting gels, sprays, rinses	Lubricate oral tissues and ease symptoms (7,12,13)
Systemic	Muscarinic agonists where indicated	Stimulate salivary glands if functional tissue remains (2,12,14)
Medication review	Adjust or deprescribe xerogenic drugs	Reduce underlying iatrogenic cause (3,4,15)

Stepwise strategies for xerostomia in polypharmacy

The dental student's role in a team

Polypharmacy-related xerostomia is a truly multidisciplinary issue, involving dentistry, medicine and pharmacy (4,5,15). Studies on older adults consistently show that xerostomia and hyposalivation are associated with worse oral health-related quality of life, especially in domains relating to pain, function and psychological wellbeing (5,11). For dental students, this means that taking xerostomia seriously is not only a matter of caries prevention but also of supporting broader quality of life in vulnerable patients.

In practice, students can contribute by systematically documenting all prescribed and over-the-counter medications, highlighting drug counts that meet polypharmacy thresholds, and flagging typical xerogenic drug classes in the notes (3,4,15). They can also provide patient-centred education on how medications may affect saliva and oral health, and, when appropriate, draft clear and concise messages to general practitioners or pharmacists describing oral findings and possible drug-related contributions (2,4,14). At the chairside, implementing preventive strategies, including high-fluoride products, dietary advice, and saliva-supportive habits, can significantly reduce the risk of rampant caries, candidiasis, and functional impairment (1, 7, 12, 13). Even at the student level, these actions can make a real difference to long-term oral health outcomes.

Take-home message for future dentists

As populations age and polypharmacy becomes more common, medication-related xerostomia will remain a routine challenge in dental practice (3,4,5). By anchoring their approach in clear, internationally recognised definitions, applying vigilant screening, following a stepwise management strategy, and collaborating with the broader healthcare team, dental students can already have a meaningful impact on salivary function and oral health in individuals in multi-drug therapy (1,2,7,15). Simple, targeted questions and interventions during everyday appointments frequently convert dry mouth from an overlooked side effect into a prioritised, patient-focused concern (4,5,8,14).

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FROM REPAIR TO REGENERATION: EMERGING CONCEPTS, CURRENT TRENDS AND FUTURE DIRECTIONS IN MAXILLOFACIAL AND PERIODONTAL MICROSURGICAL RECONSTRUCTION

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Over the past three decades, the field of surgery has undergone profound advances in both operative techniques and overall therapeutic philosophy, with traditional open, highly invasive procedures being progressively supplanted by minimally invasive approaches. This paradigm shift has effectively transformed surgeons from mere "operators who incise" into true bio-architects of the human body, capable of reconstructing and restoring form and function with increasing precision and biological respect.

Similar trends have also emerged in oral and maxillofacial surgery (OMFS) and in periodontal microsurgery, where an increasing number of clinicians are shifting their focus from merely excising and suturing tissues toward biologically driven strategies aimed at tissue regeneration and functional reconstruction. This paper represents a brief overview of the existing literature regarding regenerative strategies in oral and periodontal surgery.

Classic vs Modern Surgery

Traditionally, the role of the oral and maxillofacial surgeon has been centered on restoration, or more precisely, on complex oral rehabilitation procedures involving, but not limited to, both hard and soft tissues. Treatment modalities such as implant-supported prosthetic rehabilitations, regenerative periodontal surgery, and mucogingival aesthetic surgery all fall within the classical scope of oral and maxillofacial surgery, as well as that of periodontal microsurgery. The classical paradigm of oral and maxillofacial surgery has traditionally been associated with the image of the surgeon holding a scalpel, an instrument used to perform various incisions. Consequently, the conventional conceptual and technical foundation of oral and maxillofacial surgery was rooted in invasive surgery—procedures based on the deliberate creation of controlled tissue injuries, including incisions, wounds, and surgical cuts.

In recent years, however, a clear shift has been observed away from invasive, bleeding surgery that relies on controlled trauma to both hard and soft tissues, toward a more refined and biologically oriented surgical approach. This modern paradigm increasingly favors alternative therapeutic methods that often allow surgical treatments to be performed with minimal bleeding or even without incisions. The growing popularity and the increasing number of clinical studies not only demonstrating the efficacy but also the practical applicability of modern regenerative techniques in oral and maxillofacial surgery signal the emergence of a new horizon for the field. Protocols incorporating mesenchymal stem cells aim to harness their differentiation potential into the multiple cell types that constitute both hard and soft tissues of the stomatognathic system. This enables a fully regenerative approach, effectively allowing tissue reconstruction from the ground up.

Simultaneously, minimally invasive techniques—such as tunneling procedures in periodontal surgery or the precise repositioning of gingival mucosal segments—facilitate aesthetic corrections through incisions that are minimal or virtually nonexistent. Together, these advances reflect a sustained commitment within the surgical community to refine practice, adopt innovative methods, and reduce patient trauma relative to conventional surgical approaches. These innovative techniques, along with their underlying principles and applications, will be further described, detailed, and critically discussed in the following sections.

Tissue Reborn: Mesenchymal Stem Cells in Oral Regeneration

Stem cells are undifferentiated cells with the capacity for self-renewal and the potential to differentiate into specialized cell types, thereby playing a central role in tissue development, repair, and regeneration. The source of mesenchymal stem cells varies depending on the intended application and the type of tissue targeted for regeneration. Harvesting can occur both prenatally, during intrauterine life, and postnatally, in the extrauterine period. The most common collection sites include the bone marrow, developing teeth and dental tissues during their deciduous stage, as well as the amniotic sac and amniotic fluid during intrauterine development. Mesenchymal regenerative therapy can be applied to the regeneration of a wide spectrum of tissues, encompassing both hard and soft tissues. Examples include bone, cartilage, advanced osteoarticular structures of the temporomandibular joint, dental and periodontal ligaments, mucogingival tissues, as well as other mucosal tissues of the oral cavity.

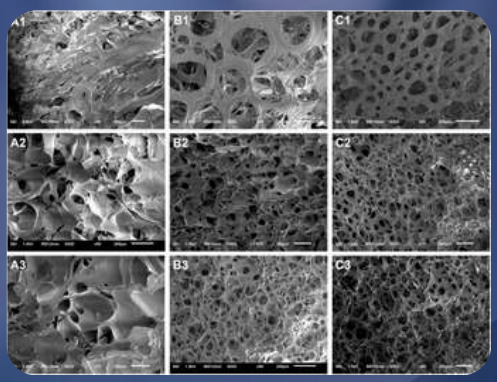
Bone regeneration with mesenchymal stem cells is achieved through the implantation of autologous osteocytes, growth factors, and scaffolds that replace the bone matrix. Stem cells can be harvested from both intrauterine and extrauterine sites, including amniotic fluid, tooth germ, progenitor cells, exfoliated deciduous teeth, periodontal ligament, umbilical cord, or amniotic membrane after birth, and subsequently induced to undergo osteogenic differentiation. Scaffolds can be derived from either natural or synthetic sources. Natural scaffolds are composed of polymers such as collagen, fibrin, or keratin, whereas synthetic scaffolds are made from aliphatic polymers like polyglycolic acid or caprolactone.

Their primary role is not only to provide structural support for newly regenerated bone through mesenchymal therapy but also to serve as a binder, integrating the various components of the developing neo-bone. In addition, osteoinductive and osteomorphogenic factors play a critical role in bone regeneration and remodeling. These factors are predominantly protein-based, with platelet-rich fibrin (PRF) being one of the most extensively studied and applied in recent years, demonstrating efficacy in both conventional oral surgery and advanced regenerative therapies. Furthermore, the FDA has recently approved the use of autologous bone marrow grafts. Bone marrow aspirate concentrate can now be obtained from sites such as the anterior or posterior iliac crest, tibia, or other suitable locations, providing a source of mesenchymal stem cells for oral and maxillofacial surgical applications.

Threads of Life: Nerve Regeneration Unveiled

Nerve dysfunctions, affecting both the trigeminal and facial nerves, are frequently observed following injury or trauma to the maxillofacial region, whether iatrogenic or caused by external factors. Traditionally, nerve degeneration or repair involved open surgical approaches, in which the damaged nerve segment was excised and the two ends approximated by the surgeon. These procedures were often complex, with patient outcomes relying as much on individual adaptability and chance as on the surgical technique itself. Recent studies on stem cells harvested from both bone marrow and adipose tissue have demonstrated remarkable capabilities in axonal remyelination and regeneration in controlled in vivo models. For instance, investigations using bone marrow-derived stem cells have shown their ability to express stem cell and neural stem cell markers, accelerate regeneration, and achieve reproducible outcomes in axonal repair and remyelination. These results are comparable, and in some cases slightly superior, to conventional approaches in regenerative neurosurgery, such as Schwann cell transplantation.

The field of neuronal regeneration is rapidly evolving, with ongoing studies pushing the boundaries of what is considered achievable through cell-based regenerative approaches. Some investigations have reported positive outcomes, demonstrating axonal regeneration and remyelination using undifferentiated mesenchymal cells of dental origin. For example, stem cells derived from dental pulp or deciduous tooth germs, under specific conditions and in the presence of appropriate modulators and stimulators, exhibit remarkable neuroregenerative potential. These findings open the door to significant advancements in neuroregenerative therapies.



Engineering the Future of Oral Surgery

Collaboration between experts in engineering and medicine is not a new concept; it has been ongoing for many years and has led to numerous innovations in the medical field. In recent years, however, a new type of engineer has emerged: the bioengineer, specializing in tissue engineering, who integrates both abstract and practical concepts related to the development and control of living matter. Concepts such as gene therapy and targeted genetic modulation, controlling the expression of specific genes that inhibit or stimulate biological responses, microperfusion and the analysis of tissue microperfusion to assess and regulate viability, as well as the biological analysis and co-stimulation of cellular and organismal responses to various stimuli, all represent emerging areas in the field of tissue engineering and bioengineering.

"The future of regenerative therapies in oral and maxillofacial surgery is exceptionally promising, poised to become routine in clinical practice"

I extend my sincere gratitude to Professor Marco Bottino and to Dr. Lais Cardoso (both from the University of Michigan, Faculty of Dentistry, United States of America) for their invaluable mentorship, guidance, and insights, which were instrumental in the preparation of this paper.

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FROM PLASTIC TO BIOCOMPATIBILITY

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Hard Beginnings

Biocompatibility is the term used to describe the state of affairs when a biomaterial exists within a physiological environment, without adversely and significantly affecting any of the other body of environment and material (Williams, 1981).

Biocompatibility is a fascinating journey that began in 1984 with Chuck Hull inventing stereolithography. Stereolithography can be described as an additive fabrication process that uses a UV laser and a liquid UV-curable **photopolymer** to build layer structures at a time. Stereolithography produces 3D solid objects in a multilayer procedure through the selective photoinitiated cure reaction of a polymer (Bártolo and Mitchell, 2003).

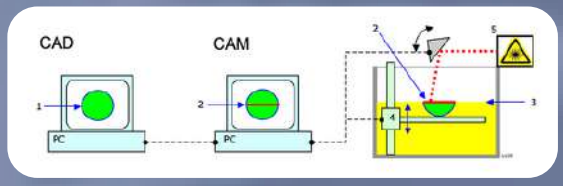

Figure 1. Basic stereolithography printing process.

Imagine the excitement: you could print objects with light. But the prototype had problems, it was brittle and toxic and if you looked at it in the sun it quickly turned yellow and cracked. The world saw a miracle of engineering, but biology saw an enemy. If we had tried to introduce those materials into the human body back then, the immune system would have reacted violently.

This is where the true challenge of biocompatibility begins - not as a simple check on a list of specifications, but as a search for the 'Holy Grail': a man-made material that could speak the language of living cells.

The Great Challenge of Survival

For the first two decades, 3D printing remained in exile in design laboratories. In dentistry, the pioneers of the 90s viewed the technology with skepticism. Early attempts to use resins in the mouth were limited to study models. Why? Because of residual monomer.

Biocompatibility was compromised by the fact that the plastic molecules never fully bonded. These stray molecules would leak into the tissues, causing inflammation. This was the early days of technology where the material was just a form, not a biological function.

Consitution of Biocompatibility

To open doors for medicine, the technology needed strict protocols, an advancement in terms of functionality compared to human cells. The track was heavy, the human body being the biggest critic in terms of foreign objects coming into contact with its living cells. The mouth is a hostile environment: acids, bacteria, strong masticatory forces of hundreds of newtons and an extremely sensitive and vascularized mucosa.

Thus, our laitmotif, biocompatibility, has received an official name: ISO 10993. This validation process starts with the cytotoxicity test, where extracts from the printed material are put in contact with live cells to confirm that the survival rate remains at a good level, representing good quality of the sample biological. Furthermore, the scientific rigour extends to genotoxicity analysis, an essential step that ensures that the material does not cause mutations at the level of the DNA, thus ensuring long-term patient safety. This acceptance barrier is supplemented by irritation tests and mucosal sensitization, mandatory procedures and in view of the extreme sensitivity of the oral environment faced by any residual chemical compound. By going through this stage, biocompatibility is becoming the essential filter through which raw chemistry is refined and transformed into regenerative medicine.

Post-processing Alchemy - Where Safety Comes From

The rigorous chemical transformation process that begins immediately after the actual printing is completed, represents the manifestation of the central pillar of biocompatibility known as the safety triad. The first critical step is cleaning by immersion in baths of isopropyl alcohol or high-purity ethanol, an essential step to dissolve and eliminate any traces of uncured liquid resin that could cause severe irritation upon contact with mucous membranes, transforming the dangerous chemical cocktail into an inert polymer.

Once decontaminated, a controlled curing process follows in chambers with UV light and heat, where the free monomer molecules are forced to permanently bind into stable and biologically inert polymer chains.

The molecules bond so tightly together that the body doesn't even realize it has a "foreign" object inside. This metamorphosis is completed by the final verification stage, which guarantees that the polymer conversion rate has reached the threshold necessary for the device to be declared safe according to medical standards, eliminating any risk of chemical leakage into the bloodstream or saliva.

The Dental Revolution

Dentistry has been the arena where biocompatibility has won its biggest battles, leaving the theoretical sphere of laboratories and becoming a clinical, everyday reality, radically transforming the way restorations are perceived by the human body. This glorious stage is led by the emergence of nano-hybrid resins, sophisticated materials that infuse a high-purity polymer matrix with a massive volume of ceramic particles, thus reducing the presence of synthetic components and providing a structure that the body recognises as almost natural - the more ceramic and the less plastic, the happier the body. In parallel, the development of resins dedicated to complete dentures has solved the challenge of long-term durability, managing to create extremely dense prosthetic bases that repel bacterial colonization and prevent chronic gingival inflammation. Invisible hypoallergenic aligners are the champions of comfort so that the patient forgets that they are wearing them almost all day.

The Guardian of Biocompatibility

In this story, the doctor and the dental technician are the guardians of biocompatibility. History has taught us that a 5-minute error in the photopolymerisation process can turn a medical device into toxic waste.

Biocompatibility is, therefore, a shared responsibility between the chemist who creates the resin, the engineer who builds the printer, and the clinician who applies the protocol. It is a chain of trust that assures the patient that the plastic tooth is in fact an ally of his health.

The future - proactive biocompatibility

InLooking to the future, our story moves from harm to healing and thee era of bioactive resins follows. Imagine resins that release fluoride ions to prevent cavities on neighboring teeth or printed structures, scaffolds, that guide stem cells to regenerate lost bone, disintegrating on their own after the mission has been accomplished. Biocompatibility will no longer just mean being accepted by the body, but actively working with it

In essence, biocompatibility in terms of 3D printable resins is no longer a simple characteristic of the material, but a rigorous process that combines high-purity chemistry with strict post-processing protocols, according to ISO 10993.

In modern dentistry, the success of a restoration is no longer measured solely by geometric precision, but by the material's ability to pass the test of invisibility to the immune system. Thus, through chemical purification and innovation of bioactive materials, 3D printing ceases to be just a manufacturing process, becoming the bridge that unites technological precision with the vital needs of the human body, guaranteeing a future in which technology and life coexist in perfect harmony.

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MASTERING INTRAORAL PHOTOGRAPHY

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Photography has become a necessity for today's dental practice and is often part of the treatment process. It serves as a powerful communication aid, enhancing diagnostic accuracy, treatment planning, and educational value [1]. Intraoral photography could be used to create a portfolio of before and after photos of cases for the dentist to show the possible progression of dental work, to show how previous patients were treated, to persuade the patient and give them a clear understanding of the dentist's experience and aesthetic standards in cosmetic treatment [2,3].

Figure 1. Standard intraoral photograph obtained using mirrors and cheek retractors.

Despite the importance of its integration into everyday dental practice, it is often perceived as technically demanding, expensive and time-consuming. Intraoral photography can now be achieved without very expensive equipment, or the presence of an assistant [4]. This article seeks to provide a clear and structured step-by-step guide for the effective use of intraoral photography.
High photographic quality is essential, as inaccurate colour reproduction, distortions caused by improper angulation, flash reflections, inadequate saliva control, and inappropriate magnification may negatively influence photographic diagnosis. Studies have shown that both smartphone cameras and DSLR cameras could provide satisfactory image quality and colour accuracy for intraoral photography, and the results depend on the device model [5]. Repeatability is also important, as it provides consistent data that supports accurate diagnosis and treatment planning [6].

Materials and Equipment

The camera must have an aperture priority setting for better intraoral photos [3], a digital single lens reflex (DSLR) or a mirrorless camera with crop frame sensors and macro lens [4]. DSLR cameras are a better choice with more than 6-megapixels, as the lens can be replaced and many functions can be manually adjusted. Smartphones, tablets, and laptops can also be used; although they offer very limited adjustable functions, they are easier to use and more portable. The use of lenses with focal lengths of 60–85 mm or 100 mm is advised [1].

Battery -powered ring flashes and dual flashes are more suitable than paraflashes/ softboxes as they do not cause clinical misinterpretations due to excessive lighting. Whether the use of paraflashes or softboxes is necessary, it's better to use 300-watt paraflashes of and softboxes of 80x100, 60x90, or 50x70 [2]. Single point, twin and ring flash are recommended for different situations. Other accessories for intraoral photography are photographic mirrors, retractors (plastic are better due to their flexibility), and contractors available in different shapes [1].

Settings and Preparation

Basic shooting parameters to the selected camera are sensitivity of the media (ISO), exposure and white balance (WB). The white balance set to 5.500K and better camera with macro lens set to manual mode [4]. In intraoral photography the lens aperture should be very small according to the selected objective and the shutter speed to be set at 1/125. The ISO should not exceed 400 to prevent image noise when using cameras with a mirror and a value of 200 is best option.

With cameras with no mirror ISO could rise to 6400 without noise with a number between 100 to 400 is a standard choice depending on aperture settings [2]. The camera should be set to the aperture priority exposure settings. This allows the lens to capture the optimal amount of light, resulting in proper exposure [3]. White balance modifies the light, and the quality of the image and auto mode is not appropriate [1].

Indirect intraoral photographs are captured with the aid of an occlusal mirror and a C-shaped transparent lip retractor [2]. The mirror is positioned as required for visualization. Rhodium-coated mirrors are recommended to prevent fogging, which can also be reduced by applying a mild air stream from the air syringe or hot water on mirror. [6].

The dentist should discuss with the patient about the procedure. The patient sits in the dental chair at 45° inclined position [4]. The head of the patient is placed lower than the photographer. The surgical drape must change after the patient. If the patient assists in retraction, they are required to wear gloves. [6].

Camera Settings for Intraoral Photography

Parameter	Recommended Value	Purpose
Aperture	*f* / 22	Maximizes depth of field to **keep all teeth in focus**
ISO	100 – 200	**Reduces** image noise
Shutter speed	1/125 – 1/200	**Synchronizes** with flash
Flash	Ring flash / Twin flash	Provides **uniform illumination**
Focus	Manual focus	Ensures **precise focus** on dentition
White balance	Flash / Custom	Maintains **accurate** tooth color

Procedure

The patient is seated in a dental chair at a 45° incline, with the photographer positioned at the 9 o'clock position. All photographic equipment is kept within arm's reach, and the dental operatory light is turned off to avoid lighting interference.

Frontal intra-oral photographs are taken with the patient in maximum intercuspal position (MIP). Intra-oral retractors are placed and held by the patient, and the camera is aligned so the occlusal plane is parallel to the horizontal frame line [4].

For buccal views, the patient's head is turned toward the operator. The retractor is placed on the opposite side of the area being photographed. A narrow mirror, warmed to prevent fogging, is inserted parallel to the occlusal plane, moved into the buccal vestibule, and rotated 90°, with the mirror edge resting on the external oblique ridge. The buccal surfaces of the maxillary and mandibular posterior teeth are captured bilaterally [4].

Occlusal photographs are obtained using a large, pre-warmed mirror. For maxillary views, the patient opens widely to expose the arch from molar to molar. For mandibular views, retractor positions are adjusted, the tongue is retracted posteriorly, and the mirror is placed against the ventral surface of the tongue to capture the mandibular arch and floor of the mouth.

Lingual photographs are taken using a small, pre-warmed mirror. Maxillary palatal views are obtained by retracting the lip and positioning the mirror to visualize the palatal surfaces and mucosa. Mandibular lingual views are captured by placing the mirror between the tongue and lingual tooth surfaces and aligning it medially [4].

Patient intraoral photographs must be securely stored, accessed only by authorized people, and retained in accordance with data protection regulations (GDPR). Any use of clinical images beyond direct patient care, especially on digital or social media platforms, requires careful ethical consideration and explicit informed consent

Conclusion

Intraoral photography is an essential tool that supports the dentist in the documentation of clinical work and the effective presentation of treatment outcomes. As technology continues to advance, the challenges associated with obtaining accurate and high-quality images have been significantly reduced, rendering intraoral photography feasible even through the use of mobile devices, provided that specific technical requirements are met. Consistent compliance with the General Data Protection Regulation (GDPR), together with professionalism and consistency in the capturing, handling, and storage of photographic records, can minimise—or even eliminate—potential challenges. Technology may therefore be regarded as a key asset for the contemporary dentist, with intraoral photography forming an integral component of modern dental practice.

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FACIAL ASYMMETRY, DIAGNOSIS AND ORTHODONTIC TREATMENT

IMPACT OF FACIAL ASYMMETRY ON QUALITY OF LIFE

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Facial symmetry is traditionally regarded as one of the key factors contributing to a harmonious appearance and functional balance of the maxillofacial region. At the same time, absolute symmetry is rarely observed. Minor morphological differences between the right and left sides of the face are present in most individuals and are generally considered a variation of physiological normality. Clinical relevance arises in cases of pronounced facial asymmetry, which may be associated with disturbances in jaw growth, occlusal imbalances, temporomandibular joint dysfunction, and reduced aesthetic satisfaction [1,7].

Facial asymmetry represents a complex morphofunctional condition involving skeletal, dentoalveolar, and soft tissue structures. In clinical practice, it is frequently associated with dentomaxillary anomalies and may progress during periods of active growth, complicating both diagnosis and treatment planning [2,3]. Current studies indicate that the severity of asymmetry does not always correlate with the patient's subjective perception; however, the aesthetic component often becomes the primary reason for seeking medical care [7,15].

Factors Contributing to Facial Asymmetry

The development of facial asymmetry is influenced by a combination of congenital and acquired factors. Genetically determined growth patterns of the facial skeleton may create a predisposition to asymmetric jaw development, while functional disturbances and external influences contribute to the clinical manifestation of asymmetry [8,9].

A significant role is played by growth disturbances of the mandible, particularly hemimandibular hyperplasia and hemimandibular elongation. These developmental forms of asymmetry differ in their morphological characteristics. Hemimandibular hyperplasia is characterized by a three-dimensional increase in bone volume on the affected side, whereas hemimandibular elongation primarily involves horizontal lengthening of the mandibular body without a marked increase in bone volume [4]. Both conditions are associated with chin deviation, occlusal discrepancies, and a pronounced imbalance of the lower facial third.

Acquired forms of facial asymmetry may develop as a result of trauma, premature tooth loss, functional imbalances of the masticatory muscles, and pathological changes within the temporomandibular joint [5,6,9]. Neurological disorders, including facial nerve dysfunction and muscular discoordination, may further exacerbate soft tissue asymmetry and alter the overall clinical presentation [8].

Clinical Manifestations and Predominant Regions

According to the majority of studies, the most pronounced clinical manifestations of facial asymmetry are observed in the lower third of the face. This is largely related to the high functional activity of the mandible and its central role in the establishment of occlusion [1,2].

Deviation of the menton point from the facial midline is considered one of the most informative quantitative indicators of asymmetry. Deviations of 2–4 mm are regarded as clinically significant and are taken into account during orthodontic and surgical treatment planning [11,13]. Additional findings often include alterations in the gonial angle, asymmetry of the mandibular rami, and canting of the occlusal plane, reflecting the complex nature of these deformities [3,6].

Contemporary Diagnostic Approaches

The diagnosis of facial asymmetry requires a comprehensive approach that combines clinical examination, anthropometric assessment, and the use of imaging techniques. Conventional cephalometric analysis allows the evaluation of linear and angular parameters of the facial skeleton; however, its applicability is limited when assessing three-dimensional asymmetries [2,3].

In this context, cone-beam computed tomography (CBCT) is regarded as one of the most informative diagnostic tools. It enables three-dimensional assessment of maxillofacial skeletal symmetry using stable anatomical landmarks such as condylion, gonion, and menton. CBCT facilitates the differentiation of asymmetry patterns related to growth disturbances and allows for a more accurate estimation of the required extent of surgical intervention [11].

In recent years, increasing attention has been given to three-dimensional analysis of facial soft tissues. Three-dimensional facial scanning and stereophotogrammetry make it possible to identify inter-side differences in soft tissue thickness, which in some cases exceed the severity of underlying skeletal discrepancies [10,12]. This aspect is particularly relevant for aesthetic assessment and for predicting the visible outcomes of treatment.

Contemporary Approaches to the Treatment of Facial Asymmetry

The choice of treatment strategy for facial asymmetry is determined by the severity of morphological changes, the dominant component of the deformity, and the functional status of the dentofacial system. In clinical practice, management ranges from isolated orthodontic treatment to combined orthodontic–surgical approaches aimed at restoring facial skeletal symmetry and achieving occlusal balance.

Orthodontic treatment represents an effective option in mild to moderate forms of asymmetry, particularly when the dentoalveolar component predominates and no marked skeletal discrepancies are present. Correction of occlusal plane canting, alignment of the dental arches, and elimination of functional imbalances within the masticatory system contribute to improved facial symmetry and normalisation of masticatory function [3,6]. In such cases, orthodontic therapy may result in clinically significant functional and aesthetic improvements without the need for surgical intervention.

In contrast, in pronounced skeletal forms of asymmetry associated with disturbed growth or altered spatial positioning of the jaws, the potential of isolated orthodontic treatment is limited. In these clinical situations, the most predictable outcomes are achieved through combined orthodontic and orthognathic treatment [13]. The orthodontic phase focuses on the decompensation of dentoalveolar discrepancies and the establishment of optimal conditions for surgical correction, while orthognathic surgery aims to restore skeletal symmetry and appropriate intermaxillary relationships.

Current evidence indicates that combined treatment approaches provide stable functional and aesthetic results, particularly in cases involving asymmetry of the lower facial third [13]. Long-term stability largely depends on the type of initial deformity, the extent of surgical correction, and the quality of preoperative planning. Within this framework, the integration of digital technologies into diagnostic and treatment workflows has gained increasing importance [14].

Digital orthodontic and surgical planning, based on CBCT data and three-dimensional facial analysis, allows more precise simulation of jaw movements and prediction of changes in both skeletal and soft tissue structures [14]. The use of virtual planning and navigational technologies reduces discrepancies between planned and achieved outcomes and enhances overall treatment predictability. Notably, following orthognathic correction, soft tissue symmetry often recovers more rapidly than skeletal symmetry, which is attributed to the adaptive capacity of the muscular system and soft tissue components of the face [12].

Consequently, contemporary approaches to the management of facial asymmetry rely on an individualised selection of treatment strategies that take morphological, functional, and aesthetic factors into account. The combination of orthodontic and surgical methods, supported by digital planning technologies, is considered the most effective strategy for the correction of pronounced forms of facial asymmetry and enables the achievement of stable clinical outcomes.

Facial Asymmetry and Quality of Life

The impact of facial asymmetry on patients' quality of life represents an important aspect of clinical evaluation. Disturbances in facial harmony may negatively affect self-esteem, social interaction, and overall psychological well-being [15].
Studies employing quality-of-life questionnaires indicate that, following the correction of pronounced asymmetry, patients frequently report improvements in both aesthetic perception and functional comfort. Nevertheless, subjective satisfaction does not always show a direct correlation with objective morphometric measurements, particularly in cases involving the chin region and the dental midline [7,15].

Facial asymmetry constitutes a multifactorial morphofunctional condition affecting the skeletal, dentoalveolar, and soft tissue components of the maxillofacial region. Clinically significant forms of asymmetry are most commonly associated with disturbances in mandibular growth and spatial positioning and tend to manifest predominantly in the lower third of the face.

Contemporary diagnostic methods, including CBCT and three-dimensional facial analysis, enable objective assessment of both the type and severity of asymmetry and contribute to improved treatment planning accuracy. In mild to moderate cases, orthodontic treatment may be sufficient, whereas in pronounced skeletal deformities, combined orthodontic and orthognathic approaches offer greater predictability and long-term stability of outcomes [13,14].
Given the discrepancies that may exist between objective clinical findings and patients' subjective perceptions, an individualised approach to the management of facial asymmetry remains essential for achieving stable functional and aesthetic results.

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BEYOND AMALGAM

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For over a century dentists have relied on amalgam – a dental material that contains approximately 50% mercury, mixed with other metals [1,2]. Due to its proven clinical benefits, cost effectiveness and its long-term success in restoring form and function it has been widely used for posterior restorations [1,2]. However, growing concerns about mercury as an environmental toxin have sparked worldwide efforts to reduce and eventually eliminate mercury containing products including dental amalgam [1,3,4]. In The European union, this has resulted in restrictions under regulation (EU) 2017/852, which limits amalgam use in specific populations and supports a phase down strategy [4].

This article aims to explain the clinical role of dental amalgam, give a summary about the environmental and regulatory reasons behind its phase down, and evaluate mercury free alternatives such as resin composites and glass-ionomer materials in terms of clinical effectiveness, limitations and sustainability.

Amalgam in Restorative dentistry

For over a century amalgam has been a crucial dental material in restorative dentistry [1,2]. However, people are growing increasingly concerned about the effects of mercury on the environment. As a result, dental amalgam is being gradually phased out in Europe. [1,3,4] As students and future dentists, we must consider the implications of this shift. This may seem like a straightforward question. The truth is, there is no other material that works as well as dental amalgam in every situation. Dental amalgam is particularly effective for certain tasks. We need to find a material that is just as effective. Evidence from studies shows that no single material can replicate the performance of dental amalgam in every situation [1,2]. People are wondering why amalgam is being phased out. Dental amalgam is being phased out primarily due to environmental concerns related to mercury, despite continued consensus that existing amalgam restorations are safe for patients. Mercury is a persistent environmental toxin that remains in the environment for a long time and dentistry has historically contributed to its release through amalgam waste and disposal [1,4]. The EU Regulation 2017/852 aims to reduce mercury use across multiple sectors, including dentistry, where alternative restorative materials are already available [4]. Importantly, international organizations and professional bodies agree that the already existing amalgam restorations are safe and should not be removed unless there is a clear clinical indication [1,2]. Thus the main focus is preventing future mercury release rather than managing existing restorations.

The main Alternative: Resin Composite

Now in Europe, resin composite is considered the primary choice instead of dental amalgam, particularly for posterior teeth [2,6,12]. Composite restorations have several advantages such as improved aesthetics, high patient acceptance, adhesive bonding to tooth structure and the ability to be conservative of tooth tissue through minimally invasive cavity preparation [6,12].

However, through the studies that have been conducted over time and the long term clinical studies, we can see some significant limitations. Evidence shown from those studies indicate that posterior composite restorations have higher failure rate and an increased risk of secondary caries when compared with amalgam, especially in high load posterior cavities [5,7,11]. Meanwhile amalgam restorations demonstrate superior longevity in many long-term studies [5,7]. Composite dentistry has undergone significant changes over the past few decades. Major improvements in resin formulation, filler technology, bonding systems and placement techniques have contributed to a better clinical outcome than the other previous studies [6]. For example, in Norway where amalgam has been banned for more than a decade, shows that posterior composite restorations can be used successfully when dentists abandon traditional mechanically driven cavity designs and adopt biologically focused, adhesive methods [10]. For this reason, we should consider composite as a different material rather than a replacement for amalgam and treat it as a material that requires essentially different clinical approach [2,6,10].

Glass-ionomer cements (GICs): A supportive role

Glass-ionomer cements (GICs) and resin-modified glass-ionomers possess unique properties, including chemical adhesion to tooth structure, fluoride release and improved moisture tolerance [8]. These characteristics make them particularly useful in pediatric dentistry, atraumatic restorative treatment and in patients with high caries risk [8]. However, conventional glass-ionomer cements generally exhibit reduced fracture resistance and wear characteristics compared with resin composites and amalgam, limiting their suitability for long-term load-bearing posterior restorations [8]. In that capacity, glass-ionomer cements are best considered complementary materials, rather than universal replacements for dental amalgam [8].

Indirect Restorations and Cuspal Coverage

On large posterior cavities where cuspal support is limited, indirect restorations (ceramic - indirect composite onlays) may offer superior biological, mechanical performance and longevity compared to large direct restorations [10,12]. Indirect restorations provide cuspal protection and improved stress distribution, potentially reducing the risk of tooth fracture [10,12]. Nonetheless, indirect restorations have higher costs, creased appointment time and reliance on lab procedures, which limits their accessibility, particularly within publicly funded healthcare systems [10]. So, even though indirect restorations may represent the optimal solution in selected cases, they are unlikely to replace amalgam at a population level [10]

Sustainability and Preventive Dentistry

The replacement of dental amalgam alone doesn't automatically result in environmentally sustainable dentistry. Resin composite are petroleum-based materials and contribute to plastic waste highlighting the need for a broader approach to sustainability within oral healthcare [9]. Evidence suggests that patients with high lifetime restorative needs generate much greater environmental impact due to repeated treatments, increased material use and higher resource consumption [9]. Thus, disease prevention, minimally invasive techniques and restoration longevity are increasingly recognized as central components of sustainable dental practice [9].

Looking Ahead: Emerging Restorative Materials

Researchers have been conducting a lot of studies on developing next gen resin composites with antibacterial, remineralising and self-healing factors, while aiming to address the primary causes of restoration failure, particularly secondary caries and material fracture [11]. Lab research have provided promising antibacterial activity, ion release and crack healing properties in experimental materials [11]. Nonetheless, these materials remain experimental, and robust long term clinical evidence is currently missing. As such, they are not yet suitable for widespread clinical use, despite their potential relevance for the future of restorative dentistry [11].

Currently there is no single restorative material that can fully replace dental amalgam in all clinical situations[1,2].However, resin composite represents the most suitable and widely accepted alternative following the EU phase out, provided it is used with appropriate case selection, moisture control and sound clinical technique[2,5,6,10,12].Ultimately, the transition away from amalgam reflects a broader shift in dentistry from mechanically driven restorative approach toward biologically focused , preventive and minimally invasive care[1,2,10]. For dental students, success in an amalgam-free future will depend not only on mastering new materials, but also on embracing this evolving philosophy of care [2,10] .

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MANIFESTATIONS OF GENERAL DISEASES IN THE ORAL CAVITY

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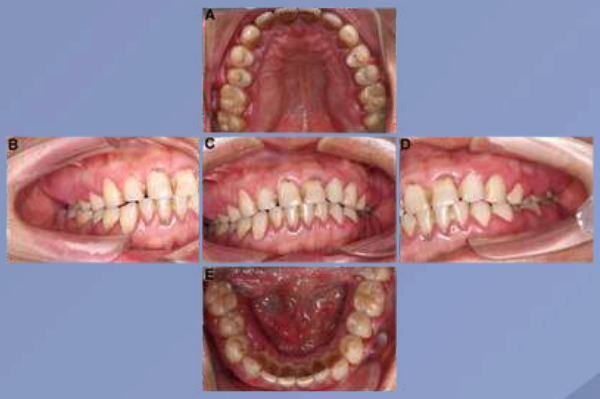
The health of the oral cavity is a remarkable reflection of the systemic status of an individual. Thus, identification of the signs and symptoms of oral lesions can act as a preventive care for the patient and reveal generalized, more concerning disseminated involvement. Dentistry is, without a doubt, one of the most challenging professions. It demands that every practitioner know their exact physical and mental limits. In such fields, it can be difficult to distinguish manifestations of rare systemic diseases like acute myeloid leukemia or genetic abnormalities from everyday routine issues, owing to the fact that every dental manipulation requires undivided attention to the detail.

Global statistics acute myeloid leukemia

Leukemia is an umbrella term for malignancies of hematopoietic cells characterized by increased numbers of immature and abnormal leukocytes and destruction of the bone marrow. Although several types of leukemia exist, the most aggressive and fatal, indeed, is acute myeloid leukemia. According to the latest 2022 statistics obtained by the Global Cancer Observatory, in European countries leukemia doesn't rank below 6th place neither by incidence nor mortality. However, some countries are in a more critical state than the others - for instance, Germany, Norway, Cyprus and Belgium rank 6th in terms of leukemia-related mortality, while Republic Of Moldova has the lowest leukemia - related death rate - 16, which is the lowest compared to any country in Europe (1).

Why is it important to know the clinical symptoms and diagnostics of acute myeloid leukemia

Every clinician must be able to detect early signs of acute myeloid leukemia, as it is highly aggressive, symptoms can develop within days to weeks, bone marrow failure occurs rapidly and patients can deteriorate dramatically in a very short time. Fortunately, the oral cavity can be very reactive to the sudden changes occurring in the body. According to Schlosser *et al.* oral examination may reveal mucosal pallor due to anemia, or petechiae of the palate, tongue and lips as the result of underlying thrombocytopenia. Painful and deep oral ulcerations are also common resulting from either neutropenia or direct infiltration by malignant cells. (2) Although it is rare, gingival hyperplasia can be one of the clinical manifestations that clinicians may overlook if the disease is in early stages and other symptoms are not present yet. Gingival enlargement may occur because of various factors, therefore, if abnormalities are not present in the blood, it is possible to misdiagnose myeloid leukemia. As reported by Wu *et al.* a 45 - year old male was referred to the periodontology department with a chief complaint of gingival bleeding and swelling. Primary hematological tests did not exhibit any unusual changes, his overall health was satisfactory as he did not present with fever, fatigue or weight loss. Oral examination revealed suboptimal oral hygiene, a minimal amount of pigmentation along with gingival hyperplasia particularly in the molar region, as well as, attachment loss with probing depth of 4 to 8 mm.

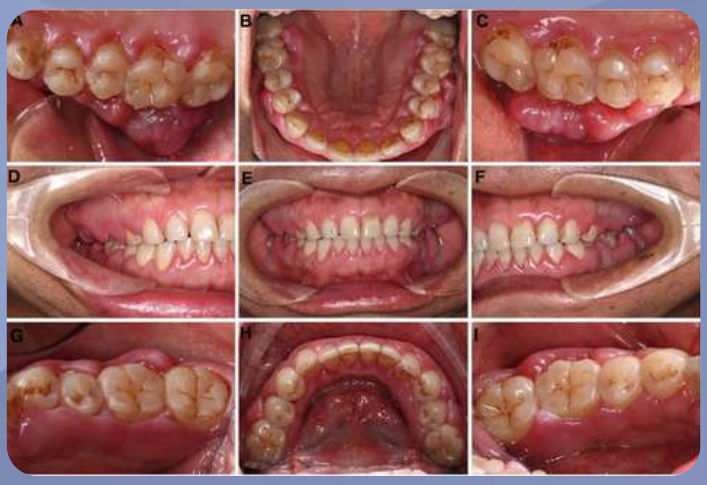


Picture 1: Intraoral photographs of patients' first visit shows manifestation of myeloid leukemia.
Author: Adapted from Dandan *et al.* Journal of Medicine, 2025.

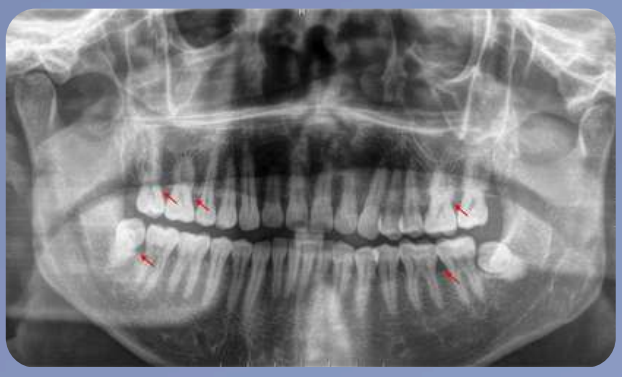
The patient exhibited bleeding on probing with no significant tooth loss or mobility. The radiograph analysis revealed mild resorption of alveolar bone. From this clinical outcome, a fundamental periodontal therapy was done including full-mouth root planning, subgingival and supragingival scaling. After 3 weeks, despite improved oral hygiene, gingival enlargement showed rapid progression, which raised suspicion for systemic malignancy. A reported blood test revealed thrombocytopenia, flow cytometry confirmed acute myeloid leukemia. The patient received 7+3 Induction chemotherapy with cytarabine and anthracycline. After the treatment gingival swelling was significantly reduced. Disappointingly, the patient passed away 5 months past the treatment (3).

This case highlights the importance of early and accurate detection of the disease. As well as the fact that dental clinicians, especially periodontists must be able to accurately detect the warning signs of underlying systemic malignancy and most importantly, distinguish them from routine oral irregularities. Whereas our obligation is not only to provide optimal oral health but to care for the patient's overall health and well-being.

Photographs taken 1 month after chemotherapy. Following 1 month of treatment with clear signs of reduced gingival swelling.
Author: Adapted from Dandan *et al.* Journal of Medicine, 2025



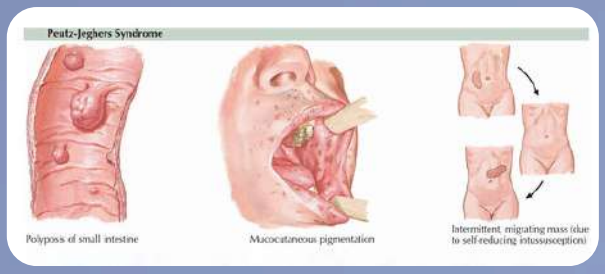
Manifestation of acute myeloid leukemia 12 days post periodontal therapy.
Author: Adapted from Dandan *et al.* Journal of Medicine, 2025



Mild periodontal bone loss around molars and premolars.
Author: Adapted from Dandan *et al.* Journal of Medicine, 2025

Oral clues to a rare genetic abnormality

Peutz-Jeghers syndrome is an exceptional disease, affecting approximately 1 In 200,000 individuals (4). It is an autosomal dominant genetic disorder caused by mutation of gene STK11. This gene is responsible for prevention of uncontrolled proliferation, cell polarity and cell cycle regulation. Disruption in this gene conserves epithelial cells to become prone to malignant transformation. Therefore, it is essential to spot oral manifestations of the disease in the early stage, which usually is melanotic macules on the lips, gums, and inner cheeks. Luckily, it appears in childhood and serves as a sentinel marker for gastrointestinal polyps which primarily are hamartomatous, but can turn malignant later. For that reason, every pediatric dentist is required to acquire knowledge about this uncommon disorder. If not, later in life, Peutz-Jeghers syndrome may cause gastrointestinal, pancreatic, breast, ovarian, cervical and testicular cancers.



Peutz-jeghers syndrome manifestation: polyps of intestine and macules in the mouth.
Author : Adapted from Frank H.Netter's Gastroenterology

GERD - The silent threat to tooth enamel

Gastroesophageal reflux disease (GERD) is one of the most common diseases in the world, according to the study conducted by the Institute for health metrics and evaluation, GERD affects nearly 13.98% of the adult population (5). With its prevalence rising over 80% between 1990 and 2021, it is mainly caused by weakened esophageal sphincter allowing stomach acid to flow back into the esophagus and oral cavity, compromising proper function of salivary glands as well as normal tooth structure, ultimately leading to tooth wear and numerous aesthetic and sensitivity complaints (6).

Diagnosis of GERD in the oral cavity

Besides GERD tooth erosion can be caused by multiple factors. Erosion itself causes the enamel to appear more thin, with increased translucency and yellowish appearance. Which might present itself in case of tooth wear from grinding, abrasion by traumatic brushing and extrinsic acid consumption. The key is to observe on which part of the tooth defect appears. Tooth wear from grinding usually occurs on occlusal surfaces, while tooth brush abrasion is seen cervically. Erosion by extrinsic acids shows a generalized pattern (7). Only under conditions of GERD are palatal surfaces of incisors and occlusal surfaces of the mandibular molars affected. Despite this fact, if the condition is not treated accordingly all the tooth surfaces become eroded (8).

Treatment for GERD

Solutions vary by the size of the defect and severity of the case, of course, identification in the early stages means that an excessive amount of healthy tissues can be saved, which is always better. But at every stage, decreasing acid exposure and implementing proper oral hygiene as well as lifestyle changes is essential. Dietary guidance as in limiting reflux provoking foods, using non-abrasive toothpaste and soft- bristled toothbrush, only brushing after 30 minutes from last meal and intake of beverages containing calcium, phosphate, fluoride and water can reduce erosion.

Compromised enamel from Gastroesophageal reflux disease Only under conditions of GERD are palatal surfaces of incisors and occlusal surfaces of the mandibular molars affected
Author : adapted from Wikimedia.

For References

CHOOSING THE RIGHT CEMENT

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Cementation in prosthetic dentistry plays a decisive role in the clinical success of fixed restorations. Although resistance and retention forms in tooth preparation are of fundamental importance, dental cements provide a connection between the restoration and tooth structure, forming an effective barrier against microbial leakage. This connection may occur through mechanical, chemical, or a combination of both mechanisms (1,6).

In clinical practice, clinicians tend to prefer cements that possess adequate mechanical properties, are easy to use, biocompatible, and capable of meeting aesthetic requirements. Self-adhesive resin cements, developed in line with these expectations, aim to combine the ease of application of conventional cements with the mechanical and aesthetic advantages of resin cements (2,3). By reducing the number of clinical steps, they minimize technique-sensitive errors, making them a prominent option in clinical practice. For dental students, cementation is not merely about knowing material properties; it is about making the right clinical decision at the right time.

In this context, can it be argued that self-adhesive cementation has eliminated the need for conventional cementation?

The answer is certainly no. These developments should not be interpreted as conventional cements having completely lost their place in clinical practice. Cementation success should not be evaluated solely based on bond strength; it must also be considered in conjunction with multiple variables such as preparation design, type of restoration, biological compatibility, and patient-related factors. In this regard, conventional cements continue to maintain their importance due to their predictable outcomes supported by long-term clinical experience, their biocompatible nature, and the advantages they offer under specific clinical conditions (1,10). Therefore, cement selection in prosthetic treatments should be based on a case-specific evaluation rather than the novelty of the material (10).

Conventional Cements

Conventional cements are among the materials that have been safely used for many years in prosthetic dentistry and form the foundation of cementation procedures. These cements derive their retention largely from the mechanical retention provided by tooth preparation and either do not contain adhesive systems or exhibit limited chemical bonding capability. In cases where these cements are used, clinical success largely depends on the accuracy of the preparation and the design of the restoration (1,10).

Conventional cements include zinc phosphate cements, polycarboxylate cements, glass ionomer cements, and resin-modified glass ionomer cements (1,10). Zinc phosphate cements have been preferred for many years, particularly in metal-supported restorations, due to their thin film thickness and high compressive strength. However, their lack of adhesive bonding to tooth structure and their potential to cause postoperative sensitivity represent significant disadvantages. Polycarboxylate cements, although they exhibit limited chemical bonding to tooth structure, have more restricted indications due to their relatively low mechanical strength (1,10). Glass ionomer cements and resin-modified glass ionomer cements stand out due to their biocompatibility and fluoride release properties. Especially in patients with a high risk of caries, fluoride release makes these cements an important clinical option. Nevertheless, their sensitivity to moisture and limited bond strength may necessitate careful case selection (10).

The main advantages of conventional cements include their predictable outcomes supported by long-term clinical experience, relatively simple application protocols, and well-established biological compatibility (1,10). On the other hand, they may be insufficient in preparations with inadequate retention or in restorations where maximum bond strength is required. Therefore, conventional cements remain a valid option in contemporary practice, particularly in preparations with sufficient resistance and retention forms, in metal or metal-supported restorations, and in situations where fluoride release provides a clinical advantage (1,10).

Self-Adhesive Resin Cements

Self-adhesive resin cements are resin-based cements capable of bonding to tooth structures without the need for separate etching or adhesive application steps (2,7,8). They were developed in the early 2000s with the aim of facilitating clinical procedures (2,3). These cements consist of functional acidic monomers, dimethacrylate-based resin monomers, fillers, and activator systems. Owing to acidic monomers, they initially exhibit hydrophilic properties that facilitate infiltration into the tooth surface; as polymerisation progresses and pH increases, they acquire a more hydrophobic structure (2).
One of the important clinical advantages of self-adhesive resin cements is the lower risk of postoperative sensitivity compared to conventional resin cements. However, it has been reported that their bond strength to both enamel and dentine is lower than that of multi-step adhesive resin cements. Although clinical studies indicate acceptable short- and medium-term outcomes, long term evaluations suggest that total-etch resin cements may demonstrate superior performance, particularly in terms of marginal adaptation and colour stability (5,6).

As separate phosphoric acid etching of the enamel surface is not required, the smear layer cannot be completely removed. The bonding formed as a result of interaction with the smear layer remains more limited in terms of micromechanical retention in dentine (7,8). For this reason, the use of self-adhesive resin cements is not recommended in restorations where bond strength is critical, where high aesthetic demands exist, or in veneer applications.
Furthermore, the reduction in application steps in self-adhesive systems not only shortens chairside treatment time but also minimises potential errors that may occur during the application of adhesive systems (2,3). This can be considered a significant advantage for us as students in the clinical training process.

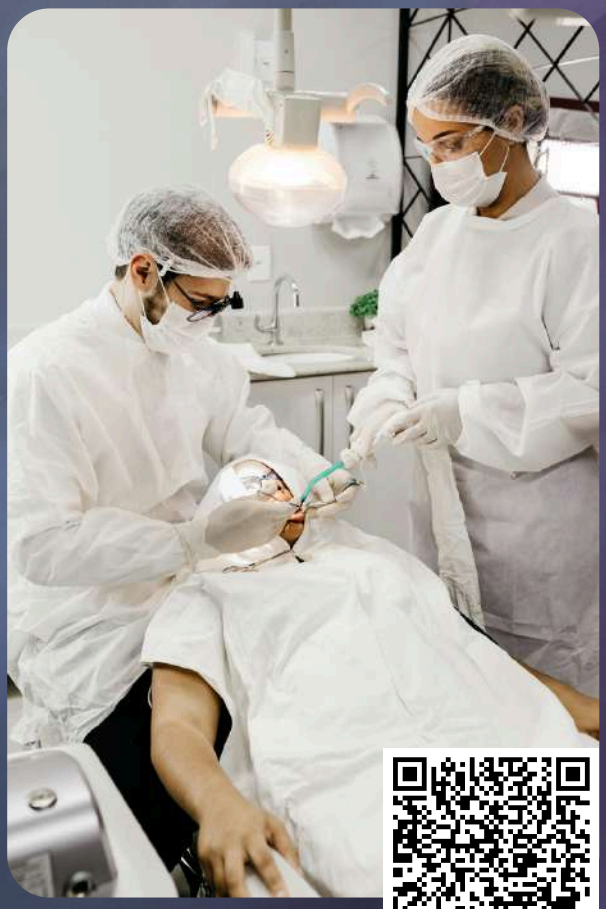
Cement Selection in Prosthetic Dentistry: A Clinical Approach

Clinical decision-making in cement selection becomes especially challenging when ideal preparation conditions cannot be achieved. When planning a zirconia-based fixed restoration for a posterior molar tooth with a short clinical crown height, it should be taken into consideration that conventional cements relying solely on mechanical retention may be insufficient due to limited retention resulting from preparation geometry (4,5). The chemically inert nature and lack of silica content of zirconia ceramics render them resistant to conventional surface treatments such as hydrofluoric acid etching and silanisation, making reliable bonding with resin cements more challenging. In such cases, the use of self-adhesive resin cements containing 10-methacryloyloxydecyl dihydrogen phosphate (MDP), which can chemically bond with metal oxides on the zirconia surface, may enhance the retention, marginal integrity, and long-term clinical success of the restoration (4,5,9). Conversely, in metal-supported crown restorations with adequate axial wall height, appropriate preparation geometry, and sufficient retention, the primary role of the cement is to fill the space between the restoration and tooth structure, and in such cases, conventional cements continue to be reported as a clinically reliable and predictable option (1,10).

Clinical Comparison of Conventional and Self-Adhesive Resin Cements

The fundamental differences between conventional cements and self-adhesive resin cements lie in their bonding mechanisms and clinical usage approaches. While conventional cements derive their retention largely from the mechanical retention provided by tooth preparation, self-adhesive resin cements are capable of providing chemical bonding in addition to mechanical retention. Consequently, in preparations with sufficient retention and adequate axial wall height, conventional cements offer reliable and predictable outcomes (1,10). In contrast, self-adhesive resin cements may provide clinical advantages in preparations with short clinical crowns or limited retention (2,7).
From a clinical application perspective, conventional cements stand out as materials with well established long-term outcomes, whereas self-adhesive resin cements facilitate the clinical workflow due to their reduced number of application steps and lower technique sensitivity (2,3). However, it has been reported that multi-step adhesive resin cements still yield superior results in restorations with high aesthetic demands and where maximum bond strength is required (5,6). Therefore, when choosing between conventional and self-adhesive resin cements, the type of restoration, preparation characteristics, and clinical conditions should be evaluated together.

Cementation in prosthetic dentistry is one of the fundamental steps that directly affects the long term clinical success of restorations. Conventional and self-adhesive resin cements have different indications due to their distinct bonding mechanisms and clinical characteristics (1,2). While self adhesive resin cements offer advantages such as ease of application and reduced technique sensitivity, conventional cements remain a reliable option under specific clinical conditions owing to their predictable outcomes supported by long-term clinical experience and their biocompatible nature (1,10). Therefore, it cannot be stated that a single type of cement is ideal for all prosthetic cases. Rather than searching for a universal cement, dental students and clinicians should focus on understanding indications and limitations to achieve predictable clinical outcomes.



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DIGITAL TECHNOLOGY AND ARTIFICIAL INTELLIGENCE IN CONTEMPORARY DENTISTRY

Zelko Relic
Aling EVP & Chief Technology Officer

Oral health is closely connected to overall health and well-being, with growing evidence linking poor oral health to a range of noncommunicable diseases. As a result, innovation in dentistry has implications that extend beyond the dental chair, contributing to broader public health outcomes. A healthy dentition and functional bite often represent the starting point for better life-long oral and general health.

In recent years, artificial intelligence (AI) and other advanced technologies have become a foundational element of digital innovation in dentistry. Rather than existing as a stand-alone technology, AI is embedded within digital dental systems and products that support preventative care, diagnostics, orthodontic and restorative treatments. These technologies are designed to help clinicians improve predictability, consistency, and efficiency of care, while continuing to prioritize minimally invasive and patient- centered approaches.

Across more than 100 markets worldwide, dentists, orthodontists, and dental laboratories rely on digital tools such as Invisalign® clear aligners with ClinCheck software and treatment planning, iTero™ intraoral scanners, and exocad® CAD/CAM software as part of modern clinical workflows. These technologies illustrate how digital systems can support diagnosis, treatment planning, and communication with patients. AI further enhances such tools by enabling faster data processing, improved image interpretation, and more advanced treatment simulations.

Education is a critical factor in ensuring that future dental professionals are prepared for this rapidly evolving environment. The EDSA Dental Education 2024 Survey on Initial Dental Education in Europe, titled "Harmonization in Progress or Persistent Disparities?", identified digital dentistry and AI literacy as core 21stcentury baseline competencies, rather than optional skills. The survey also highlighted disparities across European countries and dental schools in terms of access to and integration of digital technologies within curricula.

Align's team and EDSA delegates, during one of the workshops on how iTero intraoral scanners can help doctors deliver positive clinical outcomes

Zelko Relic introducing Align's digital tools to delegates in Dublin, past August 2025

According to the survey findings, preclinical training continues to place strong emphasis on foundational and manual skills, while digital techniques and AI enabled tools are often comparatively deprioritized. This imbalance raises concerns regarding graduate readiness, quality of care, and professional mobility within the European Union. As dentistry becomes increasingly digital and data driven, insufficient exposure during education may place future clinicians at a disadvantage when entering contemporary clinical practice.

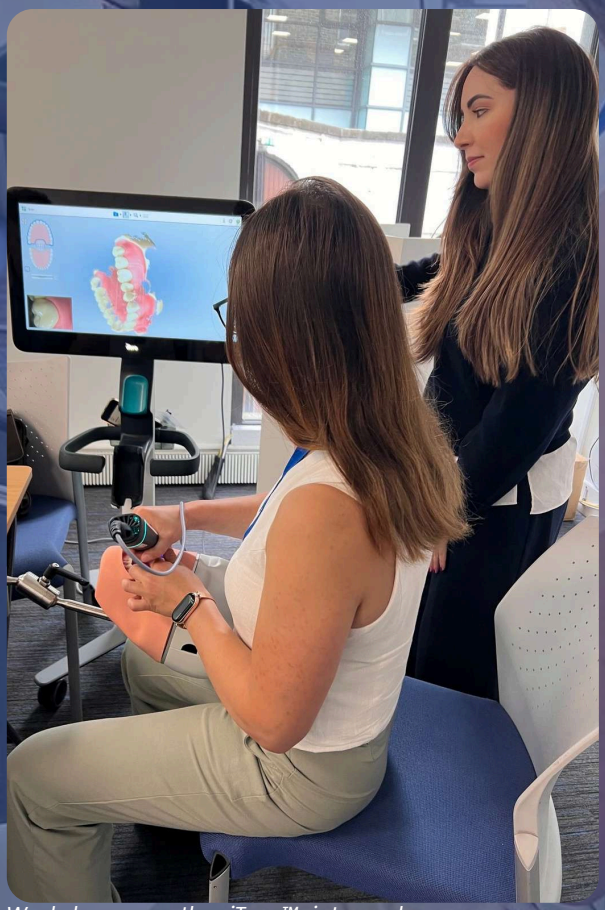
Recognizing the importance of education and literacy in this area, Align Technology's collaboration with EDSA aims to contribute expertise in digital dentistry through educational initiatives and dialogue. By engaging with students and academic communities, this collaboration seeks to support greater understanding of AI enabled dentistry, promote clinical confidence, and encourage informed discussion about the responsible integration of technology into oral healthcare.

From a clinical standpoint, dentistry involves intricate procedures that depend on precise diagnosis and complex treatment planning. AI products and systems are able to assist dental professionals by analyzing diagnostic data such as X-rays, radiographs, and intraoral scans to help identify anatomical features or potential abnormalities. By supporting image analysis and data organisation, AI can contribute to faster and more consistent diagnostic workflows, while leaving final clinical judgment firmly in the hands of the practitioner.

Approved AI supported products and systems can also assist with personalized treatment planning. By integrating information such as dental history and treatment objectives, digital platforms can help clinicians visualize different treatment scenario and plan for optimal outcomes. This capability supports evidence-based decision making and enables clearer communication with patients regarding treatment options and expected results.

A key driver behind these advances is the availability of largescale clinical datasets. Drawing on anonymized data derived from more than 22 million patients treated with Invisalign® clear aligners globally, advanced machine learning models can identify patterns across diverse cases and treatment outcomes. This enables the transformation of empirical clinical experience into algorithmically informed insights, promising opportunities for improved predictability and consistency across orthodontic and restorative workflows, while maintaining the central role of the clinician in all treatment decisions.

At the core of digital dentistry is the integration of technology across end-to-end clinical workflows. AI enabled capabilities support functions such as automated image segmentation, treatment simulations, progress assessment, and virtual care applications. By synthesizing multimodal data—including intraoral scans, imaging data, and historical treatment outcomes—digital systems are designed to reduce variability and cognitive load, allowing clinicians to focus on clinical judgment, patient communication, and quality of care.



Workshops on the iTero™ intraoral scanner were a highlight, demonstrating its potential to enhance clinical outcomes and patient experiences.

Align™ Xray Insights

Imaging based intelligence solutions, such as Align™ Xray Insights, available to customers in the European Union and the United Kingdom, provide practical examples of how AI can be applied to clinical data interpretation within established workflows. These tools are designed as decision support systems, not autonomous diagnostic solutions. Their purpose is to reinforce diagnostic confidence, support longitudinal monitoring, and contribute to greater consistency in assessment, while preserving the the important role of the doctor's medical judgement and clinical decisions.

This distinction is central to the responsible use of AI in dentistry. AI is appropriate to support the dentist but should not be used to replace clinical decision making. as a form of augmentation. It functions as a cognitive support layer that organizes complex datasets, accelerates routine processes, and enables more scalable care delivery. Ethical responsibility, diagnostic authority, and treatment planning remain with trained dental professionals.

For dental students and young practitioners, developing AI literacy is not about replacing foundational skills, rather is is about complementing their clinical skill and judgement. A strong grounding in biological sciences, manual dexterity, and clinical reasoning remain essential. Digital tools and AI should be viewed as extensions of professional expertise, supporting lifelong learning and continuous improvement in patient care.

In conclusion, the integration of AI and digital technology into dentistry presents both opportunities and responsibilities for the next generation of dental professionals. By engaging with digital workflows, understanding the principles behind AI enabled tools, and participating in educational initiatives such as those supported through the Align Technology–EDSA collaboration, students can prepare themselves for modern clinical practice. Embracing digital dentistry in a thoughtful, evidence-based manner can help future clinicians enhance efficiency, improve patient experiences, and contribute meaningfully to better oral and overall health outcomes across Europe.

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