



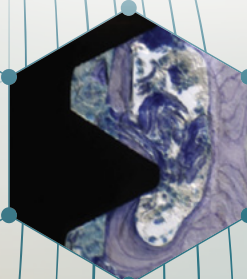
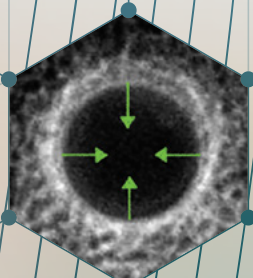
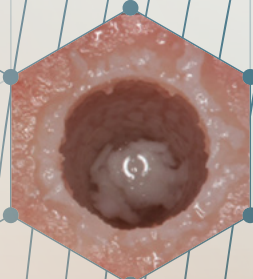
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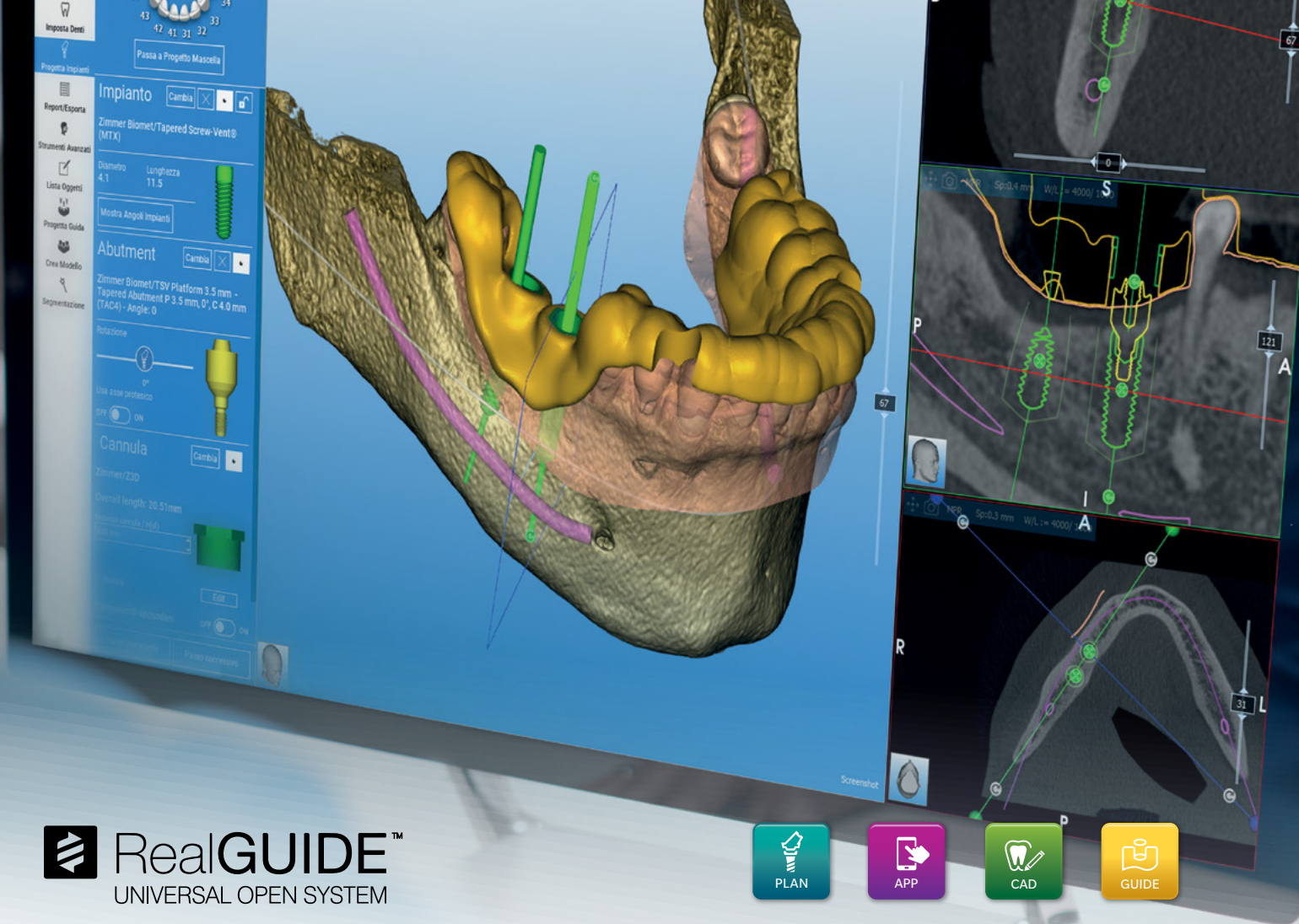
A QUARTERLY MEMBER NEWSLETTER

The unfolding science of osseointegration

- *The science of osseodensification*
- *The immune foreign body reaction theory of osseointegration*



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ACADEMY NEWS

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President's Message

Taking the Academy to the next level

By Hom-Lay Wang, DDS, MSD, PhD

Dear AO Members:

Greetings from Ann Arbor, Michigan! As we welcome spring, I hope that everyone is taking advantage of the

warmer weather and looking forward to the exciting AO opportunities in store for our members. This year, we have several exciting initiatives planned.

My focus will be on continuing to expand AO training centers globally, with a special emphasis on North America, establishing new international affiliated organizations, and further strengthening the **AO Master** and **AO Diplomate** credential process.

As you know, AO is widely recognized as the premier international association for professionals interested in implant dentistry. I am honored to serve as the president of the Academy, and I want to express my gratitude to each of you for your continued support and participation. The past few years have been challenging for us all, but I am proud of how we have come together to support one another and continue our important work despite the obstacles.

Recently, I had the pleasure of seeing this community in action as an AO representative at the **Spanish Congress of Oral Implantologists** and Academy of Osseointegration (SCOI-AO) joint meeting held in Malaga, Spain. Together, SCOI-AO focused on providing a forum where doctors could not only engage and network but also learn emerging research, technology, and techniques, share best practices, and coordinate optimal patient care using timely, evidence-based science and methodologies.

This one-day conference was an incredibly inspiring experience. I was energized by how eager the young doctors were to expand their scientific knowledge base and learn new skills. I hope that as an organization, AO is able to continue to partner with other organizations to share this enthusiasm and curiosity and forge life-long friendships.

Similarly, we are exploring new ways to connect with members and promote collaboration and knowledge-sharing. Working alongside Dr. **Joseph Kan** and newly established social media committee members, we will be expanding AO's presence on social media where members can connect, share resources, and engage in ongoing discussions. This will enable us to connect with more members and reach out to potential new members.

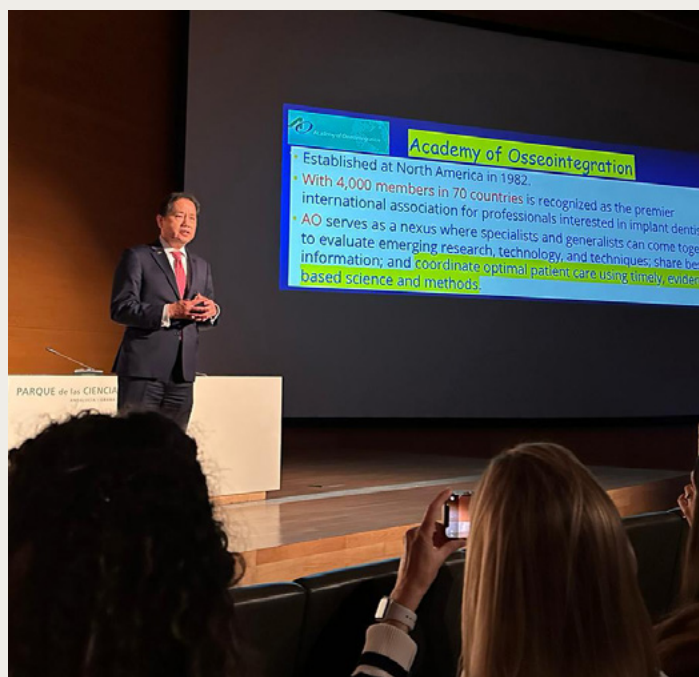
Speaking of connecting with one another, I would like to take this opportunity to invite all of you to attend our **2024 AO Annual Meeting**, which will be held in the beautiful city of Charlotte, North Carolina, March 7–9, 2024. The theme for the meeting will be **"Going Beyond the Boundaries: Optimizing Patient Care Through Scientific and Clinical Innovation."**

Special thanks to the hard work of our Program Chair, Gustavo Avila-Ortiz, and the committee – they have put together a top-notch scientific program that includes world-class speakers such as Drs. **Tomas Albrektsson, Ueli Grunder, Istvan Urban, Stephen Chu, Purnima Kumar, Craig Misch, Oscar Gonzalez-Martin, Mario Rocuzzo, Paul Rosen, Giovanni Zucchelli**, and many more.

This conference promises to be our best yet, with an impressive lineup of speakers, engaging workshops, and networking opportunities. I encourage all of you to attend this exciting event and to take advantage of the conference to learn from and network with colleagues from around the world.

Thank you for your continued support, and I wish you all a happy and productive spring season. I hope to see you all in Charlotte next year.

Best regards,
Hom-Lay Wang





The Academy's 2023-2024 Board of Directors includes (front row, left to right): Drs. Robert C. Vogel, vice president; Amerian D. Sones, immediate past president; Joerg Neugebauer, president-elect; Hom-Lay Wang, president; Joseph P. Fiorellini, treasurer; and Joseph Y.K. Kan, secretary; and directors (back row from left to right): Daniel I. Taub, Jeffrey Ganeles, Robert R. Lemke, Robert A. Levine, and Lambert J. Stumpel; and Executive Director Kevin P. Smith (not pictured: Director Stephen L. Jacobs).

Dr. Hom-Lay Wang takes helm as 37th AO President

"Becoming president is one of my dreams come true," says Academy of Osseointegration President, **Hom-Lay Wang**, DDS, MSD, PhD. "It's a new experience that will provide a great opportunity to meet even more friends, bring the Academy to the next level and increase our reach to the global audience."

Dr. Wang was elected the Academy's 37th president on March 18, 2023 during the Annual Business Meeting in Phoenix, AZ. He succeeds **Amerian D. Sones**, DMD, MS.

Overall, Dr. Wang indicated as president, he wants to continue providing top notch education at the Annual Meeting, and through networking, spread the Academy's reputation globally. More specifically, he stated the following goals:

"My aspirations are, one, to continue expanding the AO Master and AO Diplomate Certificate Program and attract more of our members to receive this certification. Second, continue our training centers globally and in the U.S. so we can train many dentists that know how to provide quality implant therapy, sound evidence, and scientific background to continue to their career the implant field."

He continued, "Lastly we want to continue establishing more AO affiliate societies and to strengthen and enhance and reputation through publishing evidence-based papers from AO Summits."

Dr. Wang will lead the following slate of officers and directors for 2023 – 2024:

Officers

President: AO Fellow **Hom-Lay Wang**, DDS, MSD, PhD; a periodontist from Ann Arbor, MI

President-elect: AO Fellow **Joerg Neugebauer**, DDS, PhD; an oral surgeon from Landsberg Am Lech, Germany

Vice President: AO Fellow **Robert C. Vogel**, DDS, a general practitioner from Palm Beach Gardens, FL

Secretary: AO Fellow **Joseph Y. K. Kan**, DDS, MS; a prosthodontist from Loma Linda, CA

Treasurer: AO Fellow **Joseph P. Fiorellini**, DMD, DMSc; a periodontist from Philadelphia, PA

Immediate Past President: AO Fellow **Amerian D. Sones**, DMD, MS; a prosthodontist from Dallas, TX

Directors

AO Fellow **Jeffrey Ganeles**, DMD; a periodontist from Boca Raton, FL

AO Fellow **Stephen L. Jacobs**, BDS, FDS RCPS; a general practitioner from Glasgow, UK

Robert R. Lemke, DDS, MD; an oral and maxillofacial surgeon from San Antonio, TX

AO Fellow **Robert A. Levine**, DDS; a periodontist from Philadelphia, PA

AO Fellow **Lambert J. Stumpel**, DDS; a general practitioner from San Francisco, CA

AO Fellow **Daniel I. Taub**, DDS, MD; an oral and maxillofacial surgeon from Philadelphia, PA

The emerging science of osseointegration

By: Ole T. Jensen, DDS, MS; Academy News Guest Contributor

Three thousand years ago, a flint-tipped arrow became lodged into the spine of a man who lived many years after the incident (Fig. 1). The arrow showed intimate bone healing on x-ray without evidence of infection. The foreign body appeared to be in a state of equilibrium with the body, the flint surface in direct bone contact without intervening soft tissue surrounding. Does this happenstance hint at the story, even the science, of osseointegration?

In 2011 I started a new tissue engineering journal and asked Prof. **Per-Ingvar Brånemark** to write the forward. He wrote: "Osseointegration is an unexplainable condition of interactive dynamic energy." (Fig. 2)

This statement stunned me in its frankness and humility. Here was a person who studied osseointegration his entire life and wasn't exactly sure what it was!

And so, we come to the question: What did Prof. Brånemark and **Tomas Albrektsson**, MD, PhD actually discover?

In 1962, they studied vasculature in bone *in situ* using a titanium optical chamber. They were interested in the vascular dynamics within bone. At the end of the study, they could not remove the titanium device from the bone which they thought a curious finding.

It is interesting that the two bone scientists started out as vascular scientists which suggests the foundational importance of blood supply as they flirted with the discovery of osseointegration.

Dietrich said, "bone is a vascular tissue that has been calcified not a calcified tissue that has been vascularized." Frost postulated that coupled bone formation centers around a vascular element--the blood vessel *determinative* of bone remodeling. Yin recently reviewed bone formation's underlying "mechanism" as one directed by endothelial cell paracrine, juxacrine and exosome function. As the initiating vascular scaffold forms endothelial cells simultaneously direct bone forming growth factors to promote proliferation and differentiation of bone forming cells.

Though modern vascular science was unknown to Brånemark in 1962, he was keenly aware of the importance of intra-osseous blood vessels. He studied heat generation when drilling in orthopedics and he came to understand that at 60-degree Celsius injury to endothelial cells and coagulation of blood vessels would occur such that cooling

irrigation of drills became a strong aspect of implant placement protocol.

Unexpected fixity of the titanium optical chamber reminds one of Sir Alexander Fleming finding penicillium mold inhibiting growth of staphylococcus. But observation alone is unimportant unless, as Einstein said, there is "flight from wonder." Like Fleming, Brånemark knew immediately the significance of the serendipity. Ten years earlier in 1952, his operating room nurse had been unable to wear a denture

despite surgical efforts to improve her condition. Brånemark's flight was to use titanium fixity to hold in dentures.

But there was nagging doubt in his mind as he began to place titanium devices into patient's jaws in 1965. He worried that under function, titanium's grip would loosen and the patient's teeth would fall out.

During this same time frame at the University of Utah, a small group of scientists under the direction of another orthopedic surgeon, Harold Frost, formed the Hard Tissue Workshop based on the counterintuitive observation that bone strengthens under load – and they wondered why (Fig. 3). In the 1960s and 70s, the group formulated biomechanical explanations for bone adaptation and developed "mechanostat" theory to explain bone's inherent responsiveness. Frost quantified certain mechanical strains that strengthened bone. This was a remarkable idea that helped explain how a titanium device placed into bone and then loaded would not loosen.

After five years of human trials, Brånemark found fixity of titanium persisted despite masticatory function. These titanium screws therefore became "fixtures."

In 1977, Brånemark coined the term *osseointegration*, a magical term used to explain titanium's still unwitnessed connection to bone. The question remained as to how to "discover" osseointegration microscopically as it could only be inferred indirectly by decalcified processing. Therefore, for any claim of direct bone contact to an oral implant, the dental community remained highly skeptical, believing it impossible.

To solve this dilemma, in 1980, Albrektsson went to Germany to visit Karl Donath, a histologist, who was studying World War II specimens of shrapnel in bone (Fig. 4). Donath had developed a cutting and grinding method to make very thin sections, 10 to 20 microns in thickness, to better observe the bone-metal interface. By 1982, Donath

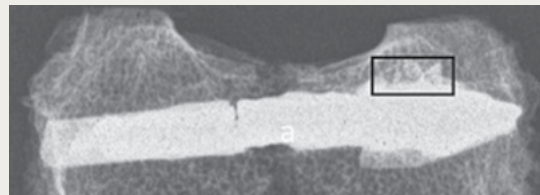


Fig. 1: Flint arrow (700-900 BC) embedded into human spine – likely present for many years – showing intimate bone contact and lacking signs of infection or rejection.

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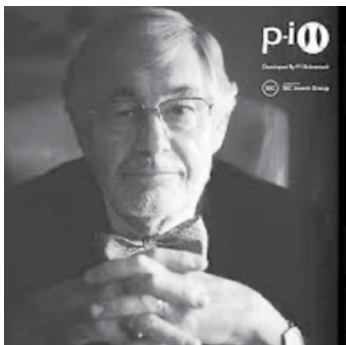


Fig. 2. In 2011 P-I Brånemark wrote "Osseointegration is an unexplainable condition of interactive dynamic energy."



Fig. 3. Harold Frost proposed a new bone strengthening paradigm for mechanical loading of bone during the same timeframe P-I Brånemark began placing oral implants in patients (1965-1970).



Fig. 4. Karl Donath developed special cutting and grinding histological methods to visualize the metal-bone interface verifying osseointegration.



Fig. 6. By 2012 Albrektsson and his Swedish colleagues suddenly embraced osseointegration as a foreign body reaction after objecting to Donath's conclusion from 1982.

The emerging science of osseointegration... (continued from page 6)

and Albrektsson had evaluated titanium fixtures and verified a direct bone connection.

At the Toronto Conference that same year, osseointegration was finally accepted, leading to broad consensus that a clinically important discovery had been accomplished.

For the next decade, the osseointegration concept disseminated worldwide. However, during this period, clinicians kept asking what osseointegration actually was and how it formed.

By 1994, **John E. Davies**, BDS, PhD, DSc, had formulated the concept of "contact osteogenesis" as the explanation for osseointegration. Titanium "contact" occurred most importantly by osteoconduction followed by de novo bone formation, the two processes establishing osteogenesis at the titanium surface. He observed the importance of blood clot upon a hydrophilic surface followed by platelet activation resulting in directed osteogenic cell migration, these processes seemingly "conducted" by the presence of titanium in bone. De novo bone then formed as a thin seam of mineralization analogous to the collagen-free cement line. According to Davies, this created a "bondable surface" to which woven bone annealed and later remodeled into mature bone.

This theory held sway for two decades, that bone formed at the surface of the implant conductively and persisted under function as osseointegration. However, back in 1982 when Donath first analyzed bone response to shrapnel and titanium, he described the process to Albrektsson of bone

adhesion to metal as an "obvious foreign body reaction." Intimate bone healing, he said, formed as "a walling off mechanism to separate foreign material from the body," this Type II immune response, mediated by macrophages (Fig. 5).

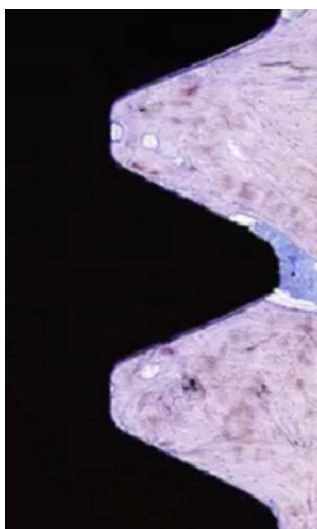


Fig. 5. Osseointegration as observed microscopically is commonly associated with foreign body giant cells suggesting a foreign body response, described by Albrektsson as, "foreign body equilibrium," thought now to include coupling of mechano-transduction and osseointegration.

At that time, Albrektsson rejected Donath's interpretation out of hand as anathema to magic until some thirty years later when he suddenly reversed course to embrace osseointegration as a foreign body reaction (Fig. 6). Perhaps though, this delayed acceptance was one more serendipity, for if described as such at the 1982 Toronto Conference one wonders if titanium fixity would have still found favor.

What osseointegration actually is matters. Without a correct scientific model technological advance is tangential and will be until a new paradigm displaces the old.

Once again, Europeans have shaken the dental establishment of the entire world and provoked controversy that may well lead to an important new field of study.

Presented here are four highly plausible scientific explanations for osseointegration including vascular scaffold mediated osteo-induction, titanium surface osteo-conduction, bone mass strengthening via the mechanostat, and foreign body equilibrium.

The question of which explanation is most correct is still under microscopic examination making Brånemark's "unexplainable dynamic interactive energy" something we call still wonder about, but which for patients, has been nothing short of magic these past 60 years.

Numerous research awards bestowed at 2023 Annual Meeting

Congratulations to the following individuals who were honored at the Phoenix Convention Center, March 16–18, 2023:

New Fellows

Fellowship in the Academy is obtained by demonstrating a commitment to the field of osseointegration. Members must excel in academics and service to the Academy. Three active members achieved Fellowship status this year:

Mehrdad Favagehi, DDS, MS;

Fouad Khoury, Prof. DMD, PhD; and

Sun-Jong Kim, DDS, MSD, PhD, MPA.

Nobel Biocare Brånemark Osseointegration Award

Dennis P. Tarnow, DDS was the 15th recipient of the Nobel Biocare Brånemark Osseointegration Award. This annual award, made possible by a grant from Nobel Biocare, is bestowed by the Osseointegration Foundation (OF), the Academy's philanthropic arm. It honors an individual whose impact on implant dentistry is exemplary in any or all of the Foundation's mission categories: research, education and charitable causes.

AO Distinguished Service Award

This is only the second time this award has been presented in the history of the Academy, which honors a member for their outstanding clinical, educational or scientific achievement, contribution to implant dentistry and exemplary service to the Academy. The recipient was **Steven E. Eckert**, DDS, MS (see related article on page 19).

William R. Laney Award

Named after the Academy's first president and inaugural editor of the *International Journal of Oral and Maxillofacial Implants (JOMI)*, **William R. Laney**, DMD, MS, this award recognizes the best article published in the past year in the Academy's official publication, in which Dr. Laney served for many years as Editor Emeritus. The 2023 recipient was **Lyndon F. Cooper**, DDS, PhD, for: "A 5-year Esthetic RCT Assessment of Anterior Maxillary Single-Tooth Implants with Different Abutment Interfaces," printed in the Volume 36, Number 1 2021 edition of *JOMI*.

OF Research Grants

As part of its mission to foster the highest ideals of research, OF awards up to \$50,000 to each dental professional pursuing groundbreaking research. The following First Place recipients presented their findings:

Translational and Clinical Science Research Grant

Lorenzo Tavelli, DDS, MS: "The Value of High-frequency Echo-doppler Ultrasonography for Assessing Peri-implant Health and Complications."

Basic Science Research Grant

David Kim: "Highly Multiplexed Spatial Mapping of Oral Microbial Communities in Peri-implant Health and Disease."

Emerging Leaders – 6 Under 10

Spearheaded by Immediate Past President Dr. **Amerian D. Sones**, this new case presentation competition among early career clinicians was held prior to the Closing Symposium. The winners were:

First Place

Francesco Giachi Carù, DDS, MSc
"Autotransplanted Tooth With Bone Fenestration Treated Like an Implant: Proof of Principle"

Second Place

Jun Ying Li, DDS, MS, PhD
"PAIR Virtual Patient Assisted Full-mouth Immediate Implant Placement and Loading: A Case Presentation With Fully-digital Workflow and 3-year Follow-up"

Third Place

Young Kim, DMD, DMSc
"Trajectory-guided Implant Surgery (TGIS) Workflow for Full-arch Implant Rehabilitation Enabling More Sophisticated Fixed Provisionals and Loading Options"

Runners Up

Andre Barbisan De Souza, DDS, MSc
"Esthetic Implant Complication Management and Oral Rehabilitation With the Aid of Digital Technology"

Sunee Limmeechokchai, DDS, MSD

"Full Arch Implant Fixed Prosthesis: How to Plan and Execute"

Ignacio Pedrinaci, DDS

"Surgical and Restorative Digital Workflow for Type 1A Implant Placement"

Continues on page 22



At its 2023 Annual Meeting, the Academy recognized 76 members as the inaugural recipients of the new AO Master and AO Diplomate certification program. AO President Dr. Hom-Lay Wang spearheaded and helped guide this initiative through the initial year of inception.

Academy recognizes 76 new AO Diplomate Certificate recipients

Just a little over one year ago, the Academy of Osseointegration (AO) made a bold announcement about the launch of its new AO Master and AO Diplomate Certificate Program. Fast forward to the 2023 Annual Meeting when 76 inaugural Diplomate recipients were recognized by standing up during the Opening Symposium.

"That to me is impressive and sets the stage for our members to become an AO Master or AO Diplomate recipient as an endeavor for their career," said President **Hom-Lay Wang**, DDS, MSD, PhD, who spearheaded this strategic initiative.

The recipients achieved an AO Diplomate Certificate Restorative, AO Diplomate Certificate Surgical, or AO Diplomate Certificate Combined Restorative and Surgical, and were across all specialties. One recipient was **Todd R. Schoenbaum**, DDS, MS, who achieved the AO Diplomate Certificate Restorative.

"The Certificate is important for all disciplines, as it helps to emphasize as clinicians, we understand what it means to be a team player, know what we excel at and know how to collaborate with other talented clinicians to produce the best possible results for our patients," said Dr. Schoenbaum. "It is one of the authoritative ways to communicate to your colleagues and patients that your clinical performance, diagnosis and execution of treatment is at an exceptional level."

The certificate program was established based upon providing members of the Academy with an opportunity to certify their knowledge and skills to the next level through a very strict credentialing process. The Academy's credentialing committee provides a very thorough and carefully orchestrated written exam, as well as very in-depth examiners who test the candidate's knowledge, clinical skills and rationale for their treatment.

"To me this is exciting," continued Dr. Wang. "By doing so, we raise our members' status by providing the quality of the recognition of their achievement."

Educational materials related to the program are provided through the AO website and by attending the Annual Meeting to obtain the required number of credit hours. Training centers have also been formed so members can go through a very detailed, organized and constructive program to achieve the level of knowledge and skill to be challenged by the credentialing process. Established training centers include: Lake Como Institute, Como Italy; Anshin Dental Clinic, Taipei, Taiwan; and Encia Dental Specialist, Kuala Lumpur, Malaysia, with others in the process.

Full details about the program are available via <https://osseointegration.org/ao-master-and-diplomate-certificates-2>. To see the list of all recipients, please scan the following QR code.



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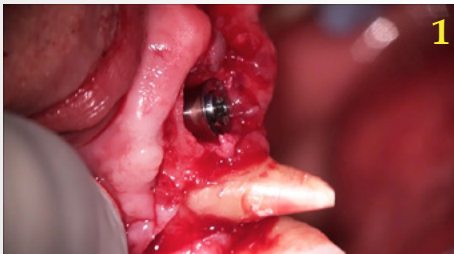
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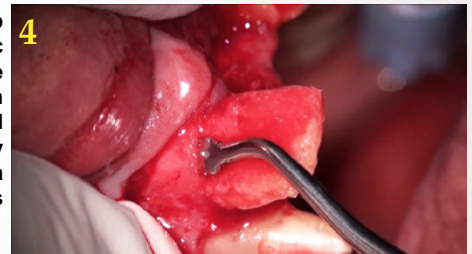
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CLINICAL CASE EXAMPLE



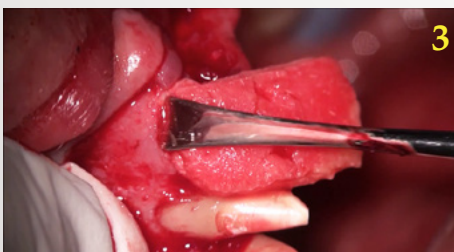
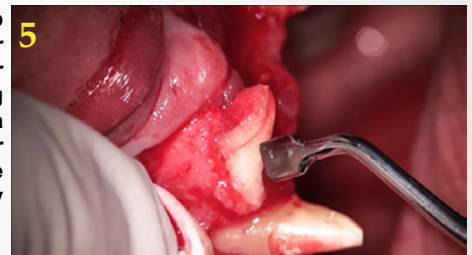
1 Implant is placed lingually following extraction. OsteoGen® Strip will be used to fill gaps and to reinforce the buccal wall

The OsteoGen® Strip is a hydrophilic material that can be hydrated with patients blood and substantially compressed to fill a variety of defects



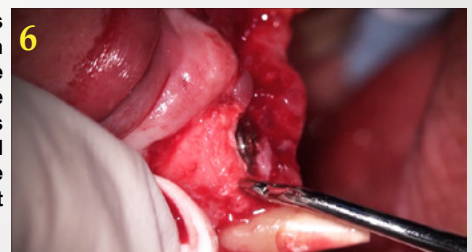
2 OsteoGen® Strip is hydrated with patients blood from the surgical site and, if desired, autologous serum or other growth factors prior to delivery

OsteoGen® Strip can be folded after hydration and prior to or during placement with a blunt instrument for additional bone width and stability



3 Buccal plate is reinforced by feeding the OsteoGen® Strip downwards in between the implant and the buccal wall

OsteoGen® Strip is in place which reinforces the buccal wall while grafting the gaps between the buccal plate and the implant



Clinical images courtesy of Robert Miller, MA, DDS, FACD, DABOI



Scan for references

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Osseodensification: Does it stand up to scientific scrutiny?

By: E. Dwayne Karateew, DDS; Arndt Guentsch, DMD, MHBA, PhD; and Salah Huwais, DDS;
Academy News Guest Contributors

Osseodensification, a universal additive bone instrumentation method, was introduced by Huwais. It utilizes specially designed burs that induce a time-dependent hydrodynamic wave ahead of the point of contact, which enhances bone plasticity and allows for osteotomy creation through compaction autografting bone into the trabecular spaces (Huwais et al. 2017).

Biomechanical and histological in-Vitro evidence: It has been demonstrated that osseodensification compaction autografting leads to bone spring-back into the implant body increasing bone to implant contact by three folds (70%) day of surgery, thus enhancing its primary stability measured by insertion and removal torque (Huwais et al. 2017, Slete et al. 2018, Caceres et al. 2020). (Fig. 1).

Histological in-Vivo large animals' evidence: There is an initial increase in implant stability and BIC is maintained throughout three, six, and 12 weeks healing regardless of the implant macro or micro geometry, (Witek et al. 2019, Lahens et al. 2018, Oliveira et al. 2018, Alifrage et al. 2018, Tian et al. 2018, Trisi et al. 2016, Lahens et al. 2016, Gendy et al. 2017), and leads to a subsequent increase in implant BAFO which translates to enhanced osseointegration (Mullings et al. 2021).

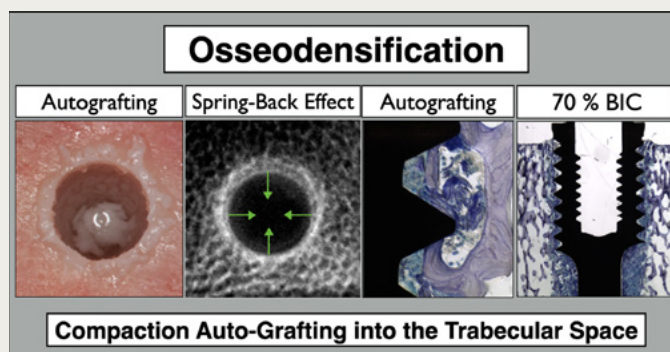


Fig. 1.

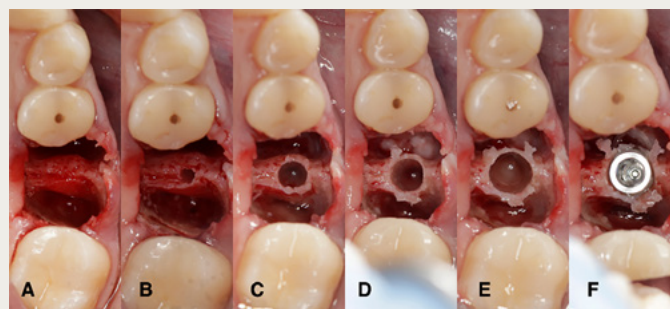


Fig. 2.

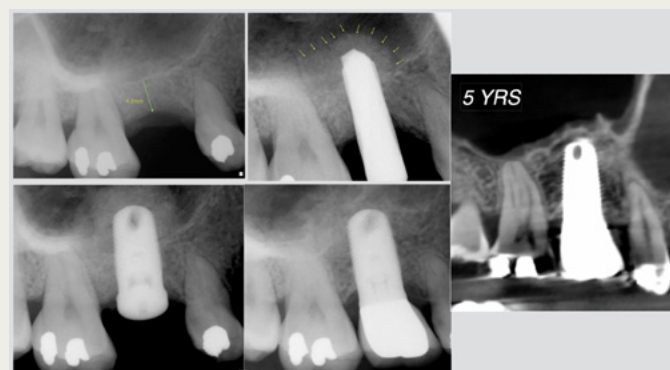


Fig. 3.



Fig. 4.

Clinical Evidence:

Prospective clinical trials have demonstrated, including a long-term prospective study, that osseodensification is a universal bone instrumentation that produces increased implant primary stability measured by insertion torque and subsequently increases its secondary stability measured by ISQ throughout the healing period regardless of implants macro or micro geometry, with 97.7% long term success rate (Bergamo et al. 2021, Ibrahim et al. 2020 and Tenello et al. 2019).

Osseodensification Clinical Protocols: Osseodensification has demonstrated efficacy in several clinical scenarios, including *alveolar ridge plastic expansion*, which allows for implant placement with narrow ridges with adequate amount of trabecular bone without creating dehiscence (Koutouzis et al. 2019 and Jarikian et al. 2021). This increase in bone plasticity also facilitates upper and lower *molar septum expansion and immediate implants placement*. Bleyan

demonstrated, the ability of osseodensification to expand molars septum with adequate amount of trabecular bone in conjunction with immediate implants placement in multirooted sockets resulting in 93.1% success rate over 5 years follow-up (Bleyan et al. 2022). (Fig. 2). It has been reported that there is a 98.1% total implants survival rate in 24 months follow-up of 211 implants immediately placed with osseodensification (Formiga et al. 2022).

Continues on page 15

Highlights from the Academy's 2023 Annual Meeting

Desert Beauty, Dynamic Content

Phoenix, AZ provided the picturesque backdrop for the Academy's 2023 Annual Meeting, held March 16 – 18, at the Phoenix Convention Center. "Be in the Know" was attended by implant professionals from around the world in-person and via livestream, featuring more than 100 exhibiting companies, nearly 230 research submissions, and more than 70 expert presenters to provide all participants "A Global Perspective on Implant Dentistry." On the social side, all registrants had many opportunities to connect and take in the Phoenix atmosphere, including at the Academy's iconic President's Reception, held this year at the Phoenix Art Museum, providing a vibrant exhibition of Southwest visual arts.

01 Presenting the gavel is always a highlight at the Annual Meeting, with Dr. Amerian D. Sones handing over the reins to incoming President Dr. Hom-Lay Wang.

02 Friday morning's Surgical Track concluded with a panel discussion moderated by Dr. Joseph Y.K. Kan, which by the looks of it went well.

03 Academy board members and colleagues had many opportunities to connect and enjoy the Phoenix ambiance throughout the 2023 Annual Meeting.

04 The Prosthetic Track included a variety of topics, speakers and formats, including this session on team approach by the Blasi Brothers.

05 President Dr. Amerian D. Sones (left) honors Dr. Tara L. Aghaloo for her service to the AO Board, including president in 2021-2022.

06 Rickard Brånemark, son of the founder of osseointegration, Per-Ingvar, connected with President Sones after delivering the keynote.

07 More than 20 OF Student Travel Grant recipients celebrate at the YCC reception after presenting their research at the Annual Meeting.

08 Passing the torch for the Osseointegration Foundation was Dr. Andrea Henderson, to incoming President Russell D. Nishimura.

09 The President's Reception at the Phoenix Art Museum was a showcase of vibrant southwest arts, time to socialize and enjoy the weather.

10 Dr. Francesco Giachi Carù received 1st Place in the "Emerging Leaders – 6 Under 10" case presentation competition for early career clinicians.

11 Dr. Hom-Lay Wang provides his remarks after being elected the Academy's 37th President during the Annual Business Meeting on March 18.

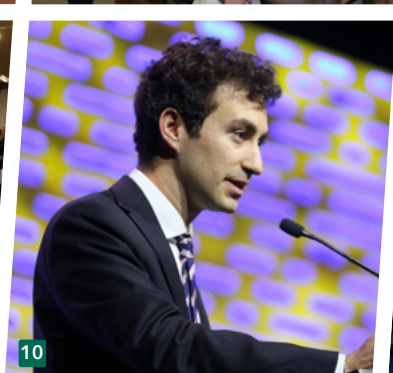
12 "Be in the Know" provided many opportunities for attendees and colleagues across all disciplines to connect and get reacquainted in Phoenix.

13 Hands-on sessions woven into the main program were very popular, allowing attendees to learn the latest technologies.

14 More than 100 leading manufacturers exhibited the latest dental products and technologies, attracting strong crowds in the exhibit hall.

15 Dr. Dennis P. Tarnow responds to the reaction of the attendees after receiving the Nobel Biocare Brånemark Osseointegration Award.





Hybrid Implant Designs – Tissue specific manipulation of the host response

By: David L. Cochran, DDS, MS, PhD, MMSc; Academy News Guest Contributor

I was asked by Dr. **Mehrdad Favagehi** to write a commentary on three articles published in the *Academy News* about hybrid implant designs by Drs. **Daniel Buser**, **Gerald A. Niznick** and **Dennis P. Tarnow**. Let me first say that I highly respect all of these “giants” in the implant field and greatly admire their incredible contributions. Each are very intelligent, and I am both honored and fortunate to call them friends. Both Drs. Buser and Tarnow point out the historical development of hybrid designed implants and then relate these to the development of peri-implantitis.

Dr. Niznick draws an important distinction that has been learned in this history and that is that a surface created by a subtractive process is better than an additive process since roughness is created without porosity. Porosity allows for the creation of microbial niches that are difficult to eradicate. Dr. Niznick also brings up an even more significant issue, which is the creation of implant component interfaces and their location relative to the bone level. This is a largely underappreciated factor with implants, but it is crystal clear that a microbial niche is created in these interfaces which harbors bacterial growth 360 degrees around the implant. The host cannot eliminate the bacteria and their associated inflammation, so the host resorbs bone and uses epithelium to try to isolate the host insult.

Add movement of the components creating the interface (conical and internal being best) and you can appreciate that a significant host response (involving bone loss) is developed. Think about another situation where bacteria penetrate the body in the form of an infected root canal. The body responds by resorbing bone at the apex and forming a cyst which is an epithelial lined cavity since again, the body cannot eliminate the bacteria. Our bodies have a spatial relationship between inflammation and bone that is well documented¹. It has been called an “extended arm of inflammation”² or a “radius of infection”³ or what Dr. **Dana Graves** and I have published, is an “inflammatory front” that develops and its proximity if close to bone, stimulates bone resorption^{4,5}. These relationships today are known as a new area of science called osteoimmunology^{6,7}.

I would propose however, that there is broader context that should be addressed when considering dental implants and their designs. This broader context can be framed by asking what happens when a foreign material is introduced into the body? Scale makes a difference but the response in the host is always the same, an immune response.

Consider any antigen that is introduced, an immune response develops with antibody production. Larger items are generally isolated by the host (if the host is able to do that). Think of piercings in the body. With soft tissues, the body isolates the foreign body: pierced ears, nose rings, studs, pierced tongues, for example. Even amalgam pieces become embedded in soft tissues as amalgam tattoos. In other words, the host (and immune system) responds in some way to the foreign body.

A dental implant is not different. As a foreign body, we place the implant in both bone tissue and soft tissue. Dental implants should be considered from the point of view of how the specific tissues react to the foreign body being placed into it. What is the host response of the specific tissue where we place the implant? We know that bone tissue tolerates certain metals (and ceramic) well but what is important is that the bone tissue sees this as foreign material and therefore reacts immunologically to wall off the material with new bone tissue to actually protect the rest of the bone and importantly the bone marrow.

You may call this “osseointegration” but it is in fact an osseimmune reaction to a foreign body, where the host bone walls off the foreign body through an immune reaction and many examples exist where this occurs. Think about fixation devices such as oral surgery plates and screws, distraction devices, knees and hips. Think also of creating an experimental saddle type defect in an edentulous osseous ridge. The bone heals across the cut bone surfaces and walls off the bone marrow⁸. Same concept for broken long bones.

Soft tissue is the other host tissue where the implant is placed. As noted above, soft tissues tolerate foreign material generally well particularly if the epithelium can encapsulate the material. Most pierced ears do not become infected nor do tongue rings. The host immune response is mitigated in these instances due to the epithelial encapsulation. Buser et al.⁹ published an interesting finding in 1992 after he placed implants with three different rough surfaces in the soft tissue of animals. He found, “The different surface textures did not influence the healing pattern of the soft tissues...” In other words, the host (immune) response was the same regardless of the surface characteristics. In fact, a “scar-like” soft tissue capsule formed devoid of blood vessels.



Dr. David L. Cochran

Hybrid Implant Designs... (continued from page 14)

Sleeping implants do not get peri-implantitis. It is therefore clear from the above that the implant foreign body itself is compatible with soft tissues and hard (bone) tissue. In other words, the body's immune response forms an equilibrium compatible with tissue health. Our studies on biologic width were the first to show that for non-submerged implants (now called tissue level) the biologic width dimensions and reactions were similar to those found around teeth¹⁰⁻¹⁶.

Our 1997 paper on crestal bone changes revealed that the pathological crestal bone loss that occurred around Brånemark-type implants in the first year was directly associated with second stage surgery and the creation of a contaminated interface between the implant and abutment at uncovering¹⁷. The amount of bone loss was also directly related to the vertical location of the interface in regard to the bone crest which correlated to the inflammatory response and its spatial relationship to bone. The closer the infection (interface bacteria) to bone, the more bone loss occurred.

Two later publications by our group demonstrated that the host inflammatory reaction was localized adjacent to the interface and consisted of predominantly a PMN response (meaning it was a persistent acute response and did not become chronic). Moving the interface (and associated inflammation) coronally resulted in less bone loss and moving it apically, more bone loss^{18,19}. It also explained the 1.5-2.0 mm of first year bone loss around Brånemark implants described as success criteria for these type implants by Albrektsson et al.²⁰ This bone loss stops as the inflammatory response has moved a sufficient distance from the bone crest²¹. The two Derks studies^{22,23} referred to by Buser can also be viewed from an interface perspective where one implant was a tissue level implant (interface away from the bone) compared to two bone level implants with a contaminated interface placed at the bone level and resulted in greater bone loss.

I would posit then that when peri-implantitis occurs it is not related to the implant surface characteristics per se

but rather a dysregulation of the equilibrium of the host immune response in the tissues. One can envision that the contaminated interfaces (one source of bacteria) stimulate a host inflammatory reaction in the soft tissues and that this inflammation as it approaches bone results in RANKL production, osteoclast formation and bone loss. Thus peri-implantitis is an immuno-inflammatory reaction that disrupts tissue homeostasis.

Of course, many factors other than plaque accumulation or interface bacteria may stimulate the inflammation or cause the breakdown of the material-host-equilibrium such as cement particles, broken components, compromised host, etc. We have recently published two reviews related to this topic and these are included in the reference list^{24,25}.

In summary, rather than focus on specific surface characteristics, a broader context is needed where the foreign material (implant)-host immune response is the focus. The majority of implants exist in harmony (equilibrium) with the host soft and hard tissue immune response however, in specific circumstances, this immune equilibrium is disrupted. This disruption can occur in either the soft tissues or in the hard (bone) tissues and can cause a loss of integration (the bone shield). When are we going to stop putting contaminated interfaces at or below the bone crest?

Editor's note: Academy News recently published an article series about Hybrid Design Implants by Drs. Daniel Buser, Gerald A. Niznick and Dennis P. Tarnow. We received great feedback from our readers about this topic. We asked AO past President and researcher on this topic, David L. Cochran, DDS, PhD to chime in as well. Please use the following QR code for references and also to link to the three previous articles about this subject mentioned by Dr. Cochran.



Osseodensification: Does it stand up to scientific scrutiny? (continued from page 11)

The hydraulics created by the densifying burs facilitates compaction autografting in both lateral and apical directions resulting in the adequate elevation of the maxillary sinus membrane and subsequent *crestal sinus grafting* with autogenous bone or in conjunction with allograft or alloplastic putty (Huweis et al. 2018). Several clinical prospective and long-term retrospective studies (Kumar et al. 2017, Huweis et al. 2018, Gasper et al. 2018, Neiva et al. 2018, Arafat et al. 2019, Alhayati et al. 2022) have reported adequate sinus grafting in initial residual bone heights range of 2-8 mm with implants survival rate of 97% utilizing osseodensification. (Fig. 3).

Osseodensification Guided Surgery System:

C-Sleeves allow for sufficient irrigation to facilitate the hydraulic effect. The surgical keys are attached to the burs to allow for the adequate luxating needed and are used in incremental steps to deliver highest accuracy and predictable implant placement (Guentsch et al. 2022, Guentsch et al. 2023). (Fig. 4).

References for this article are available via scanning this QR code.



The evolution of modern implant protocols

By: Thomas J. Balshi DDS, PhD, FACP; Academy News Guest Contributor

In the 1970s, Prof. **Per-Ingvar Brånemark** (PIB) published his 10-year clinical trial with great success, magnetically pulling clinicians from around the world to Sweden to learn the biomechanical details of his treatment protocols.

Shortly thereafter, AO Honorary Fellow **George A. Zarb**, BChD, DDS, MS, MSc, Prof. and chair of prosthodontics, University of Toronto, verified the value, veracity and efficiency of PIB's original clinical and laboratory research with his replication study. This led to the eventual FDA and ADA approval of the materials and protocol that set the stage for the 1982 Toronto Conference, opening the door for a small group of North American clinicians to acquire the necessary instruments and fixtures to provide our patients with screw retained fixed prostheses, using PIB's decade tested, two stage protocol.

Shortly thereafter, I began treating my very first "osseointegration" patient, Harry K., who presented a very unusual problem. Harry was a prominent businessman and certified archeologist who received a permit to dive on and retrieve artifacts from Herod's sunken boat in the Red Sea scheduled for January 1983. His machined surface titanium implants were installed in the mandible in late October of 1982 with the thought that he would wear a soft lined complete removable denture for the dive trip, having dived prior with a failed tooth retained overdenture.

In late December, Harry tested the use of the soft lined denture with his 1st stage SCUBA mouthpiece, reporting his disappointment and inability to function well underwater. This situation pushed me to find a solution to accelerate the prosthetic process and provide Harry with a stable prosthetic solution.



ViewPoint Conference Center at the Institute for Facial Esthetics.

At the second stage uncovering procedure, I shortened the PIB prosthetic protocol and avoided placing healing abutments on the implants with circumferential perio Pack application and instead installed the only abutment available at that time, the standard Brånemark flat top Ti abutment. At the same time, using a carbon disk, I cut vertical and horizontal retentive grooves into the gold cylinders, since there were no prosthetic cylinders available. The gold cylinders were installed with long guide pins. After applying a rubber dam barrier, I did the first "pick up procedure" connecting the gold cylinders to the temporary acrylic mandibular denture, and created the first "Conversion Prosthesis." Harry's dive trip was successful, and I presented this new protocol at the Brussels Conference in 1984, despite the chagrin of PIB and his staunch group of followers.

During the following years our center performed several variations on the concept of immediate loading, published in various journals leading to our center's "Teeth In A Day™" registered trademark. It was shortly after that, when chairing the AO PR and Awards Committee that I invited PIB to attend the annual session in Dallas, TX, where we awarded him with the Boehm Globe of Peace that U.S. President Ronald Reagan presented to Mikhail S. Gorbachev. PIB built a special display area back in Sweden for this Globe, commenting that it represents the universal concept of caring for all mankind thru osseointegration.

During the early 1990s, we joined with our Swedish colleagues to test the effect of conical shaped and angulated abutments and a variety of prosthetic and impression cylinders. It was during this time period I was invited to Brussels to scrub in with Prof. **Chantal Malavez**, who worked with PIB in the development of the zygomatic implant as she performed a complex zygomatic surgery. The zygomatic implants were not yet FDA approved and could not be brought into the USA until 1998.



Professor Per-Ingvar Brånemark addressing the membership of the Academy in Dallas, Texas where he received the Boehm Globe of Peace, March 8, 1989. Inset: AO extended an Honorary Fellowship to Prof. Brånemark.

The evolution of modern implant protocols *(continued from page 16)*



The rubber dam should be placed below the gold alloy cylinders on the titanium abutment connector.



Acrylic added to fill voids.



Harry K. conversion prosthesis January 1983, ready for the dive trip.

It was at that time that we also opened our educational center at the Institute for Facial Esthetics. The ViewPoint Conference Center consisted of a lecture room with TV studio connected to a large OR equipped with eight robotic cameras and a glass wall that enabled course participants to watch the live surgeries and prosthetic procedures and be able to communicate with the surgical team, all while maintaining a sterile environment.

It was in 1998 that I did my first QUAD zygomatic immediate loaded implant reconstruction on a 78-year-old woman from Georgia.

Then in early 2000s, we were privileged to participate in the development of virtual planning and guided surgery. Initially the 3-D data had to be acquired with a medical grade CAT Scan in a hospital setting. Those scans would have the patient in the scanner for 30 to 45 minutes. However in December of 2004, I received a call from a neighbor, inviting me to look at their engineering invention being manufactured only a short distance from our treatment center. It was our first introduction to CBCT with the iCat CT scanner.

The data (DICOM files) could be quickly moved from the iCat to our laptops to plan the surgery virtually. At the same time, the virtual plan could be digitally printed to produce a surgical guide designed to perform the "Teeth In An Hour™" procedure

and invite 50 colleagues to join us for the first course on guided implant surgery. The group stayed an extra day since a winter blizzard closed the Philadelphia airport.

The advent of the zygomatic and pterygomaxillary implants and the ability to virtually plan the implant placement, all but eliminated major bone grafting procedures that were frequently required prior to implant placement. This greatly enhanced and shortened the overall treatment time for full arch implant reconstructions.

During the past decade, our specialty has been blessed to have the advent of the high density and robotically milled dentures (PMMA) making both then the conversion prostheses and the definitive hybrid metal reinforced screw retained prosthesis stronger than those we had previously. This ties in well with the shift toward decreasing the number of implants required for a full arch rehabilitation, resulting in the very common use of the All On 4™ treatment protocol.

At this point in time, implant prosthodontic reconstructions are well understood, taking into account the biomechanical positioning of stabilizing implant fixtures. Additionally, biologic nutrients that fortify and stimulate the development of stronger osseointegration have added to the overall success rate for implant treatment. The future will likely continue to introduce additional benefits in this arena of treatment.



It was in 1998 that I did my first QUAD zygomatic immediate loaded implant reconstruction on a 78-year-old woman.

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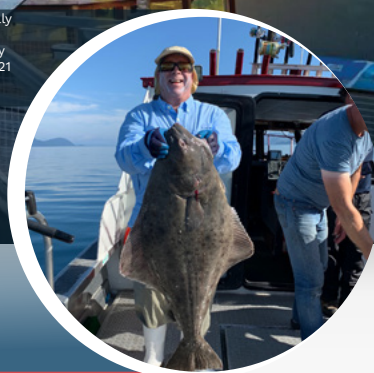
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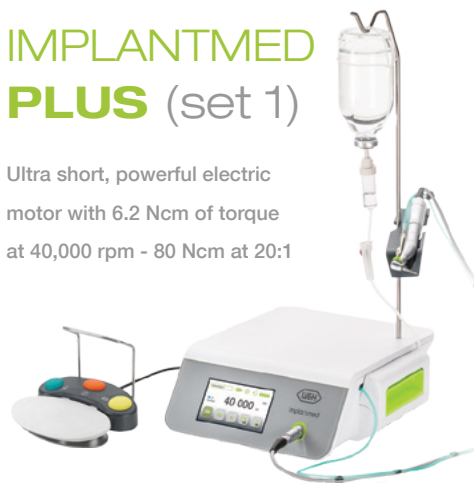
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Dr. Steven Eckert receives highest honor: AO Distinguished Service Award

For only the second time in its history, the Academy of Osseointegration honored one of its most dedicated and revered members, **Steven E. Eckert**, DDS, MS, with the newly created Distinguished Service Award. This award is the highest tribute the Academy can pay to one of its members, given in recognition and appreciation for outstanding clinical, educational or scientific achievement, contribution to implant dentistry and/or exemplary service to the Academy.

Having joined in 1990, Dr. Eckert's early path to the Academy was carved out through his relationship with its inaugural president,

William R. Laney, DMD, MS.

After graduating from The Ohio State University, and subsequently completing a General Practice Residency at Mount Sinai Hospital in Chicago, Dr. Eckert moved to Rochester, MN to attend the Combined Prosthodontic and Maxillofacial Prosthetics Program at the Mayo Clinic.

During his time at Mayo, where he began his tenure as an associate consultant, he ultimately became a full professor and served as graduate program director for prosthodontics for approximately 15 years. While there, Dr. Eckert successfully challenged the prosthodontic specialty board and eventually became an examiner in prosthodontics, an honor that is considered to be the highest professional achievement in prosthodontics. Also during his time at Mayo, Dr. Eckert met and formed a close working relationship with Dr. Laney, a vastly influential mentor who Dr. Eckert gratefully describes as "someone who was always there."

Introduced to the Academy through this significant relationship, Dr. Eckert attended several early meetings as a guest before ultimately becoming an inaugural member and one of its most illustrious contributors. During his membership, Dr. Eckert served on five different committees, was selected to participate on the board of directors, and ultimately served as its 21st president from 2007-2008.

During his presidency, Dr. Eckert led negotiations between the Academy and corporate leaders to develop the protocols used today in the selection of course curriculum and presenters for educational events. Offering course

content that followed CERP regulations was of paramount importance and finding a balance between educational integrity and corporate interests became a priority during his year as president. Another goal for Dr. Eckert was shifting the Academy into the international realm, growing its membership to match the surge of implant dentistry beyond the borders of North America.

Prior to becoming president of the Academy, Dr. Eckert had already embarked on an even more exacting undertaking as editor-in-chief of the *International Journal of Oral & Maxillofacial Implants (JOMI)*, engaging in a remarkable

stretch of duty lasting until he retired his editorship in 2022. One of his first priorities was looking at submission and acceptance rates and questioning how best to apply more critical evaluation of submissions, thus publishing better articles in the journal. By lowering the acceptance rate, it increased the ability to be more critical of submissions considered to be 'borderline', thus improving the selectivity and ultimately the journal content.

Dr. Eckert also increased his focus on seeking good science from international submissions. His goal was to intentionally reflect the growing international

representation of AO's members by publishing these submissions in *JOMI* as well as ensure that there was a global flavor on the editorial board.

Adding to the accolades of his acclaimed career, Dr. Eckert was the 10th recipient of the prestigious Nobel Biocare Brånemark Osseointegration Award, bestowed to him in 2017 by Myron Nevins, DDS, then president of the Osseointegration Foundation.

Today, Dr. Eckert continues to serve as director of research for ClearChoice, a position he has held since 2010. In this capacity, he remains instrumental in implant dentistry by managing the largest accumulation of data on implant procedures in the world.

The AO Distinguished Service Award was presented during the 2023 Opening Symposium. While he was not able to accept this honor in person, Dr. Eckert provided a video acceptance speech which is available via our YouTube Channel.



Insertion Torque: Beyond the « Biologists » versus « Carpenters » Controversy

By: Philippe Khayat, MSD; Academy News Editorial Consultant

An interesting debate was recently organized by the Academy of Osseointegration and The Dental Guys, Drs. **Wesley S. Mullins** and **Jonathan M. Rogers** (AO Spotlight, episode #5). Their guests, two world renowned clinicians and researchers, Profs. **Michael R. Norton**, AO past President, and **Tiziano T. Testori**, were asked to debate on the torque/ISQ issue.

Dr. Mullins opened the discussion relating the advice of Prof. **Lyndon F. Cooper** on implant placement: "As long as you can't spin it in the bone with your hand, then trust it." Asked to comment, our respected 31st president said with a smile, "We absolutely don't stop at spinners, spinners are our friends!" He added, "We're not carpenters. We're not engineers. We are biologists. We are surgeons, treating living, vital tissue. We are not working on wood!"

Many of us feel uncomfortable if the implant is not perfectly stable after insertion. We do not like to see the implant rotate when removing the fixture mount, connecting the healing abutment, or tightening that immediate single provisional crown. Even though osseointegration may still occur, this is a stressful situation. To avoid it, we tend to underprepare the implant site and make sure both lateral and rotational stability are obtained. This "tight" fit of the implant is often associated with an increased insertion torque. I guess we are the "carpenters!"

Of course, carpentry is a noble craft. Jesus himself was a carpenter. But in this opposition between "biologists" and "carpenters," who wants to be called a "carpenter?"

Let us approach this low versus high torque controversy pragmatically, convinced that a dispute among talented friends and colleagues can only make us more intelligent.

From a purely scientific point of view, it seems the "carpenters" aren't doing so bad. Three independent meta-analysis in 2015¹, in 2016², and in 2020³ have shown that high insertion torques do not induce increased marginal bone loss nor prevent osseointegration.

In my study⁴, very high torque values were reached. Up to 176 Ncm! This is due to the inclusion of wide tapered implants with a deep internal hex allowing a strong connection to the insertion and measuring tools (Fig. 1).



Fig. 1. Tohnichi torque measuring instrument. In our study,⁴ high insertion torques (here: 96.2 Ncm) were associated with the use of wide tapered implants featuring a deep internal hex allowing a strong connection to the insertion and measuring tools. Although no adverse effect was observed during healing, such high levels of torque are not needed, and stability is obtained with much lower values.

For the low torque group, the mean was 37 Ncm, and, for the high torque group, it was 110 Ncm. All implants osseointegrated and marginal bone levels in the control and experimental groups were similar both at the time of loading and one year later.

Despite this favorable outcome, such high levels of torque are not needed. Stability is obtained with much lower values. It was interesting, however, to show that inserting the last millimeters of a wide tapered implant can lead to important torque elevation and, still, no adverse effect was observed during healing.

Furthermore, most studies⁵⁻¹¹ comparing bone-to-implant contact (BIC) for implants placed with high and low torques show that there is no difference after healing. The statement that osseointegration after high insertion torques is not as good as osseointegration after low torques, setting the stage for future peri-implantitis, is not substantiated.

On the biologists side, it has been shown that very low torques can be associated with clinical success. In his 2011 publication¹², Prof. Norton selected implants that had been immediately placed with a very low insertion torque (mean 22.5 Ncm) and immediately restored. He observed a 95.5% success rate and concluded that 25 Ncm is more than enough to obtain clinical success. Implants with a manually detectable lack of axial stability were excluded from immediate restoration and, thus, from the study.

What do we do with such conflicting information? Here are a few reasonable guidelines:

From a practical standpoint, very low insertion torques (below 25 Ncm) should be avoided. Even if they can lead to clinical success, they are too close to the values reached when hand tightening a provisional restoration screw. Having a provisional tooth or an angulated abutment rotate during this final phase is very unpleasant.

Continues on page 22

Peri-Implantitis: An educator's perspective

By: Vincent J. Iacono, DMD; Academy News Guest Contributor

When educated by Professor Brånemark almost 40 years ago on the novel procedure of osseointegration of dental implants, it was essentially a technique that has evolved into a comprehensive discipline. Implants of machined Grade 1 pure titanium were routinely inserted into the anterior sextant of the edentulous mandible of patients under general anesthesia in an OR setting.

These osseointegrated implants often emerged through alveolar mucosa and supported hybrid prostheses. While peri-implant mucositis and peri-implantitis were not recognized at the time, complications of malposed implants (no CBCT scans), damage to vital structures, "spinners," "sleepers," and implant/restorative fractures were the concerns of the era. Yet times rapidly changed, as we began to place implants at virtually any edentulous site using concepts of guided bone regeneration, ridge expansion, sinus grafts and periodontal plastic surgical procedures.

The implant structures changed to Grade 4 titanium or its alloy for strength and some were plasma sprayed with either titanium or calcium phosphate salts. Peri-implant complications then became a major focus with the recognition that plasma spraying resulted in surfaces that when colonized by the plaque biofilm, tended to lead to significant circumferential alveolar bone resorption with loss of the implants. The plasma spraying days were over!

It was also noted that at times implants with cemented abutment crowns developed peri-implant bone loss. It was determined that this was due to excess cement extruding into the peri-implant area. However, when the protruding cement was removed during an access periodontal flap surgical procedure, there usually was a return to a normal osseointegrated state. It is likely that the adherent cement on the implant threads led to bone resorption and when removed the titanium surface was then able to osseointegrate¹.

The challenge to enhance the kinetics of osseointegration with a greater degree of bone contact led to the use of acid etching with or without sandblasting or expanding the oxide surface of machined/turned titanium implant surfaces to achieve moderate roughness. These implants have been superb for enhancing osseointegration. However, since their use, peri-implant mucositis and peri-implantitis have become significant complications that we have had to address. The incidence of peri-implantitis is increasing and its severity has similar risk factors to periodontitis including but not limited to a dysbiotic biofilm with aberrant host responses, uncontrolled Type-2 diabetes, and an unexplained genetic predisposition².

Karoussis and colleagues compared the outcome of implant therapy in patients with or without a history of periodontitis in a 10 year longitudinal study. They demonstrated that the incidence of peri-implantitis at the implant level was 28.6%

in patients with a history of periodontitis, while it was 5.8% in patients without a history of periodontitis³. It is important that our patients have had appropriate periodontal therapy before implant placement and are compliant with biofilm control and maintenance visits. It is a challenge to treat lesions of peri-implantitis and to decide on whether to remove the failing implant. I leave it to clinical judgement for implant removal as to the extent of bone resorption and existing implant restoration.

For my periodontal residents, the incidence of peri-implantitis has been comparable to that reported in the literature^{4,5}. The osseous defects resulting from lack of care for many years have either been severe horizontal bone loss or varying degrees of "moat" like defects. We have found that for lesions with horizontal bone loss, virtually no techniques have led to significant regeneration of bone coronal to the alveolar crest regardless of the thickness of the surrounding peri-implant soft tissue. In these cases, clinical judgement prevails as to apically positioning the soft tissue to the alveolar crest and expose the non-integrated coronal portion of the implant, flap access procedures for implant surface decontamination, or implant removal depending on the extent of bone loss.

We have found successful results for "moat" like defects that are dependent on the distance of the walls of the "moat" to the implant surface. The techniques employed include significant implant decontamination with "standard" acceptable methods⁶ (e.g., hydrogen peroxide and saline rinses); followed with the use of a particulate osseous allograft/xenograft/biologic composite graft and covered with a tightly

Continues on page 22



Dr. Vincent Iacono

Numerous research awards bestowed... *(continued from page 8)*

Best Presentation Research Awards

Each year, the Academy's Research Submissions and ePoster committees collaborate to select the best research abstract submissions, presented at the Annual Meeting. The following were honored:

Best Oral Clinical Presentation

William Negreiros, DMD, MSc, BDS: "A Cross-Over Clinical Study on the Precision of Digital Intraoral Scanning Versus Photogrammetry for Implant Rehabilitation of Completely Edentulous Patients."

Best Oral Scientific Presentation

Priscila Ceolin Meneghetti, DDS, MSc: "Influence of Scan Body Design on Digital Impression Accuracy in Full-arch Implant Cases Using Four Different Intraoral Scanners: An *In Vitro* Study."

First Place ePoster Award

Robert Noelken, DMD, DDS: "Hard and Soft Tissue Regeneration of Severe Peri-implantitis Defects with the Laser-assisted Peri-implant Defect Regeneration Technique: Three-year Results."

Second Place ePoster Award

Tim Halstenbach, "The Impact of Peri-implantitis on the Proteome Biology of Crevicular Fluid: A Pilot Study."

Best Case Presentation

Panagiotis Ntovas, DDS: "Double Digital Scanning Technique for Milled Prosthesis Prototype Fabrication in Single Visit: A Prospective Study on 16 Edentulous Patients."

Best Clinical Innovations

Nilo Hernandez, DDS: "Teeth in Minutes"

Insertion Torque: Beyond the controversy *(continued from page 20)*

The final insertion torque cannot be set in advance. It is the result of many factors including drilling technique, bone density, implant diameter and shape. If our target is a low torque, we may end up with a very low torque and enter a vulnerability zone.

At the other end of the spectrum, high torques should also be avoided. Even if they are associated with clinical success, they can be very dangerous for the implant system itself because the insertion tool or the connection can be damaged during implant placement. A recent study¹³ showed that deformation starts at 80 Ncm for the weaker connections and that all connections show some form of damage at 120 Ncm. Sometimes the fixture mount features a pre-determined breaking point to protect a weak inner connection, but the best strategy is to stay well below these

limits and shoot for a torque range that keeps us far away from this danger zone.

With all this information in mind, one might question the relevance of the "biologists" versus "carpenters" debate. A pragmatic approach should prevail: bone adapts to a wide range of torque values, it is uncomfortable to work on spinners, and we do not want to damage the implant connection. For these reasons, the 30 to 70 Ncm torque range appears to be a safe and reasonable objective.

References for this article are available via scanning this QR code.



Peri-Implantitis: An educator's perspective *(continued from page 21)*

adapted resorbable barrier using a "lifesaver" or "poncho" method. Copious lavage with a biologic and post-operative antibiotic are routine. However successful outcomes have not been 100% due to the extent and configuration of alveolar bone loss.

We now frequently use hybrid implants that have highly anodized surfaces at their coronal portions; avoid subcrestal placement of implants that negatively impact on the dynamics of the implant abutment connection; place the smooth surface area coronal to the crest (bone level implants) and through the transmucosal layer (tissue level implants). So, a new era begins with the hope that the incidence of peri-implant inflammation will be reduced. Whether there will be a reduction in the effects of traumatic occlusal forces, release

of titanium particles, and implant restorative designs (e.g., zirconia) will depend on the incorporation of evolving guidelines from basic/clinical research.

Unfortunately, I sense that some clinicians are resistant to accept the reasons for complications and follow a biased judgement with a false sense of security. It is critically important that we use our best judgement and follow the accepted guidelines for successful outcomes and not be "clouded" by podium science in decision making.

References for this article are available via scanning this QR code.



New theory of osseointegration: The immune foreign body reaction

By: Mehrdad Favagehi, DDS, MS, Academy News Editor

Bone loss around implants is widespread. Early pioneers in implant dentistry theorized that some loss of marginal bone levels (MBL) around implants should be considered normal. But that theory doesn't hold as we see many implants without any bone loss.

Even those who believe some loss in MBL is normal, don't dispute the fact that bone loss due to peri-implantitis is a significant problem. A recent meta-analysis reports the overall average prevalence of peri-implantitis is 12%. This translates to a grade of B+ for implant dentistry. How can we improve our record?

Some implant leaders believe that a 12% shortfall may not be just a missing piece of the puzzle, it may represent an unseen black hole requiring a brand new theory to understand osseointegration.

In the early 1900s, a group of astronomers observed small anomalies that could not be explained by Newtonian theories in physics. Albert Einstein's general relativity theory could clearly explain the celestial anomalies including black holes. Einstein's theories transformed science and set the stage for many technologies in our modern lives. Developing new theories has been associated with many scientific breakthroughs.

In his article on page 14, AO past President, Dr. **David L. Cochran** provided us with insights about maintaining MBL, but also pointed out to a new theory of osseointegration based on the new field of osseo-immunology. According to this theory, the immune system works with the bone to mount a foreign body response to a foreign object – the dental implant. In other words, bone formations that we see around implants may be the result of an osseous shield that the host forms to protect itself from the implanted foreign material.

To those who attended the keynote presentation by Dr. **Ole T. Jensen** at our recent Annual Meeting, Dr. Cochran's ideas sound familiar. For a summary of this concept, please see the article on page six provided by Dr. Jensen. According to Dr. Jensen, after three decades even Dr. **Per-Ingvar Brånemark** embraced revisions in the original theory of osseointegration. Dr. **Tomas Albrektsson**, a co-investigator of Dr. Brånemark is also a leading advocate for the new theory of osseointegration based on osseointegration as a foreign body in equilibrium.

Over the years, we've made significant progress in our understanding of the factors that influence bone around

implants. We've learned how to minimize bone loss around implants by recognizing patient risk factors, occlusion, implant and restoration position, design, and materials. We've seen the negative influence of sub-gingival cement and the positive influence of adequate peri-implant tissues on the bone around implants. We have explanations for the osseointegration of biocompatible materials based on our understanding of inflammation, wound healing, and bone remodeling. Should we stay on the same course, or do we need a new revolutionary theory as the next step forward?

Our overall record in implant dentistry shows that we still need breakthroughs to prevent peri-implantitis and loss of MBL around some implants. The new immune foreign body reaction theory of osseointegration seems plausible, now we just need scientific evidence to prove it.

The Editor's Editorial is intended to contribute to the dialogue on issues important to implant dentists. The views expressed in the editorial do not necessarily reflect the policy of the Academy of Osseointegration or its board of directors. To provide feedback about this edition, or to contribute as a guest author, please contact me at mfavagehi@yahoo.com. We will endeavor to publish pertinent comments or views when space permits.



Dr. Mehrdad Favagehi

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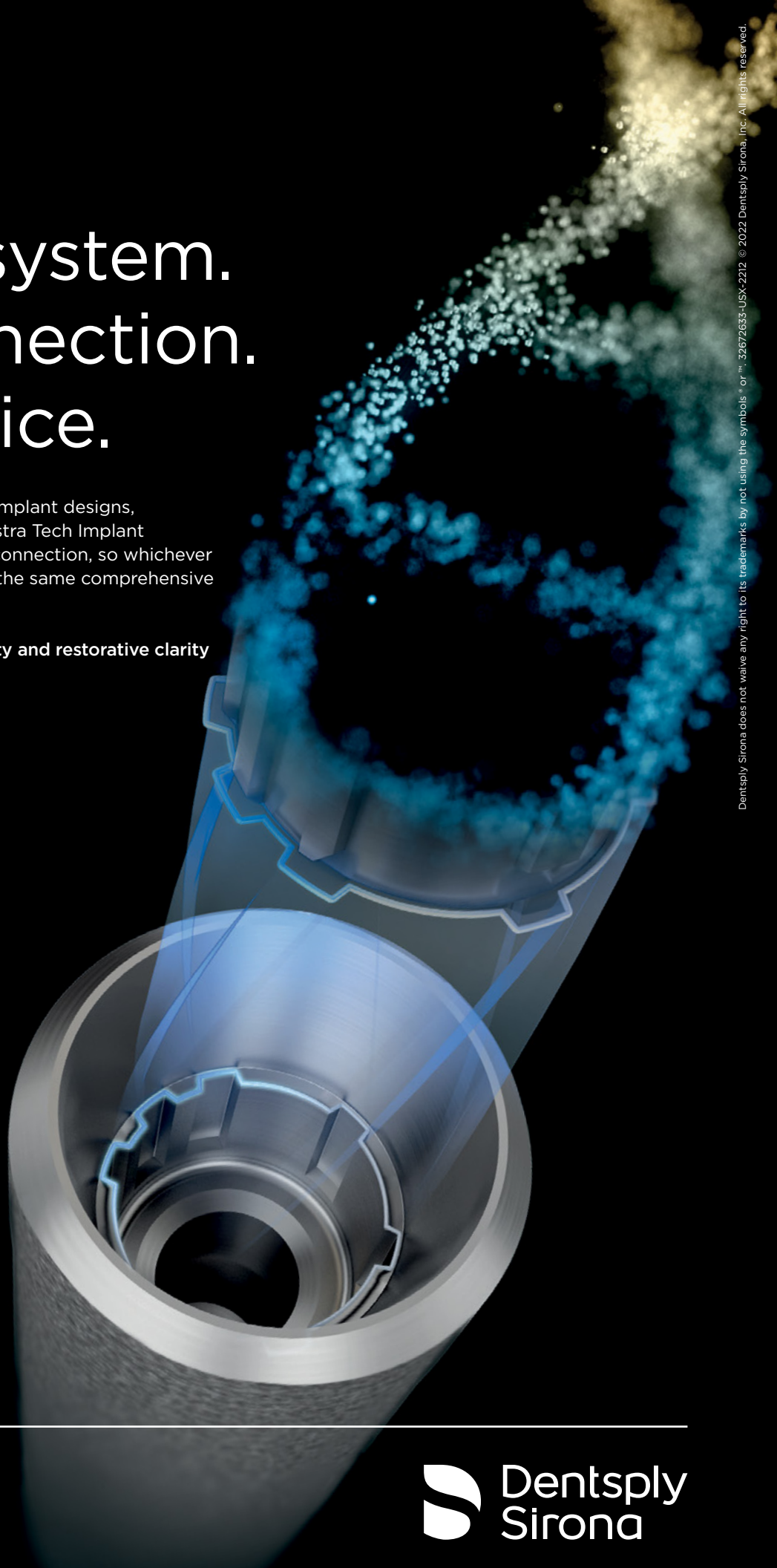
EV Implant Family consists of three implant designs, featuring proven innovations from Astra Tech Implant System EV. All implants have an EV connection, so whichever implant you choose, you can access the same comprehensive restorative platform.

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