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Drs. Massironi, Dietschi, Pelekanos, Diomataris, Lops, Benic, Debelian, Maggiore, Floratos, Fradeani, Dias, Kalcay, al-Salti, Hecht, Roussou, Camargo

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EDITORIAL  
— from Torsten R. Oemus

Dear reader,

It is my pleasure to introduce the fourth issue of the Clinical Masters™ magazine. The magazine serves to inform dental professionals about the courses, institutes and faculty involved in the Clinical Masters™ Program. This unique educational offering is anchored by intensive hands-on training and theoretical instruction. Dental professionals from all over the world who have participated in the programs, currently offered in esthetic and restorative dentistry, endodontics and implant dentistry, have moreover received mentoring in the past 12 months.

Over the past year, our number of locations for on-site training has continued to grow. Among the state-of-the-art establishments we have been working with, I am delighted to introduce our newest, Foramen Dental Education, in Porto, Portugal. You can read more about this impressive institute and coastal city and the dental professionals who work and teach there in the magazine.

Besides articles by the clinical masters featured in this issue, we bring you a brand-new section, “Meet the clinical masters”, in which past participants of the Clinical Masters™ Program showcase their relevant clinical cases.

Tribune CME now also offers the Clinical Mentoring program for clinicians seeking to overcome obstacles and expand their skills. It is designed to support practitioners in gaining as much practical experience as possible and developing their knowledge and skills step by step. During the training sessions, the Tribune CME mentors also provide advice on practice management to help participants choose the best processes, teams and training for their office and group of dental professionals.

I hope you will enjoy reading this issue of the Clinical Masters™ magazine and that it will provide the inspiration and information you were looking for regarding your further professional advancement.

We look forward to welcoming you to one of our upcoming international Clinical Masters™ Program sessions.

With my best regards,

Torsten R. Oemus  
President and CEO  
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EXCELLENCE IS IN THE SIMPLICITY

Discover the unique advantages of this product designed by Dr. Didier DIETSCHI

SHADING TECHNOLOGY DOUBLE CONSISTENCY SURFACE GLOSS ERGONOMICS

By EdelweissDR AG Unter-Altstadt 28, Mercandor 6300 Zug / Switzerland

www.edelweissdr.com
The concept of the Tribune CME (continuing medical education) programs is based on a blended learning approach. Tribune CME’s mission is to deliver comprehensive, advanced hands-on training in leading-edge dentistry on a global scale through:

- Intensive face-to-face clinical educational sessions and practical training, conducted at specialized state-of-the-art training facilities of prominent faculty members, in locations across the world
- Extensive self-study opportunities via a sophisticated e-learning platform, as well as ongoing support, live mentoring sessions with experts and peers via our webinars, premium online video training on demand and the opportunity to collaborate with peers and the Tribune CME faculty.
- Advanced clinical mentoring guided by our international faculty with evidence-based dental teaching methodologies. The result is an unmatched opportunity for dentists to achieve their most ambitious goals for professional development and their practice’s success.

Clinical Masters™ Programs are offered in:

- Esthetic and Restorative Dentistry
- Implantology
- Endodontics
- Periodontics
- Laser Dentistry

Upon successful completion, participants receive a Tribune CME certificate, which is also endorsed by the educational institutions associated with Tribune CME.

Personal branding opportunities: Tribune CME graduates may make use of the Clinical Masters™ Program logo to promote themselves and their practice both online and in print. Further learning and personal branding opportunities for Tribune CME graduates are available through the Clinical Masters™ Network. Tribune CME programs are recognized by the American Dental Association (ADA) and provide ADA CERP credits. ADA CERP is a service offered by the ADA to assist dental professionals in identifying quality providers of continuing dental education.

“Practical training at specialized, state-of-the-art facilities of distinguished faculty members”

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Certificate of Participation

CLINICAL MASTERS™
IN ESTHETIC AND RESTORATIVE DENTISTRY

This is to certify that Dr. John Smith has met the complete requirements of the Clinical Masters™ Program in Esthetic and Restorative Dentistry pursuant to the quality criteria of the American Dental Association Continuing Education Recognition Program and Tribune CME.

100 CE credits

Instructors

Prof. Ed McLaren
Dr. Didier Dietschi
Dr. Panos Bazo
Dr. Stavros Pelekanos
Dr. Domenico Massironi

Tribune CME

Scan the QR code!
Join our Facebook page and engage with the Tribune CME community
The Master Educational Group (MEG) is an educational center dedicated to esthetic dentistry with a heart-head-hands approach to clinical teaching and education. It offers innovative continuing education and interaction with dedicated and talented dentists, who share their passion with participants in exploring theory, innovations and technologies in a supportive environment. The center, in addition to educational and technological areas, offers operating rooms for multiple live sessions.

www.meg-educational.com
Location
MEG is located in Melegnano, a town in the province of Milan, in the Lombardy region. The town lies 16 kilometers southeast of the city of Milan. The busy Italian city of fashion, Milan is considered the international arbiter of taste in style and design. As one-time Imperial Roman capital, it combines a rich history with a strong sense of place.
www.lonelyplanet.com/italy/milan

How to get there
The center is located close to the Milano Linate Airport. From Milano Linate Airport, you can take a connecting bus to Milano Centrale train station in the center of Milan. Once at Milano Centrale train station, take the train to Melegnano. Line 3 on the subway will take you to Rogoredo in about 20 minutes. Alternatively, to get from Milano Linate Airport to Melegnano, a chauffeur service is available via www.mydriver.com. Prices vary based on the car class.

What to see and do
For information on Melegnano and guided visits, inquire at Pro Loco (www.prolocalegnano.it), located in the Medici Castle. It organizes cultural activities and local events, including exhibitions. The Medici Castle is home to history, art and culture. It boasts two imposing medieval towers and evidence of Renaissance refinement, such as 16th-century frescos.

The Church of San Rocco was built in the 14th century and has a rococo façade and an 18th-century interior.
The Church of San Giovanni Battista, located in Piazza Risorgimento, has medieval origins, but was renovated with a façade of the early 1900s. It is home to many artworks, among them a painting by Bergognone.
The Duomo, a Gothic cathedral in the heart of Milan, took almost six centuries to complete and astounds with extravagant detail, including 135 spires and 3,400 statues.
La Scala is probably the world’s most famous opera house. It hosts classical concerts as well.
Museo del Novecento, located in the Palazzo dell’Arengario, accommodates Milan’s museum of 20th-century art.
Castello Sforzesco houses several museums, among them, the Museum of Ancient Art, the Furniture Museum and the Picture Gallery.
Parco Sempione is a large park situated in the historical center of Milan.
Santa Maria delle Grazie, a church and Dominican convent, is the home of Da Vinci’s The Last Supper and a UNESCO World Heritage site.
For more information, visit www.turismo.milano.it.

Where to stay
— In Melegnano
Ibis Styles Milano Melegnano is located 5.5 kilometers from the center and offers MEG special rates.
www.accorhotels.com | TripAdvisor Certificate of Excellence | 3-star
— In Milan
Hotel Milano Navigli is in the trendy Navigli neighborhood of historical Milan, offering many clubs, cafes and vintage shops.
www.hotelmilanonavigli.it | TripAdvisor Certificate of Excellence | 3-star

Mercure Milano Solari is located between the city center and the canals, in the fashion and design quarter, where the showrooms of the biggest names in fashion and most innovative designers can be found.
www.accorhotels.com | 4-star

Where to eat
— In Melegnano
Melemangio, within walking distance of MEG, offers a fusion of the traditional cuisine of Parma and Milan, characterized by a modern interpretation and presentation, both satisfying and fun.
www.melemangio-melegnano.com
Osteria del Portone, also within walking distance of MEG, serves modern variations of typical regional dishes.
www.osteriadelportone.com

— In Milan
Alice Ristorante is an elegant, warm and welcoming restaurant with its Mediterranean-influenced fare updated to suit current tastes.
www.aliceristorante.it | 1 Michelin star
Cracco serves traditional Milanese cuisine with a contemporary twist, enhanced by a superbly stocked wine cellar, boasting as many as 2,000 select vintages.
www.ristorantecracco.it | 1 Michelin star
Joia is where the ingredients of Mediterranean gastronomy meet with the cultures of the world in exquisite vegetarian haute cuisine.
www.joia.it | 1 Michelin star
INTERVIEW
with — Dr. Domenico Massironi

Q: Developments in technology and materials have advanced the practice of prosthetic restoration. How has this field changed over the years?
A: Like all the medical sciences, prosthetic dentistry has changed over time in relation to the development of materials and technologies. A conservative attitude toward dental tissue has certainly been a positive development, as has the search for prosthetic materials to reduce thickness and to achieve excellent function and esthetics. The shift of the system from analog to digital with intraoral scanners and CAD/CAM technology has really brought the focus to innovation in the future.

Q: From your personal experience, how has workflow over the past several years been improved with new materials and simplified methods? Which materials do you use and why?
A: Before simplifying, we have to determine a procedure that leads to an excellent outcome. Certainly, in an increasingly competitive market and in the face of a global economic crisis, we have to look for high-quality products that aid the clinician in conducting standardized procedures for an excellent result: That guides my choice in the use of materials.

Q: How can you predict great results in prosthetic treatment, and how significant is tooth preparation as a step in prosthetic restoration?
A: The success of a prosthetic treatment—indeed, I think this can be applied to all fields of medicine—starts from the diagnosis. If we make a correct diagnosis, which is our obligation as clinicians, within the limits of our competence, then we will have good predictability of the outcome of the clinical procedure. I have devoted my life to scrupulous research of precision, and I believe that, in prosthetic work above all, it makes the difference.
Q: How important are magnifying instruments? Which microscope do you use and why?
A: I have been one of the pioneers in the use of the microscope since 1989. Its use has changed my way of treating clinical cases. Work under the microscope is very precise, but the first reason to use it is ergonomics—as I keep repeating to my students. A nearly 30-year collaboration with ZEISS has allowed me to bring my microscopy experience to the world and to create a center, the Master Educational Group (MEG), the only one of its kind.

Q: Please would you elaborate on the modified chamfer finish line? What is its rationale for esthetic and functional reasons, and what is the role of different restorative materials?
A: Every time I see my work after 20–30 years of follow-up, I see the same precision and stability over time, both from a functional and an esthetic point of view. I think I have acted in the spirit of good parterfamilias and that makes me proud. The modified chamfer design is part of a procedure I codified to seek to achieve excellence. It is a link in a chain that all together determines the longevity of the treatment result.

Prosthetic restoration entails teamwork with the dental technician regarding considerations on the choice of materials, thickness, brightness, etc. Without his or her help, the clinician cannot reach his or her goal.

Q: What role do rotating, oscillating and rounded chisel instruments play in the modified chamfer technique? Which rotating, oscillating and rounded chisel instruments do you use? Why would you recommend them?
A: Sonic instruments allow us to perform marginal deflection and repositioning without tissue trauma. That is why I think there is a good indication for these in the field of prosthetic dentistry.

Chisels allow us to better define the chamfer, making the margins clear and defined. New Hu-Friedy chisels will soon come out for the modified chamfer design.

Q: How significant is practical education? What makes hands-on courses such as the Tribune CME Clinical Masters Program so effective in advancing the skills of implantologists and general dentists?
A: I have devoted the most part of my life to teaching, through which I try to convey what I have learned, with great humility. Training is part of the profession and only continuous comparison can make us better. Meeting new students is a joy and I feel honored to have the opportunity to share my knowledge with them.

Q: Can you please tell us a little about MEG, your role at the institute and why it is important to you?
A: MEG is a center of excellence established by Dr. Carlo Ghezzi and me to seek to share our knowledge. Today, many courses for Italians and foreign students are held there, giving them the opportunity to learn about the state of the art of various dental disciplines through a highly advanced technological system. Students are able to practice on their own phantom head under the microscope following the instructor’s steps on the monitor. MEG is a part of our life in the service of knowledge.

The Master Educational Group “is a part of our life in the service of knowledge”
EDUDENTINTERNATIONAL
AT THE GENEVA SMILE CENTER
— Geneva, Switzerland

Dr. Didier Dietschi
received his DDM in 1984, his MD in 1989, his PhD in 2003 and his habilitation qualification (postdoctoral) in 2004, all from the University of Geneva, Switzerland. He is currently a senior lecturer at the university and an associate professor at Case Western Reserve University in Cleveland, Ohio, U.S. Dr. Dietschi is in charge of anterior adhesive restorations and periodontal and implant surgery at the Geneva Smile Center.

The educational goal of the Geneva Smile Center and Edudentinternational teaching facility is to share long-term experience in and knowledge on conservative adhesive and esthetic dentistry with visiting dentists, helping them reach their full potential through comprehensive lectures and hands-on programs. The center provides an inspiring, comfortable and efficient setting with state-of-the-art audiovisual equipment, including ZEISS microscopes for each participant and a 4K-resolution demonstration system. Our vision is to inspire and guide dentists in developing confidence and proficiency to achieve excellent clinical results and enjoy a more satisfying and successful professional life.

www.edudentinternational.com

Location
The Geneva Smile Center is located on Lake Geneva, Europe’s largest Alpine lake, near its landmark fountain. The main shopping area in Geneva is just a few minutes away from the center. The city is perfect for exploring on foot, but it is also convenient to visit the attractions by bike. Geneva, located in the French-speaking part of Switzerland, is a trendy paradise and a city of culture and art. It serves as the headquarters for the World Health Organization and the Palais des Nations houses the United Nations Office. Geneva is one of the greenest cities in Europe with 20 percent of its green areas, earning it the appellation “City of Parks”. It is close to some of the best ski areas in the Alps.

What to see and do
Go skiing in the Alps. Chamonix and Mont Blanc are located 80 kilometers away. Megève, 70 kilometers away, originally conceived in the 1920s as a destination for the aristocracy, is a famous and fancy ski resort. A lake tour (www.keytours.ch) offers a wonderful way to discover Geneva. Explore the shops and antique dealers of Carouge, close to the city center, by day and its trendy bars by night. Visit the luxury boutiques along the rue

How to get there
The center is located seven kilometers from Geneva International Airport. It will take about 30 minutes to reach the center by taxi in good traffic conditions. An alternative is to take the No. 10 bus to the bus stop near Genève-Cornavin railway station (the stop is called “22-Cantons”), change to the No. 9 bus and get off at Place des Eaux-Vives. A good alternative is to travel by train. Trains arrive directly from Paris, Milan, Hamburg and Amsterdam several times daily. Most international trains have dining cars or a bistro, power outlets and a newspaper service, offering relaxed and comfortable travel.
du Rhône to see timepieces of beauty and indulge at the master chocolatiers. Go on an outing to the village of Dardagny to walk among the vineyards and sample the local wines. Follow the story of the Geneva humanitarian movement by visiting the International Red Cross and Red Crescent Museum. Visit the Globe of Science and Innovation at CERN, the world’s largest laboratory for particle physics.

For more information, visit www.genevaturisme.ch.

Where to stay
The following hotels are all located close to the Geneva Smile Center and the town center:
Hôtel Les Armures, ideally located for you to discover the hidden treasures of Geneva’s Old Town, is an intimate luxury hotel with origins dating back to the 13th century.
www.hotel-les-armures.ch | TripAdvisor Certificate of Excellence | 5-star

Hôtel de la Cigogne, located between the Old Town and Lake Geneva, occupies a charming historic building and its accommodation is distinguished by luxury, elegance, comfort and artistry.
www.cigogne.ch | TripAdvisor Certificate of Excellence | 4-star

Hôtel Bernina, only a ten-minute walk from Lake Geneva, is located right by the central station and near the United Nations Office. The hotel opened in 1860 and was renovated in 2006. Its rooms enjoy lovely mountain views.
http://hotel-bernina-geneve.ch/ | 3-star

Where to eat
Le Patio, located close to Lake Geneva, has tasty, top-quality cuisine almost exclusively based on seafood and beef.
www.lepatio-restaurant.ch

La Finestra, a cozy restaurant in the Old Town serving delicious fare with an Italian flavor.
www.restaurant-lafinestra.ch

Bistrot du Bœuf Rouge, offering French and international cuisine, with excellent meat dishes, tasty wine and a variety of gluten-free options.
www.boeufrouge.ch

Living Room Bar & Kitchen, at the Ritz-Carlton hotel, provides healthy and seasonal fine dining all throughout the day with signature French and European dishes. Try the expansive breakfast menu.

Over 400 years old, Café du Soleil serves traditional Swiss cuisine—its Swiss cheese fondue comes highly recommended. Enjoy the restaurant’s gracious terrace close to the parish church of Petit-Saconnex.
www.cafedusoleil.ch
INTERVIEW
with — Dr. Didier Dietschi

During the Clinical Masters™ Program in Esthetic and Restorative Dentistry session in Geneva, Switzerland, in May 2017, Christiane Ferret spoke with presenter Dr. Didier Dietschi about the use of composite and the importance of dental photography.

Q: Dr. Dietschi, in your experience, what are some of the most common problems that dentists run into with direct restoration, and how can these issues be addressed?
A: The problem is that it seems that there is less focus on and less effort in teaching and learning composites, which leads to general practitioners being less comfortable working with composites. Probably one of the main problems is obtaining proper anatomy, proper finishing, when it comes to posterior restoration, handling the thickness of the layers and selecting the right material for anterior restorations. According to the situation, we need to determine the right protocol. What is confusing for dentists is the number of new materials, so in the program, we focus on how to select a reliable shading system and universal composite system. We then clarify the use of the different protocols suitable for every indication, and we simplify the number of products and options. We want dentists to gain confidence in the area of direct and indirect adhesive procedures to apply them successfully in a broad range of indications. Simplification is definitely important for success.

Q: How important is it to have a hands-on component in a program like this?
A: Half of the time we spend on lectures to illustrate indications and to introduce the concepts that are essential for the clinical protocol. In the afternoon, we practice everything, step by step. The first two days deal with different techniques for different cavity sizes in the posterior region. The next two days deal with anterior techniques, like Class 4 and direct veneers. We demonstrate every step and try to work together with the whole group and learn from everyone's work. For this session, we have a mixed group of participants from all over the world and many have travelled far to join this program.
Q: What is the importance of being able to take accurate and engaging dental photographs?
A: Dental photography is central in dentistry. If one wants to be a better dentist, one first has to become a better photographer. The best way to progress is to firstly document all of the steps that one has followed. At the end of the day, one checks one’s material of the cases over a coffee to learn from one’s successes and mistakes. The problem in dentistry is that the patient is eager to leave after treatment, so the time to analyze and to make a mental image of one’s work is just a few seconds.

There is no way one can memorize everything one has done. One would lose the teaching value of one’s own work, so that’s why dental photography is one of the best ways to improve one’s skills, next to teaching and publications. There are then many reasons to document our work on a regular basis.

Q: How has patient demand for improved esthetics, coupled with a generally slow economy, affected the choice of treatment options?
A: The world economy may be in a recession, but that doesn’t prevent people dreaming about a better smile. In this regard, composite is a great material because it can be used alone and in combination with ceramics to improve the smile’s appearance. Doing everything with ceramics might be a little more expensive financially and in terms of tissue preservation; improving forms, proportions or color with composite for some teeth certainly is a way to obtain a better esthetic result.

And there are many patients who can benefit from composite as an additional material. The time when we only used composite or only ceramics is over. I think it is a great opportunity today to learn more about composite and what it can do for esthetics.
INTERVIEW
with — Dr. Stavros Pelekanos

Q: It is clear from your biography that you were educated internationally, having obtained your doctoral degree in Germany. You established your private practice in 1995, and since then have published over 30 articles and collaborated on several books. It seems that you have mastered both worlds — professional and academic. How do you see this from your perspective? What has been needed from your dental team to maintain the high-quality work for all this time?

A: Theory and practice can be so close and yet so far from each other. The time I spent at the University of Freiburg (under Prof. J.R. Strub) for my postgrad studies influenced my way of thinking with regard to the academic part of my life. At the same time, having the opportunity to work with excellent clinicians has challenged my future and given me the desire to combine both the academic and clinical world.

Lately, I took a big and difficult decision to quit the Greek University (Dental School of Athens) after serving it for 16 years consecutively. It’s all about choosing the right people to be with and work with. A team approach with highly qualified dentists, dental assistants and dental technicians is established in my office in Athens, giving me the opportunity to combine clinical work and lecturing.

Q: Looking at your intense international lecture schedule, you spend a substantial amount of time outside your office in Greece. What challenges does this bring to your work, and how do you manage to maintain a balance? Can you remember how many new passports you have had to get because the old ones were filled with stamps?

A: Traveling for lecturing has been very intense during the last six years, that’s true. Visiting new places and encountering different people and cultures has really been the interesting part, but keeping a balance between work and personal life has been the difficult part. Regarding the passports, I still remember the last one, which was so full of stamps and added pages that it was not accepted, although not expired!

Q: Everybody needs a mentor. Who has had the greatest impact on your professional work? Whom do you look up to?

A: As I already mentioned, Prof. J.R. Strub in Freiburg was my first mentor and had a major impact on my professional work. Having the opportunity to work closely with him and with Prof. Markus Hürzeler (associate professor at that time) influenced my way of thinking in dentistry, especially in combining prosthodontics and surgery. I strongly believe that a good implant surgeon has to master prosthodontics and a good prosthodontist has to master surgical procedures. The modern implantologist has to be trained in both disciplines.

Q: What is your professional focus at this point in your career?

A: Having been a part of the academic community and teaching prosthodontics at the University of Athens — I really loved teaching my postgrad students. My greatest passion though is treating patients at the highest level possible. This is only possible when one has a team that shares the same vision and passion with one and a place that inspires one. This is achieved in my private clinic based in Athens. I believe one can become a better teacher if one understands and masters the clinical reality.

Q: What is your scientific focus at this point in your career?

A: Placing and restoring a large number of implants in the last 20 years, especially in the esthetic zone, and being aware of the complications that can occur, my main focus is the transmucosal part of the implant-abutment complex. The mechanical connection, the kind of abutment, the materials used (chemistry and surface roughness) and the treatment sequence are some of my focus areas, which are described in a book chapter that was recently published (Implant Aesthetics: Keys to Diagnosis and Treatment; Springer, 2017). Subsequently, clinical online videos are also available via the e-book. New treatment modalities, like the use of intermediate single-unit abutments for single-implant restorations, and the impact of surface roughness modification on the soft tissue are points of interest and the subjects of research.

Q: You actively participate in several dental associations and groups that have different approaches to dentistry. Some of them appear to be very relaxed, like the one in Ibiza, Spain, and others seem very formal. What is your insider view on these different groups and their cultures? How important is that participation for your work?

A: Well ... that’s true; that event in Ibiza was organized on Facebook among good friends and took place in a very relaxed atmosphere. It ended up being very successful and there has been great interest from dentists and companies for it to be continued on an annual basis.

In contrast, I am an active member of the European Academy of Esthetic Dentistry (EAED), one of the most important and prestigious groups in the world, with members who are pioneers, leaders and passionate clinicians in esthetic dentistry.

Dental Tribune International was fortunate to be able to interview one of the most influential international speakers in the fields of prosthetics and implantology, Dr. Stavros Pelekanos from Athens, Greece, in between his travels and spoke with him about his academic and professional lives. Dr. Pelekanos is an former assistant professor at the Department of Prosthodontics, School of Dentistry, University of Athens. As a faculty member of the Global Institute for Dental Education, Los Angeles, U.S., he lectures internationally and gives hands-on courses on implants, esthetics and restorative procedures. To date, he has published over 20 articles in peer-reviewed journals and two chapters in books.
Attending and participating in those meetings (one closed and one open annually) is really challenging, stimulating discussions at a really high level and promoting dentistry. This year, the meeting will be held in Sorrento, Italy, on May 24–26, and Dr. Stefano Gracis, President of the EAED, has prepared an outstanding scientific program (under the theme of “Strategies in treatment planning: Efficiency vs reliability”; http://sorrento.eaed.org).

Q: How does the Milan session connect with the rest of the Clinical Masters™ in Esthetic and Restorative Dentistry program?
A: The Milan session takes place in one of the best organized facilities for prosthodontic courses in Europe, the Master Educational Group, and is presented together with Dr. Domenico Massironi, a pioneer in microscopic prosthodontics. Over these four days, in a really intensive and comprehensive session, participants have the opportunity to learn how to use and prepare teeth with a microscope during the first two days, while in the last two days, larger full-mouth cases are discussed, with demonstration and hands-on work, analyzing ways to alter the vertical dimension of occlusion with different centric relation techniques.

It’s a unique opportunity to take practical knowledge and apply it directly the next week.

Q: Can you tell us about your favorite instrument choices for the hands-on part of the program?
A: W&H’s Implantmed and Piezomed motors and handpieces, Hu-Friedy instruments, botiss biomaterials, MIS Implants Technologies, Butterfly Italia sutures and BoneModels. It is a part of my character that I don’t like to make compromises. Therefore, in my hands-on part of the program, I always like to use the instruments and materials that I use in my daily practice. The mentioned companies and products are part of my daily work.

W&H provides the best implant motor available on the market right now. With an integrated insertion torque measurement system, implant stability measurement (Implant Stability Quotient) and wireless foot control, it is easy to use and one of the most important tools during surgery. With just one click of the foot control, one can switch immediately to the piezoelectric surgery device, one of the most powerful on the market.

Of course, Hu-Friedy instruments with their unique design and precision are always to hand in every dental procedure. I can’t work without them.

botiss biomaterials is my personal choice for any regenerative procedure during surgeries. The products that I prefer and have mostly used during the last several years are collacone, cerabone, Jason fleece and the new permamem membrane.

The V3 implant from MIS with the new B+ surface and an innovative design is my choice when it comes to implants. Besides surgery and owing to my prosthodontic background, the variety and precision of the prosthetic options makes my life easier, providing my patients with the highest quality possible.

Finally, when it comes to teaching, I believe BoneModels is a very reliable company for surgical and prosthetic hands-on courses. The quality of the soft and hard tissue is unique, imitating real human tissue. Procedures like immediate implant placement and temporization, soft- and hard-tissue augmentation, and sinus lift are some of the clinical procedures that can be performed and demonstrated on these models.

Q: Recently you started using one of the most innovative implants on the market—V3. What got you interested in this new concept, and what have your experiences been so far?
A: V3 is a really innovative concept providing a triangular shape at the coronal part of the implant body. This helps to reduce the pressure at the usually thin coronal part of the crestal bone, preventing bone resorption. Regarding prostheses, different possibilities, such as concave-shaped single-unit abutments and single anti-rotational multiunit abutments for single-implant restorations, provide a variety of solutions for every case. More recently, an amazing innovative internal connection single unit abutment came to the market, making prosthetics and the concept I love (one-time abutment) even more successful.

Q: Your big passions are skiing and kitesurfing. What do you enjoy about these sports? What ski resorts and kite locations can you recommend as your favorites?
A: That’s true. That’s my second passion besides dentistry. I cannot imagine myself without sport activities, with skiing and kitesurfing being two of them. My favorite ski resorts are Zermatt–Cervinia in Europe and Jackson Hole, Wyoming, in the U.S.

For kitesurfing, I would definitely recommend my favorite Greek island, which is Paros and Aruba in the Caribbean Sea.

“I believe one can become a better teacher if one understands and masters the clinical reality”
Background and aim

Different materials and treatment options are available in esthetic and restorative dentistry for the anterior region. The conventional protocol, including an analog impression with polyether or polyvinylsiloxane, a master cast and die fabrication, waxing and pressing of ceramic materials, requires exceptional skills and is technique-sensitive. Intraoral scanning and digital impression taking provide an accurate alternative method for transferring information from the mouth to the dental laboratory. The digital file is always on the computer and can be immediately processed or at any time, unlike with the conventional procedure.

Regarding materials, various newer products, such as pressed or milled ceramics, offer enhanced strength and functionality; however, in thinner dimensions, they lack the inherent esthetic beauty of conventional materials such as feldspathic porcelain. As patient demand for better esthetics has increased in recent years so too has the need for restorative materials that closely mimic the patient’s natural dentition. Initially used for the creation of porcelain dentures, feldspathic porcelain has emerged as the premier esthetic material for custom veneer restorations. In recent years, the use of hand-layered powder/liquid feldspathic porcelain has been revived based on its highly esthetic values and little to no preparation requirements. By keeping preparation to a minimum, less tooth structure is removed and procedures are much less invasive, which is exactly what patients desire.

In contrast, the conventional methods of ceramic fabrication have been described as time-consuming, technique-sensitive and unpredictable owing to the many variables, and thus CAD/CAM may be a good alternative for both dentists and laboratories. CAD/CAM may also reduce the fabrication time of high-strength ceramics by up to 90%. Furthermore, industrially fabricated blocks are more homogenous, with minimal flaws, and CAD/CAM restorations have been found to compare favorably with other restorative options.

As far as optical properties and CAD/CAM are concerned, the fact of complex optical illusion phenomena in anterior esthetics cannot always be met with monochromatic esthetic materials without the need for final characterization by a dental technician. In order to overcome such esthetic disadvantages of a monochromatic restoration, multichromatic ceramic blocks have been developed to create a 3-D layered structure. These ceramic blocks offer a gradient of chroma from the cervical to the incisal areas that replicate dentin and enamel in the same block.

The aim of this case report is to compare the analog versus the digital workflow on ten ceramic veneers in the maxilla, in terms of esthetic outcome, length of procedures and technical sensitivity for both the dentist and the dental technician.

Methods and materials

A 35-year-old patient presented at the office with the chief desire that the esthetics in the anterior region be changed (Fig. 1). A diagnostic wax-up was performed, followed by mock-up fabrication, in order to obtain a preliminary visualization of the final outcome. Orthodontic treatment was proposed in order to align the teeth in a more favorable position for veneers requiring minimal preparation and to reduce the overbite. One year after treatment, the patient returned for the final prosthetic rehabilitation (Figs. 2a & b). Digital smile design according to Coachman and Calamita.
Fig. 1 Initial photograph of the anterior teeth prior to orthodontic treatment.

Fig. 2a Anterior teeth after orthodontic treatment.

Fig. 2b Extraoral photographs after orthodontic treatment.

Fig. 3 Digital smile design indicating crown lengthening of teeth #13, 12, 11 and 21 and restorative treatment of the ten anterior teeth.

Fig. 4 Wax-up on the stone model concerning the restorative treatment of the ten anterior teeth.

Fig. 5 Three-dimensionally printed model of the digital smile design planning, bearing a mock-up shell. A cervical opening was introduced for surgical access and guidance for crown lengthening.

Figs. 6a & b Intraoral fit of the surgical guide for crown lengthening.

Fig. 7 Periodontal tissue of the anterior teeth six months after crown lengthening.

Fig. 8a Mock-up silicone index.

Fig. 8b Intraoral photograph of the mock-up.

Fig. 9a Preparation through the mock-up.

Fig. 9b Check of the preparation depth, with the use of the silicone guide, palatal aspect.

Fig. 9c Final preparation of the teeth.
Fig. 10 Analog impression with polyvinylsiloxane.

Fig. 11 Digital impression with TRIOS.

Fig. 12a Digital planning of the provisional restorations.

Fig. 12b Provisional restorations intraorally (Telio CAD).

Fig. 10 Analog impression with polyvinylsiloxane.

Fig. 11 Digital impression with TRIOS.

Fig. 12a Digital planning of the provisional restorations.

Fig. 12b Provisional restorations intraorally (Telio CAD).

Fig. 13 Analog workflow (refractory dies, built-up veneers, adjustments, staining/glazing).

Fig. 14 Digital workflow (3-D printed model, CAD/CAM veneers, adjustments, staining/glazing).

Fig. 15a Feldspathic veneers with try-in paste.

Fig. 15b CAD/CAM veneers with try-in paste.

Fig. 15c First quadrant feldspathic veneers and second quadrant CAD/CAM veneers simultaneously with try-in paste.

Fig. 16a Isolation field and try-in of the fit of the veneers on teeth #11 and 21.

Fig. 16b Etching of the enamel for 30 seconds with a 32% orthophosphoric acid.

Fig. 16c Application of the bonding agent.

Fig. 16d Final polymerization of the veneers.

Fig. 16e Veneers in situ before finishing and polishing procedures.

Fig. 16f Final outcome immediately after removal of the rubber dam.
was performed, from which a treatment plan of crown lengthening and veneers on teeth #15–25 (Fig. 3) was proposed. A conventional diagnostic wax-up was also produced (Fig. 4). Both digital and conventional mock-ups were applied, and agreement was attained concerning tooth shapes and proportions. Crown lengthening was performed, guided by the digital mock-up, with the use of an acrylic transparent double crown lengthening guide that indicated the borders of the gingivectomy and alveolectomy needed in periodontal surgery for esthetic rehabilitation (Figs. 5, 6a & b). 10

After six months of tissue stabilization (Fig. 7), a mock-up was produced with Telio CS C&B (Ivoclar Vivadent) chairside (Figs. 8a & b), and tooth preparations with silicone guides were performed (Figs. 9a–c). Both conventional impressions with polyvinylsiloxane (Fig. 10) and digital impressions (TRIOS, 3Shape) were taken (Fig. 11).

 Provisionalization was executed digitally, using Telio CAD (Ivoclar Vivadent) in the Wieland Select CNC milling machine. The design was performed with the 3Shape Dental Designer 2015 software (Figs. 12a & b). Two sets of final restorations were fabricated. The set of feldspathic veneers was fabricated on a stone model using IPS Style (Ivoclar Vivadent), while IPS Empress CAD Multi (Ivoclar Vivadent) was used for the digital set (Figs. 13 & 14). Both sets were examined intraorally with a try-in paste to compare the optical properties of the feldspathic and the CAD/CAM veneers (Figs. 15a–c). The subjective decision of the clinician and the patient was to cement the feldspathic veneers, owing to slight differences in the length of the central incisors between the two sets. Adhesive procedures followed (Figs. 16a–f), and final intraoral and extraoral photographs were captured one week later (Figs. 17a–e).

Results

Intraoral digital scanning is a perfect alternative clinical procedure compared with the conventional impression technique. The digital planning and mock-up procedure is a powerful communication tool for the dentist, although special skills in using computer software are required. Regarding the laboratory workflow, most of the analog procedures require more time (refractory dies, built-up veneers, adjustments), except the staining/glazing (Figs. 18a & b).

Although the esthetic outcome of the feldspathic veneers was subjectively chosen in this case, the analog workflow is much more demanding. The digital approach, because of the reduced difficulty, speed, complexity and patient discomfort, tends to be preferable (Figs. 18a & b).

Conclusion

Knowledge and application of virtual smile design procedures, coupled with innovative dental laboratory technologies, allow dentists to diagnose, plan, create and deliver esthetically pleasing new dental compositions. Furthermore, advances in CAD/CAM technology have catalyzed the development of esthetic veneer restorations with industrially produced materials possessing superior biomechanical properties and good esthetics.

Editorial note: A list of references is available from the publisher.
Dr. Testori is currently head of the Section of Implantology and Oral Rehabilitation at the University of Milan's Dental Clinic at the I.R.C.C.S. Istituto Ortopedico Galeazzi.


He is the author of 112 peer-reviewed publications and four books on implantology.

The Lake Como Institute is a center dedicated to higher education in implantology. The institute’s teaching is based on scientific and clinical research, and an interdisciplinary teamwork approach to the work is adopted. The clinic of excellence is based on established protocols and attention to detail, two factors that are regarded as important for achieving a long-lasting result. With the work philosophy of seeking to achieve the best results, combined with 30 years of clinical experience, the institute offers an innovative course that will allow to provide better treatment to patients, who rely on professionalism for their oral health.

www.lakecomoinstitute.com
Location
The Lake Como Institute is located in the town of Como, famous for its silk manufacturers. Within what remains of its 12th-century walls is a charming historical center. The town is set on the shores of Lake Como, situated in a basin surrounded by wooded mountains and said to be the most beautiful of the Italian lakes. There is plenty to see while strolling around, including stunning villas, gardens, and sites of historical and cultural significance.
www.lonelyplanet.com/italy/the-italian-lakes/como

How to get there
From Milano Malpensa Airport, located about one hour away by car, you can take the Malpensa Express train to Como.
www.malpensaexpress.it

From Lugano Airport in Switzerland, located about 20 minutes away by car, you can take a shuttle bus to Lugano, and then a train from Lugano station to Como S. Giovanni station.
www.trenitalia.it | www.sbb.ch

From Milano Linate Airport, you can take a connecting bus to Milano Centrale station and catch a train to Como S. Giovanni station (trains depart hourly).

The following transport options are available via the institute:
– a private mini-van for up to five passengers, one way from Milano Malpensa Airport to Como
– a private mini-van for up to seven passengers, one way from Milano Malpensa Airport to Como
– a private car (up to three passengers), one way from Milano Malpensa Airport to Como
– There is an additional cost from Il Caravaggio International Airport (Orio al Serio International Airport)

What to see and do
Como is a very small old town and the best way to get to know it is by exploring its narrow passages, old streets, quaint markets and piazzas, stopping to enjoy a cappuccino on the terrace of one of its many cafes.

The remarkable 11th-century Romanesque Basilica di Sant’Abbondio has a beautiful fresco series inside the apse and a university occupies what was once the cloister.

Lake Como’s shores feature a varied landscape of fields, forests, imposing rocks, charming villages facing the lake and magnificent mansions with beautiful gardens, particularly from Cernobbio to Gravedona and Bellagio. The following include only some of the innumerable sights:
– The middle of Lake Como, where its three branches come together, offers a spectacular view of the whole promontory of Bellagio, of the northern Grigna mountains overlooking Vallassina, and of the upper basin against the backdrop of the Alps if the skies are clear. It has the mildest climate and can be reached by boat.
www.taxiboat.it

Besides the glorious views of the Lecco branch of the lake, which turns southward, there are natural springs, like Fiumelatte, described by Leonardo da Vinci, and the impressive Orrido di Bellano (gorge), situated not far from the Renaissance Villa Monastero at Varenna.
For more information, visit www.lakecomo.eu.

Where to stay
All of the following hotels are located within a reasonable distance to the institute. If you would like to stay right on the lakefront, you might want to consider one of the following:
 Palace Hotel is an historical art nouveau palace overlooking the lakefront.
www.palacehotel.it | TripAdvisor Certificate of Excellence | 4-star

Albergo Terminus dates back to the 19th century and has an enchanting view across Lake Como.
www.albergoterminus.it | 4-star

Not on the lakefront, but also centrally located is the following hotel Albergo Del Duca, with an attractive setting on a pedestrian square, offers the hospitality of a family-run business.
www.albergodelduca.it | 3-star

Where to eat
La Colombetta is a cozy restaurant offering regional cuisine, with fish dishes as its specialty.
www.colombetta.it

L’Antica Trattoria serves seasonal, traditional Italian cuisine with specialty meat dishes cooked on the fire in view of guests.
www.lanticatrattoria.co.it

Tira, mola e meseda provides Italian cuisine, especially dishes from Lombardy (risotto, ossobuco).
www.tiramolameseda.it

Capitan Drake Enoteca is a small eatery and wine bar offering New Zealand, Italian and Mediterranean cuisine.
www.capitandrake.it

I Tigli in Theoria, situated in the old palazzo and next to Theoria art gallery, provides a combination of gourmet cuisine, art and history.
www.theoriagallery.it | 1 Michelin star
Q: Dr. Lops, you are considered an expert in implantology. What is the state of implantology today?
A: Basically, there are two approaches to implantology: The old one, which pursues a simple filling of edentulous sites by means of devices supporting something that is far from a natural tooth appearance—this approach does not consider a harmonious and global treatment plan—and the new approach aided by technological advancements as available to clinicians today. The new approach to implantology aims to restore the natural appearance of the patient’s smile through a global implant treatment plan, digital diagnosis, 3-D implant placement, new all-ceramic materials for implants and considering the adjacent natural teeth. Such an approach is the only one that can provide functionality and predictable esthetics in implantology.

Q: What have the major advancements in implantology been in terms of technology and science?
A: Digital solutions have continued to improve the entire implantology workflow, now covering diagnosis (CBCT scans), treatment planning (digital and guided surgery) and surgical procedures (guided surgery). Moreover, new all-ceramic materials are available with better biomechanical and esthetic performance. The results are more reliable and predictable in terms of the long-term prognosis of the rehabilitation and have a more natural appearance in harmony with the adjacent teeth.

Dr. Diego Lops received his Doctor of Dentistry in 2001. In 2004, he completed a postgraduate qualification in advanced oral surgery and maxillary reconstructive techniques at the Université Paris Diderot, France. One year later, he completed a master’s degree in innovative techniques in oral implantology and prosthetic rehabilitation at the University of Milan, Italy. Since obtaining a PhD in implant dentistry and prosthetic rehabilitation from the same university, he has lectured on prosthodontics and implant dentistry at the Peking University School of Stomatology, China. He also works and teaches at the implantology department of the University of Milan.
Q: Together with Dr. Goran Benic, you are teaching the Clinical Masters Program in Digital Workflow and Esthetics at Lake Como, Italy. What is your aim with the course?
A: The aim of the course is to give participants a concrete set of instruments and the technology by which to conduct an accurate diagnosis, treatment plan, surgery and prosthetic restoration using state-of-the-art methods. The entire workflow can gain from using the appropriate technology in implant treatment. My aim is outstanding esthetics and predictable function for the patient. Through the course, we aim to give participants a different point of view on prosthetically driven implantology.

Q: You also work and teach at the implantology department of the San Paolo University Hospital in Milan. What are your inspirations as a teacher of your fellow dentists and students?
A: I try to convey my passion not only for finding the best option for simple restoration of an edentulous site, but also for taking up the challenge, together with the patient, for the restoration of the patient’s smile. The interplay of hard and soft tissue is important in order to provide a prosthetically driven outcome.

Q: Which biomaterials do you use for implantology and why?
A: For horizontal augmentation and sinus floor augmentation, bovine demineralized particles and collagen membranes, stabilized by specific pins where required. These biomaterials provide a safe and stable scaffold that promotes the fixture’s stability after an adequate healing period. Titanium mesh as a barrier for vertical and horizontal augmentation. Such devices may guarantee the stability of the coagulum also if bone walls are missing. I also use collagen (not particles) and collagen membranes for socket preservation procedures. These biomaterials also provide a safe and stable scaffold for fixture stability after healing.

Q: What is necessary for a minimally invasive approach in implantology?
A: It is important to correctly plan the clinical case, to minimize the releasing incisions if possible in order to achieve minimal surgical re-entries (minimal crestal incisions without touching interproximal papillae) and to reduce the number of visits required for the prosthetic restoration.
INTERVIEW

with — Dr. Goran Benic

In 2002, Goran Benic graduated with a DMD from the School of Dental Medicine, University of Zurich, Switzerland, and received his doctor medicinae dentium (Doctor of Dentistry) from the same university. In 2016, he obtained the venia legendi (permission to teach as a Privatdozent) for reconstructive dentistry and oral implantology from the University of Zurich. He is a member of the Swiss Society of Reconstructive Dentistry and the Swiss Dental Association.

Q: As a prosthodontic specialist, what is your main goal for a successful treatment?
A: The answer relates to my role as a prosthodontist and dentist and to the medical aspects as a doctor. Basically, for each case, the following aspects, according to importance, are always the same: a healthy oral health situation, function and finally esthetics. The most important thing is to have a happy patient. Generally, when I approach a case, to reach the goal of satisfying the patient's desires, it is very important to define individual needs, which differ from case to case and from patient to patient. The key is to take one's time, especially in the beginning. Interview and listen to the patient and involve the patient in the treatment plan, especially in cases with high esthetic demand, since esthetics is subjective and the perception of esthetics differs from person to person.

Q: What do you do to present the case and treatment options to your patients?
A: Photography is of course always used in the digital part, but in this part, I use the analog method, either by drawing and explanations on the computer or notes on a piece of paper or tablet. The digital key in terms of smile design is not as important. The most important item for me is the mock-ups. Generally, for the second appointment, I prepare mock-ups that are inserted into the patient's mouth. This is the best possible diagnostic and the most important tool to show to the patient what can be done. This is also associated with a great deal of emotion, in this initial phase. Of course, there are new possibilities with digital smile design tools and so on, but personally I prefer to do something in the patient's mouth so that he or she can touch it and see it in the mirror.

Q: What is your opinion on minimally invasive therapy?
A: In general, minimally invasive therapy in surgery has been around for many years in dentistry. It was made possible through the use of digital scans, guided surgery for flapless procedures and some others. These were important tools for 3-D diagnostics, which is very important today. We can no longer think about dentistry without 3-D diagnostics, but minimally invasive therapy in terms of flapless surgery was not as revolutionary, since the indications for such therapy are relatively restricted.

Q: If you had to decide on an advanced implant surgical technique, which one would it be and why?
A: It’s not really possible to choose one technique because the field of implant dentistry is so diverse—keeping in mind that any procedure that allows us to perform minimally invasive therapy in implant treatment is always my choice. Everything that reduces invasiveness is the key not only for comfort but also for efficiency. For example: I’m a big fan of the ridge preservation procedure; I prefer any type of procedure that reduces the need for major bone grafting. As for immediate protocols, the conservative approach is not used very often in some countries. For an immediate implantation protocol, we need a clear indication for the posterior region. This is a good solution for a prosthetic indication. For the esthetic regions, immediate implantation protocols are not completely predictable when it comes to esthetics. Overall, any type of procedure using invasive methods should not be used.

Q: Implant biomaterials can be essential for the long-term success of implants. What is your opinion, and which ones do you prefer?
A: In the past decades, things have changed. In the beginning, it was advocated that good biomaterials or good bone substitutes need to be completely replaced by new bone. In the meantime, things have changed since the observation that biomaterials that are completely resorbable and are replaced by bone are
associated with an overall loss of bone volume, which means that the rate of resorption is higher than the rate of growth of the new bone. In my opinion, the approach is different today. I chose to use biomaterials with a very low substitution rate, which means that they do not resorb or resorb very slowly in order to retain the volume. It is important to preserve the volume, particularly in the esthetic regions. Generally, this is done by proteinase scintigraphy or by synthetic materials. The best combination in my opinion is the combination of hydroxyapatite with tricalcium phosphate.

Q: What is your favorite instrument when it comes to minimally invasive therapy?
A: Generally speaking, when I think of minimally invasive surgery, of course it is 3-D planning, so cone beam computed tomography (CBCT)-guided surgery. At the moment, I see a lot more development and interest in the minimally invasive prosthetic approach, which I find very exciting. There are no-prep veneers that can be fabricated from different materials, such as feldspathic ceramic and glass-ceramic. It is impressive that we can achieve beautiful results with less anesthesia, less pain, less need for provisionals and less invasive therapy. I can only see advantages with minimally invasive therapy.

Q: What is the esthetic challenge in implant dentistry?
A: The greatest challenge is definitely the predictability of the pink esthetics. The challenge is the prediction of the interaction of the hard tissue and soft tissue. The key is the correct risk assessment in every single case, the correct treatment planning. We also have to keep in mind that the surgical way is not always the best and the most predictable way. For example, in a high-risk situation, one should rather consider a prosthetic option. Let’s use the example of a large tooth in an esthetic region. This is a high-risk situation and proper assessment needs to be considered. It might be more predictable to use a prosthetic solution that proposes the use of pink ceramics instead of a staged surgical approach. In summary, the challenge is the predictability of the pink esthetics and performing the correct risk assessment and the correct treatment planning.

Q: What is your favorite instrument when it comes to digital workflow?
A: As for the digital workflow, I think that 3-D planning, virtual planning and guided surgery give dentists the possibility of creating a digital 3-D image of the patient. In the beginning, we started with computed tomography and now we are able today to combine different digital files: the image of the bone, the CBCT image with an optical scan and the virtual prosthetic setup can be seen together with the face of the patient. We are now able to create a digital patient, which allows us to perform better treatment planning. The transfer of the information is not yet ideal, however, because we are still often stuck between one step and another. There’s still progress to be achieved.

With regard to photography, it is really the standard for today’s procedure planning. When it comes to the prosthetic part and the shade selection, photography is irrelevant in this part of the treatment. Photography is not yet entirely predictable for shade selection, but of course there are techniques, filters, references and so on with spectrophotometers, but personally I think in situations with high esthetic demand, I prefer to have direct contact with the technician; it is still the gold standard.

Q: What is the evolution of dentistry as a whole?
A: There are two things: minimal invasiveness—every surgeon or prosthodontist will become more advanced—and digitalization. Digitalization of society, medicine and dentistry has given us major advantages in diagnostics, allows better treatment planning and facilitates minimal invasiveness. On the other side, digitalization is about individualization, creating customized 3-D-printed implants or bone substitutes made of synthetic materials and customized 3-D ceramic reconstructions. Additive manufacturing techniques are still in the

“What really makes a difference in medicine and dentistry are the small details, tips and tricks that can only be taught in practical courses”
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Dr. Gilberto Debelian

Dr. Gilberto Debelian received his D.M.D. from the University of São Paulo, Brazil, in 1987. He completed his specialization in endodontics at the University of Pennsylvania, U.S., in 1991 and received the Louis I. Grossman Postdoctoral Student Award in Endodontics. He concluded his Ph.D. studies at the University of Oslo in 1997 in endodontic microbiology and received two scientific awards from the European Society of Endodontology and the Norwegian Dental Association in 1997. He is the author of four books and has written more than 60 scientific and clinical papers.

Dr. Debelian taught as a clinical instructor and associate professor in the postdoctoral endodontic program at the Section of Endodontics at the University of Oslo from 1991 to 2001 and from 2006 to 2010. Currently, he is an adjunct associate professor in the postgraduate program in endodontics at the University of Pennsylvania. In addition, he maintains a private specialist endodontic practice and an advanced endodontic microscopy center in Bekkestua, Norway.

Location

Endo Inn is located in Bekkestua, close to the city of Oslo. The capital of Norway is a cosmopolitan hub with an innovative and varied cuisine, including traditional Norwegian food, a diverse fashion and art scene, and beautiful architecture. Lively Oslo is one of the fastest-growing cities in Europe. The city is enclosed by the Oslo Fjord and wooded hills and won the European Green Capital Award for 2019. Its people are keenly engaged in the conservation of their natural landscape and the reduction of environmental pollution.

How to get there

Bekkestua is 13 kilometers from Oslo. Oslo has one airport (in Gardermoen) and the quickest way from the airport to the Oslo city center is with the Flytoget express train (http://flytoget.no/), which runs every ten minutes.

To get to Endo Inn from the city center, take the metro from Jernbanetorget station (a five-minute walk from Oslo central station, which is the final stop with Flytoget from the airport) or Stortinget station, Nationaltheatret station to Bekkestua. The ride takes about 15–20 minutes. From the stop in Bekkestua, it takes two minutes to walk to Endo Inn.

Endo Inn is an endodontic training center in Norway. Its aim is to introduce to both general dental practitioners and specialists the latest technology in the specialty of endodontics in order to meet the essential biological requirements for predictable and successful outcomes. The center offers different types of courses, depending on the dentist’s schedule and area of interest. Participants will work on custom-designed workstations with operating microscopes connected to high-definition monitors. To give participants greater understanding of the complex root canal anatomy, transparent and opaque 3-D printed teeth are used. After treatment, participants can check their work using CBCT technology.

Endo Inn
— Oslo, Norway

Dr. Gilberto Debelian

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Dr. Debelian taught as a clinical instructor and associate professor in the postdoctoral endodontic program at the Section of Endodontics at the University of Oslo from 1991 to 2001 and from 2006 to 2010. Currently, he is an adjunct associate professor in the postgraduate program in endodontics at the University of Pennsylvania. In addition, he maintains a private specialist endodontic practice and an advanced endodontic microscopy center in Bekkestua, Norway.
What to see and do
Oslo is a vibrant city full of museums, restaurants and shopping opportunities, and being compact, the city center can easily be explored on foot. Oslo’s fascinating landmarks are the Norwegian National Opera, which is Norway’s largest music theatre. It has 13 soloists and was awarded the accessibility prize for the way it seeks to make opera available and appealing to new audiences. The Astrup Fearnley Museum, right in the city center, is a museum of contemporary art and hosts exhibitions of international art and the Astrup Fearnley Collection, an extensive and important private collection of contemporary art. The Holmenkollen ski jumping hill is the oldest such sport venue globally. From there, you can enjoy a fantastic view over Oslo.

If you have a lot of stamina and want to see as much as possible from Norway, one option is the one-day Norway in a Nutshell tour (www.norwaynutshell.com). The tour takes you through some of the country’s most beautiful UNESCO-protected fjord and mountain scenery, including Aurlandsfjord and Naerayfjord. Travelers will also experience the breathtaking Bergen Railway, the scenic Flåm Railway and the steep incline of the Stalheimskleiva road.

Where to stay
The following hotels are all located in the center of Oslo:

**The Comfort Hotel Grand Central** is only a two-minute walk from Oslo central station and is located in the hippest part of Oslo. The hotel is newly renovated and has a modern New York style. [www.nordicchoicehotels.com/hotels/norway/oslo/comfort-hotel-grand-central](http://www.nordicchoicehotels.com/hotels/norway/oslo/comfort-hotel-grand-central) | TripAdvisor Certificate of Excellence | 4-star

**THE THIEF hotel** is well located near bustling Aker Brygge, a popular area by the Oslo Fjord. Just a stroll from Tjuvholmen beach, which used to be a haven for smugglers, the hotel is a modern hideaway with a relaxing spa and some top international art pieces. [https://thethief.com/](https://thethief.com/) | 2017 TripAdvisor Travellers’ Choice | 5-star

**Scandic St. Olavs plass** is only a 5-minute walk from the Nationaltheatret metro station. [www.scandichotels.com/hotels/norway/oslo/scandic-stolavsplass](http://www.scandichotels.com/hotels/norway/oslo/scandic-stolavsplass) | TripAdvisor Certificate of Excellence | 3-star

**Citybox Oslo hotel** is a five-minute walk from Oslo central station. The rooms and lounge are cozy and the design emphasizes simplicity. [2017 TripAdvisor Travellers’ Choice | 3-star](http://www.scandichotels.com/hotels/norway/oslo/scandic-stolavsplass)

Where to eat
Publiko serves mainly Nordic food with a twist. The restaurant is newly opened and, with its excellent food and good vegetarian menu, has been a great success. It is close to the Bogstadvien station. [http://publiko.no/](http://publiko.no/)

**Südøst** is a highly recommended restaurant that offers cuisine crossing Asian and European culinary traditions—also try the cocktails. It is located in Grünerløkka, an area with many hip restaurants and bars. [http://sudost.no/en/](http://sudost.no/en/)

**Mister India** is a restaurant offering delicious regional Indian cuisine close to Oslo central station. [www.mister-india.no](http://www.mister-india.no)

**Alex Sushi** has two restaurants in Oslo, in Tjuvholmen and Solli. Watch the chefs create the best sushi in town. The menu includes general Asian food and good options for vegetarians. [www.alexsushi.no](http://www.alexsushi.no)

**Himkok bar and distillery** was recognized as the 20th best bar in the world in fall 2017. Its team of cocktail professionals produce tasty and creative concoctions using homegrown spirits and herbs. [www.worldsbestbars.com/bar/oslo/city-center/himkok](http://www.worldsbestbars.com/bar/oslo/city-center/himkok)
Fifty years ago, Dr. Herbert B. Schilder introduced two legacy concepts to the science of endodontics: the constricted envelope of motion for instrumentation and the use of hydraulics to enhance the rheology of the obturation material used to seal the root canal space and optimize its gravitometrics. These were radical innovations for their time and despite technological and biological shortcomings of the armamentarium available, these innovations should have been technology-iterated and shortcomings in material and manufacturing evolution obviated; however, until recently that has not proved to be the case in toto. In order to truly understand the inherent flaws, the clinician must recognize the totality of what is necessary to engender predictable clinical success in endodontics.

Studies assessing the diametric dimensions of apical anatomy have repeatedly demonstrated that the buccolingual diameter is greater than the mesiodistal diameter; canals are predominantly ovoid throughout, not round (Figs. 1a & b).1–4 The technical flaw most inherent, the use of a round file of any design conformation to clean an ovoid canal configuration, manifests as the failure to debride a substantial amount of the canal contents. A recent study showed that the mean (± standard deviation) untreated areas ranged from 59.6% (± 14.9%) to 79.9% (± 10.3%) for the total canal length and 65.2% (18.7%) to 74.7% (17.2%) for the apical canal portion, respectively (Fig. 2).

The evolution of nickel-titanium (NiTi) instrumentation manufacture has persisted with a round core blank, regardless of whether it was ground, twisted, nano-coated, heated or metallurgically reformulated. NiTi files are superelastic and able to self-center, avoid apical elliptization and, with appropriate taper selection, prevent thinning of the coronal and middle thirds of the root, resulting in weakening or strip perforation. They are, however, unable to cleanse most of the intracanal space effectively (Fig. 3). Moreover, regardless of design configurations with a variable tip or variable taper or multiple tapers on a single file, they were unable to adequately cleanse the isthmus confluence of many canals.5 A revolutionary design in file configuration, the Self-Adjusting File (SAF) System (ReDent Nova) was introduced to correct this deficiency by including a virtual core (Fig. 4). It showed significant promise in terms of the degree of debris removal in complicated intracanal anatomy such as the isthmus when compared with the widely accepted ProTaper system (Dentsply Maillefer); however, it failed to take hold as a true replacement for traditional “round” rotary instrumentation systems.7–9

The manipulation of the metallurgical properties of NiTi by thermomechanical processing treatments has led to significant improvement on the clinical performance of the endodontic rotary files. The transition from the martensitic phase (soft phase) to the austenitic phase (stiff phase) is dependent on temperature and metal stress. The reversible transition between these two phases increase the safety and performance of these files during rotation. Unfortunately, fracture still occurs due to cyclic fatigue and torsional failure when the elastic limit is exceeded (Fig. 5a).

The new generation of NiTi alloys have transformation temperatures much higher than those of conventional austenitic materials used in previous generations of rotary instruments and will transform at close to body temperature. A recent study of ProTaper Universal, HyFlex CM, TRUShape and Vortex Blue showed that a temperature increase to 37 °C, simulating body temperature, substantially decreased the fracture resistance of all instruments.
This axial view of a mandibular molar demonstrates the ovoid eccentricity of the canals and existence of an isthmus connection between the mesiobuccal and mesiolingual canals consistent with findings of numerous studies.8, 9

The root canal space is an arborizational, anastomotic, labyrinthine complexity, morphologically comparable to the pathways of a maze. While primary canals exist, the tributaries, accessory branches and lumina of the dentinal tubules harbor extensive tissue and microflora. The existence of these vast, capacious passages has been demonstrated throughout the past century, beginning with the work of Hess and continues to this day with the use of microcomputed tomography.17

The axial view of the obturation (microstructural replication) demonstrates the flaw in flat field film interpretation. Significant areas of the buccolingual dimensions of the root canal space remained uncleared despite the illusory appearance in the radiograph.

Dr. Herbert B. Schilder’s principles included a continuously tapering shape, maintenance of the original anatomy, an apex as small as practical, and conservation of tooth structure. A continuously tapering space was acquired using precurved hand instruments, which imposed discontinuous contact with the canal walls and created an envelope of motion. Transactionally, Schilder created a virtual core.

The ideal file would produce an apical size that three-dimensionally cleaned the minor apical foramen. The SAF is a hollow file designed as an elastically compressible, thin-walled pointed cylinder that is composed of a NiTi lattice. Its hollow shape allows for the continuous flow of irrigant through its lumen. It was a beginning in the paradigm shift toward minimally invasive 3-D debridement and disinfection.
The revolution in endodontic instrumentation imparted by the first generation of NiTi instruments related to their shape memory and super-elasticity. Despite the advantages, these files were susceptible to fracture due to fatigue and torsional failure.

**Fig. 5b**

Heat treatment (thermal processing) is one of the most fundamental approaches to adjusting the transition temperatures of NiTi alloys and affecting the fatigue resistance of NiTi endodontic files. Newer alloys (e.g., MaxWire) transforming close to body temperature have demonstrated superior resistance to cyclic fatigue and torsional failure.

tested. MaxWire (Martensite-Austenite electropolish-flex), while not included in this study, is analogous to Vortex Blue. The temperature effect on the latest generation of NiTi files is shown in Figure 5b.

A new generation of adaptive/virtual core files, the XP-endo system (FKG Dentaire) has dramatically changed the view of endodontic instrumentation. In the absence of a solid core, this system allows the tooth to dictate the canal configuration achievable and allows cleaning of the canal with a degree of thoroughness that is unprecedented. Figure 7 details various features of the XP-endo Shaper. The Booster Tip lead section fits into the pre-established glide path, ensuring precise guidance and centering of the instrument. A traditional glide path instrument is used consistent with a #15/0.02 (size/taper) instrument. There are no cutting flutes on the lead section of the Booster Tip, and the XP-endo Shaper instrument slips into the prepared apical component of the glide path to a depth of 0.25 mm. The next 0.25 mm section of the Booster Tip is configured with six cutting flutes. Rotation of these flutes sizes the next 0.25 mm of the canal space anywhere from a #25/0.02 to #60/0.02 (size/taper) instrument; however, the apical size chosen for the XP-endo Shaper is #30. The taper of the XP-endo Shaper is 0.01; however, the MaxWire alloy of the Shaper enables the martensitic shape at room temperature to realize the memorized shape as illustrated at body temperature (Fig. 6). By repeated swaths (a motion analogous to whittling in contrast to pecking) of the file, the taper created ranges anywhere from 0.02 to 0.08. The ideal intracanal taper throughout is 0.04, which preserves dentinal girth in the coronal third and sustains maximal dentinal retention in any root curvature. Figure 7a demonstrates the difference between the ability of a standard round NiTi file to clear a less than ideal volume of intracanal debris in contrast to the more significant maximal debridement achieved by the XP-endo Shaper’s adaptive discontinuous contact of the canal walls. The desired minimally invasive shape achieved with this unique instrument is shown in Figure 7b.

The distinctions of greatest importance between the XP-endo Shaper and conventional NiTi instruments are as follows: The Shaper does not compact debris on the flutes, resulting in increased frictional resistance, as it provides substantial space in the lumen or the virtual core; nor does it force the debris apically as evidenced in instruments used with reciprocating motion. As the points of contact on the dentinal walls are discontinuous, less stress is applied and thus less cyclic fatigue created than with conventional instruments, which can be readily demonstrated in photoelastic testing models (Fig. 8a). Figure 8b demonstrates that efforts have been made with other file systems to emulate the uniqueness of the adaptive core design of the XP-endo Shaper; however, regardless of the design alterations, a solid round core remains.

Inhibition or eradication of microflora presence from the root canal spaces is a multifactorial conundrum. The bulk of the microbes reside in the primary canal in a planktonic/loose form; however, there is a vast network of labyrinthine irregularities acting as a microbial reservoir that communicate with the primary canal. While irrigation with disinfectants may be very effective against planktonic microbes, it is not sufficiently effective when the microbes are in biofilm form or in canal irregularities. The ability of organisms within the residual biofilms to create an adaptive mechanism to the environmental changes resulting from the treatment protocol can result in recrudescence of the pathosis. The biofilm must be eliminated before the disinfectants will work. This is analogous to scaling and root planing in periodontal therapy.

As already mentioned, most files produce a final round shape on any given canal cross section and as such the prac-
The XP-endo Finisher was designed to be adjunctive to the XP-endo Shaper. The Finisher has many properties that allow it to gain access and scrape untouched components of the canal walls, and the turbulence it produces in the canal irrigant enhances its antimicrobial properties. The file has a #25 tip diameter with a 0.00 taper. It is extremely flexible and thus has tremendous resistance to cyclic fatigue. Its primary action within the root canal is to scrape the walls that it contacts rather than debride and sculpt a shape into the wall of the canal.

When the file is cooled below 35 °C, it is in the martensitic phase. It can be bent to any other shape when in this phase. When the file is heated to body temperature (37 °C), it will change to the austenitic phase. When the file is rotated in the austenitic phase, it creates a uniquely shaped cleaning instrument: The apical 10 mm of the file transforms into a bulb shape coronally while retaining a tip in the last few millimeters. Since the depth of the spoon is 1.5 mm, the total diameter of the bulb and tip is 3.0 mm. However, if the bulb is squeezed, the tip will expand to a maximum of 6 mm; if the tip is squeezed, the bulb will likewise expand to a #300 file (Fig. 9a); however, since the instrument cannot cut, the only impact on the dentin is optimized scraping. Therefore, if moved up and down in the canal, the bulb and tip will expand or contract in concert with the natural 3-D diameter of the canal. Maximum loss of length when transforming from straight to full austenitic phase is 1 mm.

The small core diameter of the file maintains its flexibility and cyclic fatigue resistance, causing it to scrape, not shape, the dentinal walls. This, plus the turbulence that is created in the irrigant, results in a large surface area of the canal being touched by the file and removal of biofilm that would never be removed by round files.

**Figure 9b** shows the action of the XP-endo Finisher. In the martensitic phase, the Finisher is placed in the canal before it changes to full austenitic phase. The middle illustration demonstrates full austenitic phase at canal temperature; the file will expand to the extent that is determined by the canal anatomy. By moving the Finisher up and down in a 7–8 mm swath, it expands and contracts according to the anatomy of the canal. A recent study demonstrated the efficacy of the Finisher in comparison with traditional modes regarding hard-tissue debris removal; the results are reflected in **Figure 10**. A more recent study showed that the Finisher had the greatest bacterial reduction compared with standard needle irrigation, sonic agitation with the EndoActivator and PIPS (photon-initiated photoactivated acoustic streaming). **Figure 11** is an example of the unique action of the Finisher. The irregularity in
A traditional NiTi file from a round blank is represented in red and XP-endo Shaper in blue. The sinusoidal motion of the XP-endo Shaper in contrast to the round file, which augers, demonstrates the benefit of adaptive debridement. In conjunction with the XP-endo Finisher, unprecedented levels of debris removal and disinfection are possible.

Minimally invasive endodontics, preservation of coronal dentinal girth and optimal apical size (courtesy of Dr. G. Debelian).

Photoelasticity is an experimental technique for stress and strain analysis useful for conditions of complicated geometry or loading. As evidenced by the accompanying images, the XP-endo Shaper demonstrates the least stress in the apical third.

ProTaper NEXT was the first example of an attempt to migrate away from the augering peck and pull motion of most NiTi files. Its swaggering motion was an improvement with regard to emulating the constricted envelope of motion; however, its foundation remained a round blank with all the attendant issues related to cyclic fatigue and torsional failure.
the canal is in the mesiodistal dimension owing to internal resorption. The Finisher enabled removal of debris and tissue in the irregularity while retaining the original shape of the canal and preventing further weakening of the root.

There is a third file in the XP-endo system, the XP-endo Finisher R designed for retreatments. This file is a #30/0.00 making it slightly stiffer and more efficient in removing root filling material adhering to the canal walls, especially in the curvature or oval areas. The residual amount of filling material when a tooth is retreated is difficult to calculate; however, studies using histological evaluation of teeth with post-treatment periapical periodontitis show evidence that bacterial colonization is associated with the canal remnants. A new supplementary strategy using a finishing instrument was evaluated for its ability to improve filling material removal in a recent study, and the results showed substantial reduction in residual contents when the Mtwo system and RECIPROC system were used for retreatment. The results using the XP-endo Finisher R instrument were encouraging because the remaining filling volume showed a 69% reduction in volume contents. In canals with residual filling material, an adjunctive approach with the XP-endo Finisher R instrument significantly enhanced removal (Fig. 12).16

Conclusion

Preliminary studies on XP-endo files have shown remarkable removal of soft tissue, fewer dentinal chips residual in the isthmus and canal walls after instrumentation, and low dentinal stress (fewer microcracks). The minimally invasive conservative instrumentation engenders a low amount of dentin removal coronally and efficient debridement and disinfection of the apical third area. Have we achieved the ideal fusion of technology and biology for long-term positive treatment outcomes? Perhaps. What has been achieved is a redress of a design flaw that has persisted for much too long.

Editorial note: This article first appeared in May 2017 in the Dentaltown magazine. A list of references is available from the publisher.
The image reflects the distal views of 3-D reconstructions of the mesial root canal systems of four mandibular molars prior to (green) and after (red) canal preparation with reciprocating instruments. Final irrigation was done with conventional irrigation, passive ultrasonic irrigation, the SAF and the XP-endo Finisher. The figures demonstrate the effectiveness of the Finisher in the apical region.

The pre-op periapical radiograph shows a mesiodistal resorptive defect. The cone beam computed tomography images show that this was internal resorption and that it extended buccolingually as well. The post-op radiograph shows that, at the second visit, the canal was filled completely, which is an indication that the tissue and debris had been removed. Also, and just as importantly, the original shape of the canal was maintained so that the tooth was not further weakened by the cleaning procedure.

Microcomputed tomography (μ-CT) images of representative specimens subjected to retreatment procedures. Only the apical segment of roots was reconstructed. (A) The initial μ-CT scan taken after root canal filling. (B) A post-preparation μ-CT scan taken after retreatment procedures with both systems: left canals with RECIPROC and right canals with Mtwo. (C) The final μ-CT scan after using the XP-endo Finisher.
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SOFT-TISSUE MANAGEMENT IN ENDODONTIC MICROSURGERY:

Modern procedures/techniques lead to more favorable long-term therapeutic success

Modern endodontic microsurgery is drastically different from traditional endodontic surgery in many ways. Accurate diagnosis provided by cone beam computed tomography (CBCT), knowledge of the soft-tissue physiological principles, proper magnification and illumination provided by an operating microscope, conservative osteotomy and root resection, microscopic management of the apical third, the use of ergonomic microsurgical instruments such as micromirrors and ultrasonic tips, and the application of biocompatible and bioceramic materials are just some of the key features of current microsurgical procedures and promote a favorable long-term outcome.

In particular, proper flap design and soft-tissue management are among the most important concepts in current endodontic microsurgery. The primary purposes of flap design and elevation are to provide adequate surgical access to the underlying bone and root structure and to promote scar-free soft-tissue healing. Flap design and elevation should prevent any damage to adjacent critical anatomical entities. The major flap designs used in endodontic microsurgery are the paramarginal and the intrasulcular flaps; the outline can be either triangular or rectangular. The flap outline mainly depends on the length of the roots, the proximity of anatomical structures and accessibility to the apical area of the treated teeth.

Owing to the position of the roots and root apices, surgery on anterior teeth relies on direct and straightforward access to the apical lesion. Furthermore, the esthetics of the soft tissue is a priority. In the molar region, the esthetic appearance of the soft tissue plays a secondary role, with the focus being on convenient and adequate surgical access to the root apices that allows for faster and complication-free endodontic surgery.

Paramarginal flaps and incisions at the level of the papillae are preferably performed using a microblade, which has the advantage of minimal trauma, especially in the presence of thin or poorly keratinized tissue. The use of a microblade often results in scar-free healing, which is particularly important when surgery is conducted on anterior teeth or when esthetics plays a primary role.

Once the apical microsurgery has been completed, great care has to be taken in repositioning and suturing the elevated soft tissue. The ultimate esthetic result of the soft-tissue manipulation depends on several factors, such as the tissue biotype, the kind of incision performed, the choice of instruments used for incision, the elevation and retraction of the flap, as well as the careful reapproximation and proper suturing technique.

In endodontic microsurgery, the most commonly used suturing techniques are the single-knot suture and the continuous sling suture. Synthetic monofilament 5-0, 6-0 or 7-0 sutures are generally used to secure the flap.

Figures 1 to 10 demonstrate a clinical case of soft-tissue healing after endodontic microsurgery performed on tooth #14.

Editorial note: This article was first published in Dental Tribune Germany, Issue 7/2017.
Fig. 1
Pre-op radiograph of tooth #14. The tooth was symptomatic and sensitive to percussion.

Fig. 2
Clinical pre-op photograph of the soft tissue.

Fig. 3
A triangular paramarginal flap was raised to access and treat the apical third of tooth #14.

Fig. 4
Intra-op photograph of the resected root.

Fig. 5
Synthetic monofilament 6-0 sutures were used to secure the flap in its original position.

Fig. 6
Note the reapproximation of the soft tissue at the junction between the vertical and horizontal incisions (10× magnification).

Fig. 7
On the day of suture removal (72 hours after surgery), the tissue showed good healing.

Fig. 8
Clinical photograph of the soft tissue immediately after suture removal.

Fig. 9
Control of the soft tissue two months after the surgery.

Fig. 10
Control of the soft tissue four months after the surgery. The vertical and horizontal incisions are barely visible.
SURGICAL AND NONSURGICAL ENDODONTIC RETREATMENTS

—From theory to practice

Introduction

A case of failure of a previous endodontic treatment is a clinical situation that we face in the office very often and the treatment plan, as well as the communication with the patient, is a challenging task. Failure of an endodontic treatment may involve extrusion of filling materials into the periradicular tissue, iatrogenic errors that either block the root canals or alter their natural anatomy. Alternatively, a radiographically satisfactory endodontic treatment may fail and, combined with the presence of intraradicular posts and permanent restorations, access for retreatment may not be feasible or practical. This article describes the decision-making criteria for providing nonsurgical retreatment or apical surgery as the treatment of choice for the management of endodontic treatment failure.

Failure of endodontic treatment

Reasons for failure of an endodontic treatment that are reported in literature essentially involve the presence of intraradicular infection, while others have to do with factors that cause an extraradicular infection. This means microorganisms found outside the root canals.¹ The complexity of the root canal anatomy is one of the causes of failure of an endodontic treatment.² Anatomical studies published as early as 1925 described this complexity and showed that, apart from the main root canals, there are lateral canals, anastomoses, apical ramifications and other areas that need to be cleaned during the endodontic treatment. Those areas cannot be accessed with the means of instrumentation and disinfection that we have available today.² Isthmuses and apical deltas and ramifications are among these areas. The term “root canal system” is used to describe this complex anatomy (Figs. 1a & b).³ More recent findings using 3-D microcomputed tomography imaging have proved the inability to shape and disinfect the entire root canal surface.³ Coronal microleakage and microorganisms that are resistant to antimicrobial medications and disinfection techniques, such as Enterococcus faecalis, can also maintain the intraradicular infection.⁴–⁶ The importance of an adequate permanent restoration for the long-term success of an endodontic treatment has been proved in many studies.⁷–⁹

In addition, the presence of a true cyst, formation of a microbial biofilm, and microorganisms such as Actinomyces and Propionibacterium propionicum that cause periradicular infections resistant to endodontic treatment procedures are among the factors that can cause an extracanal pathology.¹⁰,¹¹ Even if a paper point is accidentally extruded into the periradicular tissue when treating particularly a necrotic case, it can cause an acute inflammatory response and extracanal infection. Histological images of a true cyst show that it is an entity completely enclosed in stratified squamous epithelium, without any apparent communication with the root canal.¹² Therefore, it is less likely to heal by a nonsurgical endodontic treatment or retreatment. In the case of a true cyst, apical surgery is the treatment of choice.

Endodontic microsurgery

Endodontic surgery was traditionally considered to be the last treatment option, as it was viewed with negativity and uncertainty regarding its therapeutic result. This view was based on past experience with accompanying inappropriate surgical instruments, inadequate visualization, frequent postoperative complications and failures that often resulted in extraction of the tooth. However, in the early 1990s, new theories and equipment were developed in the field of surgery.¹³ The operating microscope, ultrasonic tips for root end preparation, surgical microinstruments and new, more biocompatible materials for root end filling led to better understanding of the apical anatomy, greater success rates and improved responses from patients.¹⁴ Therefore, endodontic surgery evolved into microsurgery. Endodontic microsurgery is an apical surgical procedure that combines the magnification and illumination provided by the operating microscope with the proper use of new microinstruments.¹⁴ The operating microscope, ultrasonic tips, microsurgical instruments and the latest root end filling materials constitute the “triad of endodontic microsurgery” that was introduced after 1992.

The use of the operating microscope in endodontic surgery allows for inspection of the apical surface at high magnification, thus revealing anatomical details such as isthmuses, canal fins and lateral canals that may cause endodontic treatment failure. Moreover, at higher magnification, an osteotomy can be made smaller, and by use of digital radiographs and video capture options offered by the microscope, communication with the referring dentist or specialist is significantly improved.¹³,¹⁵

Surgical versus nonsurgical retreatment—Treatment decisions

The aim of the microsurgical technique is a minimally invasive procedure.¹³ This means a small osteotomy, about 3–4 mm in size, just enough to allow for an ultrasonic tip of 3 mm to prepare the root end...
Figs. 1a & b
Root canal system complexity demonstrated in clinical cases. Lateral canals and ramifications are evident on the post-op radiographs.

Fig. 2
Tooth-related factors for decision making on nonsurgical or surgical retreatment.

cavity freely. This results in a significant reduction of postoperative symptoms of pain and swelling and faster healing.

According to the literature particularly of the previous decades, nonsurgical endodontic retreatment is still the treatment of choice for the elimination of intracanal bacteria, while apical surgery comes in second as an alternative option. In the case of a failed endodontic treatment, the decision for endodontic retreatment or apical surgery is based on a number of factors concerning the clinical and radiographic status of the tooth, as well as the dentist's clinical dexterity. The quality of the permanent restoration, the ability to access the root canals, the quality of the root canal filling, iatrogenic errors, and intraradicular or extraradicular infection are factors that must be taken into consideration for the final treatment plan (Fig. 2). If coronal microleakage has occurred or inadequate, open-margin restorations have been placed, nonsurgical endodontic retreatment is the treatment of choice. In the case of intracanal infection, apical surgery blocks the microorganisms inside the root canals, while endodontic retreatment eliminates them. In contrast, in the case of extraradicular infection, apical surgery eliminates bacterial infection, while endodontic retreatment isolates bacteria in the peri-radicular tissue.

However, the main factor that affects the treatment plan is communication with the patient. Modern treatment dictates that the clinician should inform the patient of the benefits and risks of each treatment option in a detailed manner and then provide the treatment that the patient selects. In the case of a failed endodontic treatment with an esthetically very successful prosthetic restoration, if endodontic retreatment is considered to be time-consuming or even when the patient is unable to afford the cost of the procedure, apical surgery may be the treatment of choice.

The high magnification of the operating microscope provides the ability to see iatrogenic errors during apical microsurgery.
A failed previous nonsurgical retreatment and apical surgery done on tooth #36. A pre-op radiograph showing persistence of the periradicular lesion. Apical surgery using a microsurgical protocol was determined to be the treatment of choice.

Figs. 4a & b
Inspection of the resected mesial and distal roots under 12× magnification of the microscope revealed (a) a gap in the filling on the mesiobuccal canal and (b) the untreated isthmus between the distal canals.

Fig. 5
Post-op radiograph showing root end filing with mineral trioxide aggregate.

Fig. 6
Radiographic examination at one year. Complete healing was evident.

Conclusion
The microsurgical technique based on the operating microscope, microsurgical instruments, ultrasonic root end tips and root end filling materials that are more biocompatible provides a predictable, minimally invasive solution and is often more favorable than endodontic retreatment. The choice between endodontic retreatment or apical microsurgery is a decision that is based on three pillars: the tooth in question, the patient and the dentist.
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graduated with a DDS from University Fernando Pessoa, Porto, and completed the postgraduate program in endodontics at the University of Lisbon, Portugal. Besides running a practice limited to endodontics in Porto, he is Director of the Master in Endodontics clinical residency program at Foramen Dental Education. Dr. Dias is the founder of the Portuguese Group for Endodontic Study (study club). He is a member of the European Society of Endodontology and the Sociedade Portuguesa de Endodontologia [Portuguese endodontic society]. He has given more than 20 lectures around the world.

Foramen Dental Education is a modern dental training center that was founded in 2013 specifically with the aim of providing quality dental training in procedures performed on patients. Addressing the market gap in postgraduate training in clinical practice on patients, Foramen was soon established as an important European center for this type of education. The center offers training through clinical residencies, which are long-term courses providing opportunities for constant practice and follow-up in a real clinical context. Alongside this, Foramen has short-term training available, with hands-on courses dealing with specific subjects during which it is possible for complete immersion in the subject for a short period.

www.foramendental-education.com

Location
Foramen Dental Education is located right in the heart of the very trendy city of Porto. Porto is the second-largest city in Portugal and one of the major urban areas of the Iberian Peninsula. Located along the Douro River estuary in northern Portugal, Porto is one of the oldest European centers, and its historical core was proclaimed a World Heritage Site by UNESCO in 1996. One of Portugal’s internationally famous exports, port wine, is named after Porto, since the metropolitan area, and in particular the cellars of Vila Nova de Gaia, were responsible for the packaging, transport and export of the fortified wine. In 2014 and 2017, Porto was named the Best European Destination by the Best European Destinations agency. Being popular, it offers an overwhelming choice of cultural, gastronomic and accommodation options.

www.lonelyplanet.com/portugal/the-north/porto/

How to get there
It is possible to fly to Porto or Lisbon (capital) from virtually all of Europe. From Porto Airport, located 20 minutes from Porto by car, you can rent a car for about €35 or take the Metro do Porto for €2 to Bolhão station. From there, it is a short walk to Foramen Dental Education.
What to see and do

For fantastic views of the city, climb the Torre dos Clérigos, the bell tower of the Clérigos Church, a Baroque building from the 18th century located at one of the highest points of town. The tower is the most iconic feature of Porto’s skyline.

Porto’s hilly streets can be very steep in some areas, so a fun way to get to know the city quickly is to take a ride in one of its restored trams. A good place to start is with Line 1, which leaves from outside the historical Casa do Infante in the Old Town and heads out to sea along the Douro River. It is recommended that participants visit wine cellars and museums in this amazing city, travel along the Douro River by boat.

Book fans, mark this one high on your list of things to do in Porto. A beautiful bookshop worth seeing just for the architecture alone, the Livraria Lello was designed by Francisco Xavier Esteves in neo-Gothic splendor and was opened in 1906 by brothers José and António Lello. Ascend the gorgeous circular red stairs to leaf through the volumes and look down to admire one of the most attractive shop floors in the world. J.K. Rowling worked as an English teacher in Porto in the 1990s, and local legend has it that this bookstore inspired the library in the Harry Potter books.

There are many activities on offer in Porto and the surrounding area. For more information, visit visitportoandnorth.travel and www.visitporto.travel

Where to stay

The following hotels are located within reasonable distance to the institute:

The InterContinental Porto – Palácio das Cardosas hotel, overlooking Liberdade Square, is located in a former palace and is a few minutes’ walk from the Lello bookshop and São Bento train station.

www.ihg.com | 2018 TripAdvisor Travellers’ Choice | 5-star

The Dom Henrique Hotel Downtown, named after the patron of Portuguese exploration Infante Dom Henrique, was renovated two years ago and boasts exemplary artwork.

hoteldomhenrique.pt | TripAdvisor Certificate of Excellence | 4-star

Hotel Teatro, located right next to São Bento train station in the heart of Porto, has a theatre-inspired design.

hotelteatro.pt | TripAdvisor Certificate of Excellence | 4-star

The Grande Hotel do Porto, located in the same street as the institute in the historical city center and only 3 minutes from the Coliseu do Porto theater, has a dramatic 19th-century charm.

www.grandehotelporto.com/pt/ | TripAdvisor Certificate of Excellence | 3-star

Where to eat

Hungry? Craving a decent portion of meat or traditional Portuguese food? In Porto, you won’t need to look far to have your wish granted. One of the city’s food staples might not be fancy and is certainly not good for the waistline, but it’s a source of local pride—not to mention an unforgettable experience. The Francesinha is a dish of steak, sliced ham and spicy sausage between toasted bread, all covered with melted cheese and a hot sauce, the recipe for which is a well-kept secret. There is an eternal competition for the best Francesinha in town. Just ask any local for his or her favorite and embrace the challenge, or go with popular opinion and opt for Bufete Fase on the same street as the institute.

Champ’s da Baixa Bistró is a bar serving Mediterranean cuisine, including typical Portuguese dishes and tapas.

www.chamspdabaixa.com

bbGOURMET is known for its delicious and diverse cakes, but also offers gourmet fast food.

www.bbgourmet.net

Cozy Brasão Cervejaria Aliados offers typical Portuguese cuisine, such as the local Francesinha specialty.

brasao.pt

In the heart of Porto, the Flow restaurant and bar serves in three different spaces, including a terrace, each with its own atmosphere.

www.flowrestaurant.pt/flow/
MANAGEMENT OF PULP CANAL OBLITERATION: TIPS AND TRICKS
— A clinical case report

Dr. Hugo Sousa Dias, Portugal

Introduction

Clinical management of calcified teeth provides an endodontic treatment challenge and makes up a significant portion of current endodontic practice. People are living longer and want to maintain their natural dentition. There are several factors that might influence the development of varying degrees of moderate and severe calcification of the pulp chamber, as well as the root canal system, such as multiple restorations, trauma, vital pulp therapy and chronic irritation arising from deep restorations or cracks.1

Pulp stones in the pulp chamber, sclerotic dentin usually in the pulp chamber, dystrophic calcification in the root canals, and pulp canal obliteration in the pulp chamber and the root canal are some of the clinical situations commonly encountered by endodontists.1 Pulp canal obliteration, also called calcific metamorphosis, is a sequelae of tooth trauma. It has been reported to develop more often in teeth with concussion and subluxation injuries.2–4

Calcific metamorphosis is defined by the American Association of Endodontists as "a pulpal response to trauma characterized by rapid deposition of hard tissue within the canal space".1,9 It is generally asymptomatic and patients present clinically with yellow discoloration of the affected tooth crown and apparent loss of the pulp space radiographically. This discoloration is due to a greater thickness of dentin deposition. The incidence of pulp canal obliteration after dental trauma has been reported to be approximately 4–24%. It is generally accepted that the frequency of pulp canal obliteration is dependent on the extent of the luxation injury and the stage of root formation, and generally, obliteration of the pulp canal spaces advances in a corono-apical direction.3–6

The exact mechanism of canal obliteration is unknown, but is believed to be related to damage to the neurovascular supply of the pulp at the time of injury.5 The critical management decision is whether to treat these teeth endodontically immediately, upon detection of the pulpal obliteration,7–9 or to wait until signs and symptoms of pulp or periapical disease occur.10–15 Only 1–16% of teeth with pulp canal obliteration will develop pulpal necrosis and only 7–27% of them will develop radiographic signs of periapical disease.5

There is a progressive decrease in the response to thermal and electrical pulp testing as pulp canal obliteration becomes more pronounced. Furthermore, a significant difference in electric pulp testing between partially obliterated and totally obliterated teeth has been reported. It is generally accepted that an absence of a positive response to the electric pulp test does not automatically imply pulpal necrosis.2 It is also generally accepted that sensitivity tests are unreliable.5 Teeth undergoing pulpal obliteration are generally asymptomatic.2 Such teeth are often an incidental finding during clinical or radiographic investigation.

The literature suggests that pulpal necrosis and periapical disease are not common complications of pulp canal obliteration, and if root canal therapy is selected as a routine procedure, most treatments would be unnecessary, as the majority of teeth with pulp canal obliteration will never suffer pulpal necrosis or periapical disease. Smith recommends delaying treatment until there are symptoms or radiographic signs of periapical disease, a view accepted by many.10–15

It is possible to differentiate two types of radiographic pulp canal space obliteration: partial pulp canal obliteration (limited to the coronal part of the tooth) and total...
pulp canal obliteration (extended to the coronal and radicular pulp canal spaces), with or without associated periapical pathosis. Complete radiographic obliteration of the pulp space does not necessarily mean the absence of the pulp canal space; in the majority of these cases, a pulp space with pulp tissue is present, but the sensitivity of conventional radiographs is too low to allow visualization of this.5

Taking into account the degree of difficulty of the clinical management of these kinds of cases, the practitioner should be aware of the possible complications that may occur. The complications include root perforation and irretrievable instrument fracture.15 This article presents a case report with some valuable tips regarding the clinical approach to such cases.

Case report

A 47-year-old male patient was referred to our clinic in order to evaluate a symptomatic tooth (tooth #11). The patient had spontaneous pain in the right maxilla, in the vestibule of the maxillary right central incisor. At the clinical examination, a fistula in the buccal area of the tooth was identified. The tooth was very sensitive to percussion and nonresponsive to thermal and electric pulp tests, without mobility, and periodontal probing around it was within physiological limits.

The patient gave a history of trauma in childhood. On examination, tooth #11 was found to have a discolored crown (Fig. 1) and undergone a previous root canal therapy attempt. Initial radiographs were taken (Fig. 2), and these revealed that the canal could not be traced from the coronal and middle thirds. Cone beam computed tomography (CBCT) scans were requested for the patient (Figs. 3 & 4). Based on the results of the clinical and radiographic examination, a diagnosis of necrotic pulp with chronic apical abscess was made and root canal therapy recommended.

Local anesthesia was performed, and the tooth was isolated with a rubber dam (Fig. 5). The access cavity was prepared, with an incisal orientation (following the long axis of the tooth), under continuous inspection under the operating microscope. The action of the long shank bur is only in the darker dentin (tertiary dentin), avoiding removal of the lighter dentin in the buccal area of the tooth was identified. The tooth was very sensitive to percussion and nonresponsive to thermal and electric pulp tests, without mobility, and periodontal probing around it was within physiological limits.

Taking into account the degree of difficulty of the clinical management of these kinds of cases, the practitioner should be aware of the possible complications that may occur. The complications include root perforation and irretrievable instrument fracture.15 This article presents a case report with some valuable tips regarding the clinical approach to such cases.

Initial photograph (tooth #11 was found to have a discolored crown) and the presence of fistula in buccal mucosa).

Initial radiograph.

CBCT scans (axial and sagittal planes).

Isolated tooth with rubber dam.

Access cavity preparation.

Root canal entrance.

Glide path with D Finder files and M4 Safety Handpiece.
After finding a ring of calcification (Fig. 7), we use an ultrasonic tip to have a more controlled cutting action and better visual control; in this clinical case, we selected the Red-Star RS-2 ultrasonic tip (Kerr Endodontics).

In such a clinical situation, it is important to follow a basic sequence of irrigate and scrub with sodium hypochlorite/EDTA, dry, observe and cut until one can find the root canal. Radiographic control during this procedure is fundamental in order to avoid any mishap.

When the root canal entrance was identified (Fig. 8), a short (21 mm in length) and more rigid hand file was selected to allow more tactile control and a more effective cutting action. The root canal was instrumented with size 8, 10, 12 and 15 D Finders (Mani Inc.) to obtain a manual glide path using the M4 Safety Handpiece (Kerr Endodontics; Fig. 9).

Working length radiographs were captured (Fig. 10). Cleaning and shaping were performed using TF Adaptive (Kerr Endodontics) up to size 25.06 with the Elements Motor (Kerr Endodontics) in Adaptive Motion. Irrigation was performed during the entire treatment with 5.25% sodium hypochlorite. A final irrigation protocol was done with 17% EDTA and 5.25% sodium hypochlorite, and irrigant was activated with the manual dynamic activation technique. The canals were thoroughly dried and obturation performed using Autofit 4% gutta-percha cones (Kerr) and AH Plus (Dentsply Maillefer), employing the continuous wave of condensation technique with the Elements Obturation Unit (Kerr Endodontics). The pulp chamber was sealed with Ionoseal (VOCO) and a temporary restoration was performed (Fig. 11). The patient was referred to his dentist for the permanent coronal restoration. At a follow-up visit after three months, the tooth was asymptomatic (Fig. 12).
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**Tips for clinical management of pulp canal obliteration**

1. It is essential to remember that the pulp chamber is always located in the center of the tooth at the level of the cementoenamel junction (CEJ; Fig. 13).5
2. The calcified pulp chamber is darker than and appears a different color to the axial wall root dentin.5
3. A much better solution is to prepare the access cavity close to or through the incisal edge. This approach facilitates straight-line access and is a more predictable approach to locating the pulp chamber while avoiding unnecessary damage (Fig. 14).5
4. The use of the dental operating microscope is recommended to identify color changes (Fig. 15).5
5. Using long shank burs in a slow handpiece or preferably ultrasonic tips to penetrate deeply into the canal system is recommended.5
6. Sodium hypochlorite can also be used to aid in the identification of a calcified canal by visualizing the occurrence of bubbling (called a bubble or champagne test).5
7. Take radiographs at multiple angles to maintain alignment and direction during the procedure.
8. A CBCT scan is quite useful in the planning and progression of treatment.1
9. Alternate between size 8 and 10 K-files with a gentle watch-winding motion with minimal vertical pressure with regular replacement of the instruments before fatigue occurs.5
10. Frequently irrigate and scrub with chelating agents/sodium hypochlorite. After that, dry and observe.
11. A crown-down approach has been recommended to improve tactile sensation and better apical penetration.5
12. In single-rooted teeth, never forget the root canal centricity in the root, look for the color changes (sometimes, it is useful to use the fisheye view: deliver irrigant to the pulp chamber) and search the root canal lingually in maxillary incisors. In multirooted teeth, look for white lines and white spots.5
13. The calcification process as seen in pulpal obliteration occurs in a coronoapical direction, so once the initial canal has been located an instrument tends to progress more easily as it advances toward the canal terminus.5
14. In premolars and molars, taking into consideration the following anatomical landmarks may be useful.

**Important anatomical landmarks**5, 16, 17

<table>
<thead>
<tr>
<th>Landmark</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>7 mm (distance from midpoint of a line connecting the two cusp tips to the pulp chamber ceiling)</td>
</tr>
<tr>
<td>C</td>
<td>11 mm (distance from midpoint of a line connecting the two cusp tips and closest point to the furcation)</td>
</tr>
<tr>
<td>E</td>
<td>2.5 mm (height of the pulp chamber)</td>
</tr>
<tr>
<td>C</td>
<td>11 mm (distance from the buccal cusp tip to the closest point to the furcation)</td>
</tr>
<tr>
<td>E</td>
<td>6 mm (distance from the buccal cusp to the pulp chamber ceiling)</td>
</tr>
<tr>
<td>F</td>
<td>2 mm (height of the pulp chamber)</td>
</tr>
</tbody>
</table>

The measurements were similar for both maxillary and mandibular molars.

15. The decision flowchart (Fig. 16) outlines the various treatment options that can be considered depending on the presenting signs and symptoms.

**Conclusion**

In this article, I have provided several tips for approaching the endodontic challenge of pulp canal obliteration. However, in an era devoted to conservative dentistry, other tools are emerging that may allow a more conservative, faster and more predictable approach in a large number of clinical situations where root anatomy is favorable: “microguided endodontics”.

*Editorial note: A list of references is available from the publisher.*
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For this new edition of the Clinical Masters™ magazine, this is what the participants had to say about their experience of the programs and presenters this year.

**Clinical Masters™ Program in Esthetic and Restorative Dentistry (Milan, 2016)**

**Dr. Ilan Hecht, Israel**

The hands-on part of the course was on point. Being able to immediately execute the concepts discussed in the course is always a big help, knowing that you can or would include them later in your daily practice.

**Clinical Masters™ Program in Esthetic and Restorative Dentistry (Milan and Athens, 2016)**

**Dr. Mehmet Kalcay, Turkey**

The program has provided me with advanced practical knowledge and I have successfully completed esthetic cases since the program. The provider has a very well-structured program, as well as a very professional team of lecturers and staff.

**MSc Marten Jan Lindeman, Germany**

The experience with the microscope was breathtaking for me and it opened a new world. The microscope in dentistry was always something endo-related for me, but now Dr. Domenico Massironi made me realize that the microscope is not only relevant in endo. I was very happy about my new experiences and also grateful that I met such great teachers and other nice participants. I like the way everything went and it was very relaxed.

**Clinical Masters™ Program in Esthetic and Restorative Dentistry (Milan, 2017)**

**Dr. Günther Stöckl, Germany**

The preparation for the course was superb. It was a great learning experience and really “Chapeau”.

**Clinical Masters™ Program in Esthetic and Restorative Dentistry (Geneva, 2017)**
Clinical Masters™ Program in Esthetic and Restorative Dentistry (Geneva, Athens, Milan, 2017)

Dr. Gina Martinez, U.S.

I just finished my third and last session for the Clinical Masters Program in Esthetic and Restorative Dentistry. I had the opportunity to learn from some of the top clinicians in the world. They are truly supermasters.

Milan was great! My expectations were not only met; they were exceeded. In this week, we learned and practiced the modified chamfer technique, which Dr. Domenico Massironi developed. The lecture by Dr. Stavros Pelekanos on the increase of the VDO was a huge success. I also had the opportunity to work under a microscope in Geneva at Dr. Didier Dietschi’s office. It was a pleasure to work beside him; he’s the best, especially when it comes to direct composite restoration—a true mentor for me.

Dr. Alexandra Stefana Cotetiu, Romania

I attended the microendodontics workshop that was held by Tribune CME in 2016 and I found it such an impressive experience with great teachers, and it was one of the best workshops in the same line.

Dr. Mohammad Mortazavi, Iran

I was looking for something on the cutting edge, fine advanced dentistry. I wanted to move to the next level, and I found this course has upgraded me, step by step.

Dr. Dušan Brajović, Slovenia

It has been one of the most beneficial courses. I love composites and Dr. Didier was great. The coordination and helpfulness were outstanding.

Dr. Mohamed Ragai, Egypt and Kuwait

I have always been intrigued by the European model, and how they look at dentistry—differently than the Americans do. I wanted to inject some of the European model into my work. The course has been a good source, and the faculty are really well-known and respected in their field.

Dr. Ramin Tabib, U.S.
Some favorites of our faculty

**DR. DEBELIAN**

hitting the waves on Mantawai Islands, Sumatra.

**DR. FLORATOS**

“It allows you to use both your hands and sterile, practical rotary files by attaching the device to the doctor or assistant’s wrist.”

**DR. DIAS**

“One of my hobbies is photography. Photography is my way of reliving a feeling. It allows me to capture a moment, the color of the sky, a smile of someone passing in the street that I contemplated and that affected me in some way.”

Photograph by Dr. Hugo Sousa Dias
**DR. LOPS**

“My favorite product is the Geistlich Combi-Kit Collagen, which is a combination of a collagen membrane and a collagen plug, and very effective in preservation of the horizontal volume after a tooth extraction.”

Photograph by Geistlich Biomaterials
www.geistlich-pharma.com/en/

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**DR. MASSIRONI**

“Life is like riding a bike: if you want to stay balanced, you have to move.”

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**DR. PELEKANOS**

“I like to take my little dog Aris with me on my travels whenever it is possible.”
After graduating in medicine and surgery in 1979, Dr. Mauro Fradeani completed a specialization in dentistry at the then University of Ancona, Ancona, Italy, in 1983. He was a visiting associate professor in prosthetics at the Louisiana State University Health Sciences Center New Orleans, U.S., from 1999 until 2008.

Dr. Fradeani is founder and Director of the ACE Institute, an advanced continuing education center in Pesaro. He is also founder and Director of Fradeani Education, an educational project developed together with a group of expert lecturers with the goal of promoting an Italian model of excellence in dentistry worldwide. He runs a private practice in Pesaro limited to prostheses on natural dentition and implants.


He served on the editorial board of Practical Procedures and Aesthetic Dentistry and presently is associate editor of the International Journal of Esthetic Dentistry and serves on the editorial advisory board of the Journal of Esthetic and Restorative Dentistry.

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FRADEANI EDUCATION AT THE ACE INSTITUTE — Pesaro, Italy

ACE Institute
The ACE Institute was established in 2000 by Dr. Mauro Fradeani with the aim of expanding clinical knowledge and sharing professional skills and scientific updates in esthetic dentistry. The facility is located in a 17th-century building in the historical center of Pesaro, and it can accommodate up to 30 participants. The second floor offers 14 laboratory stations for hands-on courses. Professional high-definition audiovisual equipment allows easy connection with the conference room for an optimal interface with the course participants during live treatments. Simultaneous interpreting can be arranged upon request.

www.maurofradeani.it/ace_institute

Fradeani Education
The members of Fradeani Education, founded by Dr. Mauro Fradeani, include Drs. Leonardo Bacherini, Tiziano Bombardelli, Stefano Gori and Roberto Turrini, all of whom are very talented and motivated presenters who give lectures and courses under the Fradeani Education brand. Their mission is to teach operative and educational models founded on evidence and experience, but with ongoing consideration of technological innovation. The aim of this educational project is to share, spread and promote worldwide an Italian model of excellence in dentistry, based on clinical accuracy and operative simplicity.

Fradeani Education offers a wide range of educational programs presented in Italian and English. The didactic activity consists of theoretical and hands-on courses covering all aspects of prosthodontics and implant dentistry and available for all levels of knowledge. Customized one- to 12-day courses can be organized for private groups upon request, either in Italy or abroad.

www.fradeanieducation.com
THE PROSTHETIC REVOLUTION
—the Minimally Invasive Prosthetic Procedures (MIPPs) and new digital tools for the treatment plan

Minimally invasive prosthetic procedures (MIPPs)

Nowadays the demand for prosthetic treatments is steadily rising. The importance given to esthetics in our society is growing, especially among young people, and clinicians ought to be increasingly conservative in their treatments and take precautionary measures. This type of approach allows the dentist to maintain most of the remaining dental structure while re-establishing the proper relationship between function, esthetics, and duration of the prosthetic restoration.

Minimizing the removal of enamel while aiming to satisfy the esthetic expectations of the patient represents a risk for the clinician, especially when the remaining tooth structure is already partly worn. When treating a case extended to both arches with a severely worn dentition, the goal of the clinician should be to obtain micromechanical retention and mechanical strength though paradoxically limiting the amount of tooth preparation. The key steps of this technique are the following:

(1) increase the Vertical Dimension of Occlusion (VDO);
(2) reduce the thickness of the monolithic ceramic material;
(3) preserve the enamel during tooth preparation;
(4) adhesively bond the restorations.

1. Increase the vertical dimension of occlusion

In prosthetic rehabilitations extended to at least one full arch, an increase in the VDO of the patient can be important in order to achieve a successful esthetic and functional result. This procedure will help the clinician to reduce the amount of dental tissue removed. By increasing the VDO, the clinician will be able to avoid invasive occlusal preparations and thus be able to bond the ceramic restoration to the remaining enamel. A permanent increase in the VDO is a safe and predictable procedure if done up to 5 mm; any discomfort related to the patient’s new VDO ratio of the patient will normally last no longer than one to two weeks.

When determining a modification in the VDO, the clinician may consider the following parameters:

– clinical evaluation of the required space for restorative material;
– interocclusal rest space;
– evaluation of the facial proportions;
– phonetic sounds (“m” and “s” sounds);
– an acrylic preoperative mock-up.

Among these techniques, the one most effective in order to gain acceptance of the new VDO by the patient is the evaluation of speech, particularly with regard to sibilants or “s” sounds.

2. Reduction of the thickness of the monolithic ceramic material

The reduction in the thickness of the ceramic material used in the restoration is a great advantage of the MIPP technique. It has been proven that minimal thickness of lithium disilicate occlusal restorations, if supported by enamel, have a high load-bearing capacity, and therefore a high resistance to fracture. The key to the success of the restoration is its adhesive bonding, which must always be on enamel and involve an etchable ceramic material.

3. Preservation of enamel during tooth preparation

The preservation of enamel during tooth preparations is highly important in order to implement the MIPP technique. Traditionally the recommended conventional thickness in the occlusal area for porcelain restorations is 1.5–2 mm; however, these values can be reduced by using an etchable monolithic ceramic material with a decreased thickness of 0.5–0.8 mm bonded on enamel.

4. Adhesive bonding of the restorations

Adhesion to enamel can influence the design of the tooth preparation, allowing the clinician to maintain the maximum amount of dental structure and thereby achieve excellent treatment results, including lower post-cementation sensitivity, improved support of the ceramic restoration and avoidance of endodontic intervention. Moreover, a correctly performed adhesive procedure can eliminate the need for extensive tooth preparation, as well as the use of anesthesia. Success will depend on the ability to establish good adhesion between the tooth structure and the porcelain with correct per-
Location
The seaside resort town of Pesaro lies on the east coast of central Italy and is famous for its fine golden beaches lapped by the Adriatic Sea and picturesque old town. The outstanding Italian composer Gioachino Antonio Rossini so loved his hometown that he left most of his estate to Pesaro on his death. Make sure to visit his home, Casa Rossini, while you are there. Being the town with the highest number of cyclists in Italy, Pesaro can easily be explored by bike with its many paths. The old town with its cafes and restaurants is charming and there is much to see while strolling around. Famous for seafood, the town’s restaurants offer many local fish dishes that are not to be missed, with panoramic views over the water and the coastline. 

How to get there
The ACE Institute is located at Corso XI Settembre, 92. Pesaro is well connected by train with the following international airports: Marche Airport (45 minutes), Bologna Guglielmo Marconi Airport (1 hour and 30 minutes), Milano Malpensa Airport (3 hours and 30 minutes) and Leonardo da Vinci International Airport (3 hours and 30 minutes). Timetables and information on train connections are available at www.trenitalia.com.
If planning to rent a car, the distances from major airports to Pesaro are as follows: Ancona: 55 kilometers; Bologna: 135 kilometers; Milan: 350 kilometers; Rome: 370 kilometers.
Private transfers from/to the airport by car or bus can be booked with a local private company called Chiuselli. Contact information and cost estimates are available on its website, www.chiuselli.com.

What to see and do
If you wish to explore the territory surrounding Pesaro, we would certainly recommend you visit Urbino (36 kilometers from Pesaro), one of the most important tourist art destinations, notable for a remarkable historical legacy of Renaissance culture. Gradara and its fortress (15 kilometers from Pesaro), Candelara and its castle (8 kilometers from Pesaro), and Novilara and its necropolis (9 kilometers from Pesaro) are other historical sites that deserve a visit.
More information on guided tours and opening hours of museums, monuments and churches is available at the tourist information office located in viale Trieste, 164, close to sculptor Arnaldo Pomodoro’s sphere within sphere (Palla di Pomodoro; a ten-minute walk from the ACE Institute) and on its website, www.turismo.pesarourbino.it.

Where to stay
The ACE Institute is located in the historical center of the city and only a few minutes’ walk from the seaside.
Hotel Excelsior is a recently renovated boutique hotel with décor reminiscent of the 1950s. www.excelsiorpesaro.it
Grand Hotel Vittoria is a very elegant, traditional and refined hotel centrally located in a Belle Époque-style building. www.grandhotelvittoriapesaro.it | 5-star
Mercure Hotel is a modern hotel located on the seafront. www.mercure.com | 4-star
Nautilus Family Hotel, only opened in 2016, is located at the seaside and is the tallest hotel in Europe entirely built on a wooden structure. https://nautiluspesaro.edenhotels.it/it TripAdvisor Certificate of Excellence | 4-star
For alternative hotel suggestions: www.apahotel.it

Where to eat
Osteria La Guercia is located in a 5th-century historical palace overlooking the ruins of an ancient Roman villa and offers traditional regional cuisine. www.osterialaguerzia.it
Ristorante Lo Scudiero is a fine-dining restaurant located in the former stables of the Palazzo Del Monte Baldassini. www.ristorantescudiero.it
Nostrano is a sophisticated fish restaurant very near to the Palla di Pomodoro. www.nostranoristorante.it | 1 Michelin star
Ristorante GIBAS is a very elegant restaurant in the Monte San Bartolo regional park overlooking the sea with mainly contemporary fish-focused fare. www.gibasristorante.it
Levante is a bright restaurant with a relaxing ambiance serving excellent fish dishes right on the sea. www.levante-food.com
formance of the etching procedure and appropriate use of adhesive materials.

The MIPP technique is characterized into six different classifications, which can be divided into two main approaches:

1. **Confirmatory approach**
   The patient’s occlusion is left in maximum intercuspation:
   - MIPP 0 = Additional restorations with no preparation, mainly on enamel
   - MIPP 1 = Partial restorations with minimal to tooth preparation, mainly on enamel

2. **Reorganization approach**
   Modification of the VDO and centric relation (CR):
   - MIPP 2A = Partial restorations with minimal tooth preparation, mainly on enamel
   - MIPP 2B = Full-coverage veneers with minimal tooth preparation, mainly on enamel
   - MIPP 3A = One arch in CR with VDO alteration and tooth structure preservation, mainly on enamel
   - MIPP 3B = Two arches in CR with VDO alteration and tooth structure preservation, mainly on enamel

The use of the MIPP technique in prosthetic restorations aids the clinician in achieving excellent functional and esthetic results.

**New digital tools for the treatment plan: GETApp (Guided Esthetic Treatment Application)**

The need of clinicians all over the world for a tool that supports them in formulation of the correct treatment plan, combined with the new technologies that simplify and accelerate many prosthetic procedures, led us to develop a multimedia application that assists the dentist in all of the phases of data collection and analysis. This app is designed to interact with other available technological tools (such as new-generation 3-D face scanners), thus facilitating an entirely digital workflow for prosthetic rehabilitations; it is also essential to reach an enhanced communication between prosthetist, implantologist, orthodontist and dental technician, as all of them will have access to the same information reported on a PDF file.

The GETApp (Guided Esthetic Treatment Application) was developed according to the systematic approach to data collection created by Dr. Mauro Fradeani. The app automatically analyzes all of the values and information on the patient collected by the clinician to determine the best possible treatment to be chosen. The user can modify the suggested treatment plan at any time, by adapting the selected parameters according to his or her specific needs.

The tool guides the dentist step-by-step through the complete decision-making process, aiding him or her in achieving optimal esthetic and functional results. The two main phases of data collection and processing offer detailed clinical explanations, which contribute to making GETApp a modern educational system for both simple and complex prosthetic rehabilitations.

By the clinician following all of the suggested steps and entering all of the
In conclusion, the benefits and possibilities provided by the GETApp to the clinician are as follows:
- Collection of data for patient anamnesis (the GETApp system can replace the medical records);
- Collection of all of the clinical data necessary for good communication with the dental team (radiographs, periodontal chart, health of each tooth, tooth color, previous dental treatments to be redone, stomatognatic dysfunction);
- guided and predictable method for dental photography and case documentation;

requested values and parameters, the app automatically generates a PDF file containing all of the information provided by the clinician. This allows him or her to easily share with the dental laboratory every detail for the fabrication of the ideal prosthetic work.

This step contains the objective examination of the lower arch.
This section deals with the importation of the patient’s images. You can take the photo directly with your iPad, using the mask to centre the photograph correctly and the level instrument to position the device.

The evaluation of the occlusal ratio with overjet and overbite values is an essential moment in planning the treatment. These data will lead automatically to the many clinical implications that concern the treatment plan and surgery procedures.

- Collection of all esthetic and functional values necessary for the formulation of the treatment plan;
- Complete and automatized support in formulation of the treatment plan;
- Effective communication with the dental laboratory;
- Effective communication with the patient.

Innovative operative protocols such as the MIPP, combined with the use of modern digital systems such as the GETApp, represent a revolution in the approach to prosthetic treatment. These new procedures will undoubtedly help the clinician to confidently perform comprehensive treatments involving bridges, crowns and veneers on natural dentition and implants, from simple to complex full-mouth rehabilitation.
The viewed mask allows you to evaluate the position of the canines and any changes in size to be done to them in order to achieve an ideal incisal pattern.

The black dotted line shows the initial occlusal relationship while the red line shows the new occlusal relationship once modifications in GETApp in the previous steps have been completed. The purpose of showing this is to analyze the overbite and overjet values and therefore the functional aspect of the treatment plan you are preparing.
This step shows a summary of the size modifications in length and width of all the teeth in the upper arch and the lower sextant.

This step shows graphically a summary of the modifications undertaken on the upper and lower central incisor, as well as the overbite and overjet values, and any changes in VDO. The occlusal view of the upper arch and lower arch is also reproduced, with the prosthetic solutions chosen.
TREATMENT OF AN INFLAMMATORY PERIAPICAL CYST OF ENDODONTIC ORIGIN — with surgical endodontic therapy

Dr. Mehmet Kalcay, Turkey

Introduction

Periapical cysts are defined as inflammatory and non-neoplastic lesions of the jaw. Approximately 15–20% of periapical lesions are diagnosed as periapical cysts. The localized inflammatory proliferation of epithelial cell rests in the periodontal ligament results in the formation of periapical cysts. These lesions are usually seen in the maxillary anterior region. These pathologies are generally asymptomatic and are diagnosed during routine radiographic examinations. Periapical cysts are generally seen in patients aged between 30 and 40 and predominantly in men. The purpose of this case report is to present the diagnosis, treatment and postoperative findings of previously treated maxillary anterior teeth affected by an inflammatory periapical cyst.

Case report

A 25-year-old male patient presented to the Department of Endodontics, Gazi University, Faculty of Dentistry, Ankara, Turkey, with a swelling at the palatal mucosa of the maxillary anterior region. A detailed dental history revealed that the swelling had also occurred four months ago and was left untreated, with a prescription of antibiotics. Extraction had been advised by the previous general dentist. A dental panoramic tomogram was taken for initial radiographic examination. A large radiolucent periapical lesion was observed associated with teeth #21 and 22 (Fig. 1). Clinical examination found a swelling at the palatal mucosa that was painful on palpation. Cone beam computed tomography (CBCT) images were used to gather more information on the size and association of the lesion with the surrounding anatomical structures (Fig. 2). CBCT images were taken of the maxillary anterior region axially and coronally with 1 mm spaces between the slices. These images showed a radiolucent lesion associated with the roots of teeth #21 and 22 that was lytic and of 11 × 16 mm in size and had a regular border. The lesion had perforated the palatal cortex and was in close proximity to the nasal cavity and the incisive canal. The preliminary radiographic diagnosis was an inflammatory periapical cyst.

Root canal therapy was initiated for teeth #21 and 22 to relieve the patient of acute symptoms. During the retreatment of tooth #21, an open apex led to the extrusion of some gutta-percha into the periapical lesion. Pus and exudate drainage was achieved via the root canals. The root canals were vigorously irrigated with physiological saline until the drainage stopped. The cavities were then temporarily restored with glass ionomer cement. The patient was prescribed antibiotics and nonsteroidal anti-inflammatory drugs and was recalled the next day.

Acute symptoms had been alleviated by the time of the recall. The temporary restorations were removed and the root canals were irrigated with 5% sodium hypochlorite. There was no drainage of exudate; therefore, calcium hydroxide was introduced into the root canals after preparation. Another appointment was set up...
15 days later. The root canals were further prepared and shaped with manual hand files. The dentinal walls of tooth #21 were very thin; therefore, chemical disinfection with ultrasonic activation was performed. This prevented further thinning of the dentinal walls and mechanical weakening of the tooth itself. After preparation, the root canals were obturated by the merging of three #80 gutta-percha points with adaptation to the apical third by eugenol (Fig. 3). Spaces at the coronal and middle third were filled with accessory points by cold lateral compaction.

After the completion of the orthograde treatment, the patient was prepared for surgery the next day. After anterior alveolar nerve block and incisive block, a mucoperiosteal flap was raised. The lesion was completely removed and the osteotomy cavity was irrigated with physiological saline. Root-end preparation at the apical third was performed using ultrasonic retrotips.

Mineral trioxide aggregate was used for retrograde filling. The resected lesion was sent to the pathology laboratory for histopathological examination for the definitive diagnosis (Fig. 4). The histopathological examination revealed that the lesion was bordered with hyperplastic, nonkeratinized stratified squamous epithelium with inflammatory cells. Definitive diagnosis was determined to be an inflammatory periapical cyst. After surgical treatment at the one-month recall, the patient was clinically asymptomatic. The six-month radiographic examination revealed new bone trabeculation around the defect (Fig. 5).

Discussion

Surgical endodontic therapy was selected for this particular case owing to the large borders of the lesion and its close proximity to the nasal cavity and the incisive canal. Histopathological examination is essential for definitive diagnosis. Differential diagnosis considered periapical granuloma and other odontogenic cysts. The radiographic appearance of the lesion in this case is very similar to that of these pathologies. Histopathological analysis showed that the lesion was an inflammatory periapical cyst.

In endodontics, CBCT is used for a detailed analysis of the root canal system, along with diagnosis of resorptive defects and surgical planning. In this case report, CBCT images were used for diagnosis and treatment planning and provided accurate and realistic information on the size and location of the lesion; therefore, surgical limitations could be established before surgery.

Conclusion

Teeth with periapical periodontitis can be treated by surgical or nonsurgical endodontic therapy. Nonsurgical endodontic therapy with optimal preparation and disinfection should be the first clinical option for treatment. However, periapical periodontitis with cyst formation should be surgically treated after endodontic therapy.

Editorial note: A list of references can be obtained from the publisher.
Q: Dr. al-Salti, you recently attended Tribune CME’s Clinical Masters™ Program in Esthetic and Restorative Dentistry in Athens, Greece. What attracted you to this training session?
A: The short answer would be the caliber of the presenters. I have heard Dr. Stavros Pelekanos speak before and he is a very engaging and knowledgeable clinician. His ability to explain evidence-based concepts greatly appeals to me. Furthermore, Dr. Ed McLaren is a world authority on ceramics. I have heard many good reviews from fellow colleagues about his courses and decided to come and learn from him.

Q: What was your experience of the course?
A: The lecturers were great, very informative and engaging. The social events with fellow colleagues from around the world, along with the course presenters, were memorable. Not only did we learn some great things, but we also made some new friends along the way.

Q: You combined this further education with volunteer work at a refugee camp in the Greek city of Thessaloniki. What motivated this admirable and inspirational commitment through the Health-Point Foundation?

“We have the skills to help alleviate the suffering of fellow humans”
A: As dentists, we have the skills to help alleviate the suffering of fellow humans. When possible, we should also help those who have been affected severely by drastic life events, such as war and the displacement that follows. Our medical colleagues often report the need for dental professionals at refugee camps because of the multiple dental problems they encounter. I stumbled across a Facebook post, shared by a friend, seeking dental volunteers in northern Greece. I contacted the organization and scheduled a time to go, which neatly coincided with the course in Athens.

It was my first time volunteering with the Health-Point Foundation. They have been amazing—efficient in organization and dealing with dentists from across the world. One also gets to work alongside dentists from across the globe and forge new friendships as well. They have been a pleasure to work with.

Q: Have you worked as a volunteer before?
A: Yes, many times. I volunteered back home in Sydney during National Dental Rescue Day, treating patients with limited access to oral health care. I have also worked with a number of nongovernmental organizations treating refugees in Jordan and disabled children and adolescents in the West Bank.

Q: What would you recommend to fellow dental professionals who would like to become involved in humanitarian efforts like this, but are not sure of how to get started?
A: I was in that position many years ago. The power of Google cannot be underestimated! I would recommend searching for the area of the world in which the person would like to volunteer and let that search be the starting point. Dental professionals can also contact their local dental associations, who may know of projects locally or abroad. However, if really passionate, but unable to commit to any program, then the person could maybe allocate a day to treating disadvantaged patient groups. A local trustworthy charity can often source some of these patients on one’s behalf.

Editorial note: This interview was published on March 31, 2017, on the Dental Tribune website under European news.
SMILE MAKEOVER OF DARK SUBSTRATE WITH VENEERS AND AN ANTERIOR CROWN — using the biologically oriented preparation technique in a digital workflow

Dr. Ilan Hecht, Israel

Introduction

This case report demonstrates the possibility of combining different materials and approaches in order to achieve a satisfactory result when it comes to treating teeth with a dark substrate. The focus is on the biologically oriented preparation technique (BOPT) applied in a digital workflow to achieve maximum predictability in the esthetic area.

The BOPT entails a vertical preparation or feather edge to achieve satisfactory results in the cervical area, especially in the case of dark substrate or a thin gingival biotype that is susceptible to recessions in the marginal area. Preparations without finish lines are more conservative and the crown margin is located at the root area. For vertical preparations, the laboratory technician positions the margin based on the gingival tissue information. The problem is that, for digital scanners and CAD/CAM restorations, a different protocol is required than for the classical BOPT, where the technician works on the cast in order to define the margin and create the crown’s emergence profile.

Case presentation

The patient was a 32-year-old man wishing to improve his smile (Fig. 1). He particularly did not like the color and shape of his teeth, especially the crown on the maxillary left central incisor and its darker appearance at the gingiva. His maxillary left central incisor had an old porcelain-fused-to-metal (PFM) crown (placed more than ten years before) with gingival recession at the cervical area and the metal margins of the crown showing (Fig. 2).

After a clinical and radiographic examination, we proceeded to a treatment plan according to the digital smile design (DSD) concept in order to create a predictable additive mock-up that would show us the end result prior to commencement of treatment (Figs. 3 & 4). Owing to the visual communication (DSD of the case and mock-up), we gained the patient’s acceptance of the treatment plan, which would entail removal of the old PFM crown and preparation of the adjacent teeth for laminate porcelain veneers (Fig. 5). The maxillary anterior teeth had vertical and horizontal cracks. This, combined with the initial dark substrate and the patient’s desire for a significantly whiter shade for final restoration, led to a less conservative preparation. Under the PFM, a golden post in good shape was encountered. It was decided that, owing to the differences in substrate color, we would first proceed with the laminate porcelain veneers and, after cementation, move forward with a new monolithic zirconia crown for tooth #11.

Impression taking was done digitally using TRIOS 3 (3Shape) for the laboratory to manufacture the desired restorations. The veneers were manufactured with a CAD/CAM core of lithium disilicate, allowing for a cutback and layered porcelain. After the veneers had been cemented, we proceeded to refine the old preparation according to the BOPT, then added composite (IPS Empress Direct, Ivoclar Vivadent; A2 dentin shade) to the substrate surface in order to achieve a homogeneous substrate (Figs. 6 & 7). A new digital impression was taken for tooth #11.

The laboratory used Zirkonzahn for the CAD restorations and modified the margins of the crown for these to be located in the sulcus for the tissue to have a new emergence profile (Fig. 8). Owing to accurate visual communication and shade matching, the laboratory technician was able to manufacture a monolithic zirconia crown for tooth #11 that would mask the dark substrate and match the adjacent restorations (Figs. 9–11).

Conclusion

The BOPT concept can be of great help for masking dark substrates, in the case of a thin gingival biotype or for a better emergence profile. Owing to the digital impression (which is less technique-sensitive than classical impression taking for the BOPT), good visual communication and the advances of CAD/CAM, the laboratory technician can now easily create better emergence profiles and thinner and smooth margins that will ensure the longevity of the restorations and better health for the surrounding periodontium.

Editorial note: A list of references can be obtained from the publisher.
Fig. 1
Initial situation.

Fig. 2
Intraoral view. Note the PFM on the maxillary left central incisor.

Fig. 3
DSD with the desired outcome.

Fig. 4
Additive mock-up in order to show the final outcome prior to the treatment.

Fig. 5
Stump shades of the prepared teeth. Note the dark substrate of the maxillary left central incisor.

Fig. 6
Laminate porcelain veneers cemented and preparation according to the BOPT for the maxillary left central incisor.

Fig. 7
Stump shade of the maxillary left central incisor for shade matching.

Fig. 8
CAD for the new crown on the maxillary left central incisor. (Image: Yuli Dental Studio)

Figs. 9–11
Final outcome.
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REDEFINING FUNCTION IN A COMPLEX BRUXING CASE
— Treatment position and occlusal considerations

Dr. Ilia Roussou, Greece

Occlusion confusion is common among dentists. Occlusion is one of the most important considerations in dentistry, but also most controversial. The balance and the restoration of function of the stomatognathic system is often an everyday challenge during many dental treatments. For these distinct reasons, the dentist needs to study and fully understand the normal function of the temporomandibular joints, how the mandible rests against the cranium in the most favorable position, and of course how occlusion and any dental prosthetic restorations should be adjusted without jeopardizing the stability of the stomatognathic system.

Severe wear, missing teeth and periodontal disease over the years change the maximum intercuspation the patient had when his or her teeth were intact. For example, it is very common for patients with severe wear of their dentition to present with contacts of their anterior teeth in a Class III tendency relationship, which can also be described as a pseudo Class III malocclusion according to Angle’s classification. Determining the treatment position during full-mouth prosthetic reconstruction or orthodontic treatment is a challenge. Dentists often choose to maintain the occlusal relationship the patient presents with. This clinical decision can lead to occlusal discrepancies upon delivery of the final restorations, temporomandibular pain symptoms and discomfort of the patient.

Therefore, it is essential to register and maintain the orthopedic stability of the stomatognathic system during the treatment and determine the musculoskeletal stable position during the dental procedures. In this case presentation, several common clinical problems that the dentist often has to deal with in everyday practice will be presented and the treatment sequence to maintain the stability of the stomatognathic system will be presented. A 57-year-old male patient presented to a private clinic with his chief complaint related to functional difficulties and considerable esthetic impairment created by the appearance of his teeth. Owing to severe wear of his dentition, the dentist was exposed on all of his teeth (Fig. 1). The patient was aware of his parafunctional activity of bruxism that had never been addressed. Although the wear was significant, he complained of no sensitivity to chemical and thermal stimuli. He also complained of no pain or other symptoms related to a temporomandibular disorder. During clinical examination, a clicking sound was detected at the right temporomandibular joint during opening and closing, indicating a disk displacement with reduction in this joint that was however asymptomatic. The range of movement was within normal limits, and the left and lateral movements were 12 and 15 mm, respectively.

Intraorally, the effects of bruxing on the dental tissue were significant. The masticatory surface of the posterior teeth was completely flat, without any cusps and/or physiological anatomy (Fig. 2). Dentin exposure was present on all of the posterior teeth. The anterior teeth also presented with severe wear and dentin exposure. Because of the lack of physiological anatomy and the flat masticatory surfaces, no stable maximum intercuspation was present. The patient, as already mentioned, had a pseudo Class III relationship (Fig. 3), since his most comfortable bite was in an edge-to-edge anterior relationship while all the posterior teeth were also in occlusion. Nevertheless, the patient described feeling like he had several bites, none of which were comfortable.

Important clinical dilemmas arise in such a case. The diagnostic questions that need to be answered before the treatment plan are as follows:
– How can the bruxism be controlled? The bruxing forces applied to the patient’s natural teeth will also be applied to the future restorations. This consideration also leads to the next question.
– What is the material of choice to withstand the bruxing forces?
– Should the vertical dimension of occlusion (VDO) be changed? Usually in bruxing patients, although the wear of the dental structures might be significant, the VDO remains normal owing to the continuous eruption of the teeth.
– What should the treatment position be? The patient presented with several bites and a pseudo Class III relationship. Most dentists would feel more comfortable maintaining the maximum intercuspation that the patient presented with, since he was asymptomatic, although most probably it was not the one that the patient had when his dentition was still intact. Determining the 3-D position of the mandible and where it is resting against the rest of the stomatognathic system should be a priority.
– Is digital dentistry an option?

How can the bruxism be controlled?

Bruxism is an involuntary parafunctional movement that often occurs without the patient even realizing it. The etiology is not fully understood; therefore, there is no treatment that can stop bruxism from happening. Once the patient has been informed about the parafunctional habit and how it affects the structures of the stomatognathic system, he or she should be educated on how to avoid grinding and clenching of his or her teeth. We as dental professionals can and should control the parafunctional forces applied to the teeth, masticatory muscles and temporomandibular joints with the use of a stabilization appliance during sleep and by educating the patient (Fig. 4). The appliance protects the teeth from wearing down while allowing the rest of the stomatognathic system to determine its most stable relationship dictated by the rest position of the masticatory muscles. Therefore, the stabilization appliance not only controls and redistributes the parafunctional bruxing forces, but also dictates the musculoskeletally stable position that will be the treatment position of choice.

What is the material of choice to withstand the bruxing forces?

Ceramic restorations are popular because of their excellent esthetic properties. However, failures are still a major concern, and dentists fear that sleep bruxism may be associated with an increased frequency of ceramic restoration failures due to occlusal overload. Nevertheless, there is a lack of data to support this clinical fear. Within the limitations of the existing studies, there is no association between higher failure of ceramic restorations and bruxism. Monolithic restorations present better results, but it is important to provide adequate material thickness. Lithium disilicate glass-ceramic is often the material of choice owing to its mechanical properties and high esthetic value.
Should the vertical dimension of occlusion be changed?

In a bruxing patient, usually the VDO remains stable even though the wear of the dental tissue might be significant. This is mainly a result of continued tooth eruption compensating for the loss of dental tissue. The prosthetic space is limited and often the vertical dimension needs to be increased in order to gain the prosthetic space needed for the final restorations. The amount of increase is determined by the freeway space and by the esthetic and functional analysis of the case during the diagnostic stage, during which all the information is gathered and analyzed. Fabrication of an analytic wax-up for the reconstruction of a functionally and esthetically adequate tooth morphology and predefinition of the reconstructed tooth is essential. The diagnostic wax-up needs to be re-evaluated intraorally in the try-in stage of mock-up. The esthetic analysis will determine the inclination and position first of the incisal edge and second of the occlusal plane. This will also help the clinician to decide in which dental arch (if not both) the increase in VDO should be performed. In this case, it was decided to increase the VDO in the maxillary arch (Fig. 5). Monolithic onlay restorations fabricated from IPS e.max CAD lithium disilicate blocks (Ivoclar Vivadent) were used on the premolars (Figs. 6a & b). The reason for restoring only the premolars with final restorations was that the molars presented with failing old resin restorations; therefore, definitive restorations would be implemented in different stages. At this stage, only composite onlays were placed over the existing restorations on the molars in order to stabilize the occlusion. The composite onlays were made based on the transparent silicone matrix of the diagnostic wax-up.

Which should the treatment position be?

Since the VDO needed to be increased, the future treatment position needed to be established. The maximum intercuspsation that the patient presented with was an inadequate treatment position and was not to be maintained. He also had more than one bite, making it uncomfortable, especially because the anatomy of the masticatory surfaces was compromised due to wear. The new treatment position should be reproducible and stable throughout the treatment. Of equal importance is the maintenance of the stability of this treatment position after the finalization of the case. It has to be a functional one based on normal function without strain of any of the structures of the stomatognathic system. The new 3-D position in which the mandible will rest against the rest of the cranium should be dictated by the masticatory muscles during their rest position. This treatment position is called the musculoskeletally stable position. It is similar to the centric relation, but it is not as exact about the intracapsular condyle position (the debate about the definition of centric relation is still under considerable discussion even currently). Rather, it allows the masticatory muscles to dictate the position of the mandible regardless of the condylar position. Therefore, it is a position highly individualized to each patient and his or her distinctive anatomical and functional characteristics.

This position is determined initially with the stabilization appliance. In order to record this position, we use an anterior deprogrammer (Fig. 7). Compared with jaw manipulation, this device is a predictable way to record the musculoskeletally stable position, since it does not depend on the patient relaxing to...
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allow the practitioner to guide the jaw during registration. The difference in the position of the mandible against the maxilla between the initial maximum intercuspation that the patient presented with and the new treatment position of the musculoskeletally stable position demonstrated the importance of defining and restoring the case in this new position (Fig. 8). This would ensure the stability of the occlusion, and effortless function, during treatment, but also most importantly after cementation.

**Is digital dentistry an option?**

Digitalization of dentistry is advancing rapidly. The advantages are significant, such as the standardization of working steps, increase in material quality through CAD/CAM and reproducible restorations. As a result, the final restorations are easily, more quickly and predictably produced, providing at the same time an excellent fit. The potential is enormous in a case like the one presented here, where the increase in VDO, along with the bruxing parafunctional forces applied, required the maximum making use of and benefiting of restorative materials. IPS e.max CAD lithium disilicate blocks were the material of choice. Intraoral scanning was performed with TRIOS 3 (3Shape), and the restorations were manufactured through CAD/CAM (Fig. 9). IPS e.max monolithic onlay restorations were cemented on the posterior teeth to increase the VDO (Fig. 10). In the anterior area, teeth #11, 12 and 13 were restored with veneers and teeth #21, 22 and 23 with ceramic crowns owing to pre-existing resin restorations that decreased the amount of enamel available for final cementation (Figs. 11–15b).

**Conclusion**

Defining the treatment position prior to any extensive dental therapy, such as full-arch prosthetic rehabilitation or orthodontics, is essential. A healthy, stable maximum intercuspation is not always present. Skeletal abnormalities, dental malocclusions, missing posterior teeth and severe wear of the dentition are some of the etiological factors for patients presenting with an unfavorable bite. If the clinician does not recognize the former and diagnose this clinical situation, he or she might choose to maintain the occlusal relationship that the patient presents with. After all, it is what the patient is used to, and in many cases, it is also functional. According to the adaptive capabilities of the stomatognathic system, acquired malocclusion might result after completion of the treatment. This is a very unfortunate situation for the patient and the treating dentist. The patient might complain of temporomandibular pain and dysfunction due to the orthopedic instability. Owing to pain symptoms, it is impossible for the clinician to redefine the occlusion, and at this point, no dental treatment can correct the malocclusion. Therefore, before any dental treatment, a stable, reproducible treatment position needs to be defined, registered and maintained. This is called the musculoskeletally stable position, and it ensures the 3-D stabilization of the mandible against the maxilla.
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INTERVIEW
with — Dr. Selma Camargo São Paulo, Brazil
and Dr. Susana Teitelbaum Montevideo, Uruguay

Dr. Selma Camargo has a master’s degree and a PhD in endodontics from the University of São Paulo, Brazil. She teaches endodontics, lectures at and coordinates the General Dentistry Clinic for Adults at the Universidade Cidade de São Paulo, Brazil, lectures on lasers in dentistry and is coordinator of the laser in dentistry unit at the university.

Dr. Susana Teitelbaum has a master’s degree in pediatric dentistry and laser dentistry. Since 2013, she has taught laser dentistry at the Instituto de Tecnologia Avanzada, Monterrey, Mexico. Dr. Teitelbaum is also a member of the Grupo de Estética Orofacial Argentina in the field of laser dentistry and of the Comisión Científica de la Asociación Odontológica in Uruguay. She has held over 100 presentations in laser and pediatric dentistry.

Q: Can every cancer patient who develops oral mucositis be treated and benefit from laser treatment?
A: Yes, certainly. All patients, without restriction, can benefit from laser treatment. Patients that develop mucositis from radio- or chemotherapy and are undergoing different treatment protocols can be treated with laser. Laser is indicated in a preventive approach or to treat mucositis.

Q: How does laser treatment act on mucositis-affected areas? Does laser work based on a specific mechanism to control the spread of oral mucositis or does it accelerate the healing process?
A: There are three basic actions of laser light: It promotes analgesia, controls the inflammatory process and acts as a cellular biomodulator, stimulating the healing process.

Q: What are the main effects of oral mucositis treatment using low-intensity laser therapy for the quality of life of oncology patients?
A: Most patients with Grade 3 or 4 oral mucositis cannot eat because of the extent of the extremely aggressive lesions and high-intensity pain. Since they are unable to eat, there is a risk that their overall condition will worsen. Laser acts in accelerating the healing process of oral mucositis, repairing lesions faster. Besides that, thanks to its analgesic effects, laser eliminates or at least diminishes the pain, allowing patients to consume food immediately.
Q: Should laser treatment be part of a multidisciplinary treatment for oral mucositis or is it curative by itself?
A: Treatment with laser is curative on its own, but there is no doubt that a multidisciplinary approach involving medical doctors, nurses, nutritionists, hygienists, dentists and laser specialists is always preferable when treating cancer patients. It is also necessary to improve or at least maintain the patient’s hygiene habits to improve the situation.

Q: Is laser treatment indicated for patients who have not developed oral mucositis, but are at risk of it? Is there a specific protocol for each case?
A: The protocols depend on the neoplastic pathology. Different medication and treatments are used for each pathology. Based on that, specific laser protocols are adapted for every situation. For example, almost all patients who are undergoing radiotherapy entailing irradiation of the head and neck areas will develop some form of oral mucositis. Those patients can be scheduled for laser treatment focusing on oral mucositis prevention.

Q: Concerning the most severe cases, how many laser applications are needed to obtain a satisfactory result? How often should treatment be performed to ensure an effective outcome?
A: Laser treatment protocols depend on the chemo- or radiotherapy program. Laser treatment is performed on the patient from the first day of cancer treatment. Depending on the chemical medication used for cancer treatment, the incidence and severity of mucositis may be higher. In such cases, laser irradiation can be performed every day, continuing for up to ten days, even after chemo- or radiotherapy has been completed, or until it is needed.

Q: Does the patient feel pain during laser application?
A: Absolutely not. In fact, what happens is the opposite: Patients feel released from pain during laser irradiation. The laser used for these treatments is of low intensity and not invasive. The light stimulates intracellular processes, accelerates healing and controls pain.

Q: Can laser therapy have a preventive effect or is it just curative?
A: Laser has both effects: It treats lesions in the case of an existing injury and prevents development of oral mucositis when correctly indicated. For example, in bone marrow transplant patients, laser treatment starts a few days before they receive their new cells in order to prevent or minimize the development of oral mucositis.

Q: How was oral mucositis treated before the use of lasers?
A: Before the use of low-intensity lasers, patients did mouth rinsing with serum, chemical products, homemade chemical concoctions or topical anesthetic products. These treatments only focused on oral mucositis symptoms and did not help or accelerate wound healing.

Q: Is it possible to say that the use of low-intensity laser for oral mucositis treatment shortens the cancer treatment as a whole?
A: Yes. Mucositis is a dramatic, though expected, side effect of oncological treatment. If it is severe, patients cannot eat or drink and their general condition decreases significantly. Therefore, oncological treatments have to be suspended until the mucositis lesions have resolved. Since laser treatment accelerates the healing process, the chemo- or radiotherapy can soon resume according to schedule and treatment is not protracted.

Q: Does laser treatment have positive emotional repercussions in the lives of cancer patients?
A: Patients feel better emotionally for the simple fact that their pain recedes. That brings great relief, especially for patients who are facing such a difficult time in their lives. It is definitely very positive for the patient’s quality of life.

Q: The World Health Organization classifies oral mucositis into five grades, from 0 (when there is no change) to 4 (when oral intake becomes impossible owing to the lesions). Does low-intensity laser produce beneficial effects in all grades from 1 to 4?
A: Low-intensity lasers benefit all grades of mucositis. Patients treated with established laser protocols before starting chemo- or radiotherapy will not develop severe mucositis, Grade 3 or 4.

Q: Are there differences in terms of protocols and results of low-intensity laser treatment in children and adults?
A: Both adults and children have very positive results with laser therapy. There are no differences in the effects from this point of view. However, differences become relevant depending on the oncological protocol and chemical medication used. The chemotherapy doses used in children’s treatments are three times more aggressive than the ones used in adults. Side effects are related to the drugs’ aggressiveness.

Q: In children, is there a minimum age for use of low-intensity laser?
A: There is no established age limit for use of low-intensity laser. Even newborns can be treated with low-intensity laser therapy, and no side effects or problems have been described in the literature—quite the opposite: It brings relief from pain and aids well-being.

Q: What should training of health care professionals in the application of laser for the treatment of oral mucositis entail?
A: Advanced training is important in order to apply laser. Professionals must understand the physics and emission characteristics of each laser wavelength, absorption spectra of the target tissue, mucositis development process, laser application protocols, etc. It’s necessary to have both academic training and specialization in oncology.
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