

Issue 1

December 2020

# IAADent Journal

INTERNATIONAL ACADEMY OF ADVANCED DENTISTRY

## Upcoming Events

Stay Tuned with the IAADent Study Club sessions!

Sat 30 Jan 5:00pm AEDT

Sun 14 Mar 10:00am AEDT

Sat 1 May 7:00pm AEST

Sun 20 Jun 10:00am AEST

## Introduction to faculty

In the inaugural edition of the IAADent Journal, we have the honour of introducing our amazing faculty, and diving in depth with Dr Marianne Pinto on her journey through dentistry!

## Implant stability and the methods of diagnosis

Gain a deeper understanding into the current knowledge base of implant stability and methods to quantify the degree of stability and hence infer the level of osseointegration.

## Life in lockdown

Join Dr Beng Kai So as he unpicks his unique experience throughout 2020 and discover what has motivated him through the Pandemic.

## Contact Us

Email: [journal@iaadent.com](mailto:journal@iaadent.com)

[www.iaadent.com](http://www.iaadent.com)



**IAADent**

International Academy of Advanced Dentistry

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# To my dear IAADent family and friends,

Welcome to the inaugural edition of the IAADent Journal December 2020!

Back in 2008, when IAADent was in its early stages, our intention was originally to form a study club with dental professionals interested in hearing and seeing how we did things at Today's Dental. I had previously been teaching quite extensively overseas in America and Asia since the 1990s. These talks and lectures became the genesis of our orthodontics and Implantology foundation courses. Within a few years, we found all our courses had become fully attended and over-subscribed. Almost every weekend was taken up doing some form of teaching.

2020 saw an introduction of the UJI diploma courses in Implantology, and orthodontics and dentofacial orthopaedics. This, too, was heavily over-subscribed. We intend to continue to hold diploma courses for those who wish to obtain an official University postgraduate qualification. We are also proud to be entering into our third year of offering university masters courses in oral Implantology, and orthodontics and dentofacial orthopaedics, which the candidates have found extremely challenging, time-consuming, yet rewarding.

2020 was also an extremely challenging year, with multiple travel restrictions, lockdowns, and generalised COVID stresses. We all felt the impact. Our philosophy has and always will be: our family comes first. My humble thanks to those who attended classes and for those who Zoomed in when they couldn't attend. I look forward to seeing those who have deferred to next year. It has always been family first, and we took every opportunity to help and assist our family members through this troublesome period.

What we have today is a cumulative knowledge base founded upon learning from the three major regions of the world, namely North America, Europe, and Asia. It is a global picture which we are bringing to you. It is, by far, not the total sum of our knowledge, but what will help the general practitioner achieve an excellent result in the majority of their simple cases predictably and safely.

As 2021 approaches, we are proud to expand on our foundation courses with the introduction of the "Master Series", beginning mid-2021. The Master Series will take your knowledge and understanding to the next level. Prerequisite are the foundation courses.

IAADent is an organically grown organisation. We are now the largest independent provider of implant education, and the second largest independent provider of orthodontic education in Australia. This cannot be achieved without the wonderful faculty that make the wheels turn every day. We rely on you, to pass the word, and to encourage your friends and colleagues to expand their knowledge base, and thus increase their clinical skills to better treat your patients.

The IAADent journal has been a long while in the making. I thank Sheng very much for bringing it to fruition.

My aim has and always will be for IAADent graduates to be the yardstick by which all other dental professionals judge themselves by. I wish you a safe and Merry Christmas. May you all remain blessed and have a healthy and prosperous New Year! Viva IAADent!!



*Dr Kenneth Lee*

Professor of Postgraduate Studies, Jaume I University  
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 FAACP; FIDIA; MIDIA; DICOI; DWAUPS; DIAO; DIDIA;  
 Certified Master Senior Instructor IAO  
 International Director WAUPS  
 President IAO 2015/2016  
 President of IDIA Australia  
 Chair of Education IAO  
 Global Ambassador for American Academy of Oral  
 Surgery

# Editor's Message

It is my pleasure to welcome you to the first publication of the IAADent journal.

The genesis of this publication started after a night with Dr Ken over a bottle of Château Lafite-Rothschild 1998 and reflecting on what makes the IAADent organisation unique to many of the other CPD providers across Australia.

For me, the IAADent group is unique due to the passion of the educators and the message they drive deep into the psyche and soul of the students - *primum non nocere*. As clinicians we have a privilege and a duty of care to give our patients the best possible treatments which ought to be driven by health, function and cosmetics. Another point of difference is, the educators are all busy clinicians who teach exactly what they preach in their practices. These methods and results are reproducible, tried and tested and most importantly safe.

The other unique characteristic of the IAADent group is that Dr Ken has nurtured a family unit unlike any other organisation I know of. Dentistry can often feel like an isolating profession but graduates of IAADent are actively supported by the faculty, forum, social media platforms and most importantly each other. Many of the friendships and camaraderies formed at IAADent are genuine and will last a life time.

The IAADent Journal is the natural evolution of the desire to continue to support our graduate family. It is an altruistic endeavour with no financial benefits. Our goal is to produce a bi-monthly publication delivered digitally to you.

The intent of the publication is to educate, support, connect and offer a platform for graduates to keep up to date on the latest research in the fields of implantology, orthopaedics and orthodontics. I do however have one favour to ask of you, the readers, please contribute to the IAADent Journal.

The success of this publication relies on your input and like many things you get out of it what you put into it. Having all the articles written by members of the faculty is not the intention of this publication.

Contributions may be scientific, a research project you want to share or an exceptionally documented case you are very proud of. But contributions can also be your community involvement, a product you can not live without or simply if you want to put a shout-out for an event you are organising.

This is also an excellent opportunity to give yourself some publicity and elevate yourself as a professional for your patients to see.

Please do not be shy. Reach out to me at [Journal@iaadent.com](mailto:Journal@iaadent.com) to discuss any ideas or submissions you would like to contribute.

I thank you for taking the time to read this edition and for your future contributions.

VIVA IAADent and to your professional success!



*Dr Sheng Zhang*

# Introduction to Faculty



**Dr Kenneth Lee**



**Dr Theresa Lee**



**Dr Jonathan Low**



**Dr Marianne Pinto**



**Dr Darshan Thumar**



**Dr Robert Lin**



**Dr Jae Choi**



**Dr Sheng Zhang**

# Meet a faculty member



## Dr Marianne Pinto

It is a privilege to introduce myself to the IAADent family as a faculty member! My name is Marianne Pinto and I have been associated with IAADent since 2010. Taking stock of my professional journey brings back such great memories! What I have realised is that every opportunity that has come my way has been a lesson and helped me grow personally.

A good place to start is the present! I work as a private practitioner in Perth, Western Australia since 1994 and have been the Principal Dentist of Marianne Pinto Dental Clinic since 1998! Time certainly flies!

My dynamic team consists of 7 dentists and around 22 staff members. We cover general dentistry, implants and orthodontics. Keeping the team well trained and running the skills deep into the list of staff is something I learned from Dr. Kenneth Lee.

The practice is always growing and we continually strive to evolve and develop as a team to serve my patients better.



My dental journey can be divided into two significant phases. Pre IAADent which grounded me as a dentist and post IAADent which opened my eyes to new dental frontiers.

It started in Mumbai when I graduated in dentistry from University of Bombay in 1988 at Nair Hospital Dental College. I then went on to doing my Masters in Oral Pathology there, and was subsequently appointed as a lecturer in the Oral Pathology Department.

Learning dentistry was interesting. A great combination of theory and hands on stuff. I ensured that as an undergraduate student I took part in many extra-curricular activities like sport, debating and music. I was the Sport Secretary played Table Tennis competitively. When I first started, I had to go to the Boys Common room to play on the one and only table tennis table in the building. I met resistance initially because I was a girl but as I beat a fair few of the boys, they soon forgot I was a girl and accepted me as a force to reckon with!

Participating in these activities taught me to think outside the box, the importance of finding funding and sponsors, budgeting for the faculty, negotiating for venues and managing people of different viewpoints. Keep a close eye on your fundamental values and you retain the respect of your peers!

When I was working at the University it exposed me not just to my speciality but to all the other specialities! All that time spent at the University canteen with dentists from all the other specialities sharing sweet masala chais has stood me in good stead! It seems like just yesterday that we were the young and the enthusiastic, switching between silly nonsense and new dental concepts!

My time as a lecturer helped me understand that it is so easy to lose the attention of your class! How important it is for a student of a subject to ensure that their understanding of the basic concepts is solid. While we all make errors, sticking to solid basic principles ensures that mistakes are not fundamental or profound.

Learning to set exams for students made me better understand how to fare better at my own exams! It matures you to answer relevantly!

One has to understand that standards are not sacrificed at the expense of the effort or the convenience of the practitioner.

Australia became home to me when I migrated in 1992 to get married to my husband Vianney! Poor man gave little thought to the fact that his wife not only was a match for his skills in table tennis but also pulled teeth for a living! Nevertheless, he has been a great support to me both personally and professionally!





I had to pass accreditation exams and the process takes 2 years even though I passed all of them at the first attempt. It was a humbling process because one has to leave behind all that one has achieved in the past and look towards the future! But once I was accredited the world was my oyster!

My first job in Australia in 1994 was in private practice and I worked as an employee dentist for 4 years till 1998, after which I bought into the practice as an associate. I learned a lot from my employment. I learned that you have to be patient and work hard to build up your books, your standards are not worth compromising for a job, you do not take rejection personally, and not be possessive of patients. Most of all I learned for the first time that you need to check your accounts and that there are employers out there that will withhold your wages or super and one must in the words of Ronald Reagan 'Trust but verify!'

As an owner dentist, I learned business skills, cash flow management, staff management. 30% of my staff have been with me for more than 10 years, 50% have been with me for more than 5 years. A good core team is vital to give your business the stability it needs.

So things were chugging along quite well. My first implant course was in 1998 and I started placing fixtures in 2002. The course was good with a cookie cutter attitude to implant planning. The concept of force factors and bone type were not explained. But it skilled me to do basic implants for 9 years before I met Dr. Kenneth Lee.

And thus began the phase in my profession I call Post IAADent!

Doing the IAADent implant course in 2011 as if someone had thrown open the doors wide to take in the universe! We used autologous blood concentrates much before they were popular in Oz. I understood bone biology and the engineering of implants. It improved exponentially my implant practice in numbers, quality and enjoyment!

Having finished the IAADent implant course, I looked at the other courses IAADent had to offer. Orthodontics did not interest me because I considered it to be a dry subject but when Dr. Lee offered it, I was tempted to see what he as a great teacher had to offer! And Boy! was I not disappointed!

In hindsight I feel that I could not afford NOT doing the course.

The basic concepts of occlusion and TMD and airway should be a part of every undergraduate dental course! It helps you plan for the whole mouth with more stable results. It also helps do better restorations and achieve more stability in your dentures.

When the IAADent claims to create 'Super Dentists' it is no hollow boast! To educate a dentist to restore harmony in the head and neck complex that will impact on one's general health and wellbeing is very empowering.



If I were to list dental knowledge in the order of importance I would say TMD, Occlusion, General dentistry, Orthodontics, Sleep, Implants and Cosmetics.

Dr. Lee always encourages his students to continue to progress in their tier education. It helps one take stock of their standards and grow as a professional.

Thanks to IAADent I am a member of the IAO, ICOI and IDIA. A Fellow of the IAO, ICOI and IDIA, a senior instructor for the IAO and a member of the education committee of the IAO, and a coordinator of the Western Australian IAADent Study Club.

I am currently doing my Masters at the Jaume I University in implants.

I look back at my career in dentistry for 32 years and believe that continuing to learn and grow is the secret to keeping the interest alive. To survive needs one to believe in yourself in the face of sexist or ageist environments.

And I look into the future and hope that like the wind and water that needs only time to shape a rock, our patience and focus on what is really important will transform our profession from being mere isolated tooth carpenters to holistic inclusive health providers.

To now give back to the profession and the IAADent family , what I have received in abundance from Dr.Kenneth Lee and the IAADent team is my honour.

Viva IAADent!

*Dr Marianne Pinto*



# IAADent Comprehensive Orthodontic/Orthopaedic Course 2021

<b>Session I</b>	19-20 March 2021	<b>Understanding Aetiology &amp; Diagnostics. Bones, Muscles, Airway and Teeth. Record Taking.</b>
<b>Session II</b>	30 April-1 May 2021	<b>Diagnosis continued. Early Treatment &amp; Introduction to Appliance Therapy.</b>
<b>Session III</b>	28-29 May 2021	<b>Treatment Planning. Class II correction &amp; Mechanics. Functional Appliances. Introduction to Straightwire.</b>
<b>Session IV</b>	2-3 July 2021	<b>Continued Straightwire Mechanics. Introduction to Controlled Arch Technique.</b>
<b>Session V</b>	6-7 August 2021	<b>Alternatives to Conventional Orthodontics. Class III Skeletal and Dental case management.</b>
<b>Session VI</b>	3-4 September 2021	<b>Introduction to Pain. TMD Work-Up. Splint Therapy, Splint types, Splint design.</b>
<b>Session VII</b>	8-9 October 2021	<b>Impacted Canines, Sleep (SDB, OSA), Introduction to Sleep Appliances, Microimplants-TADs.</b>
<b>Session VIII</b>	12-13 November 2021	<b>Banding &amp; Bracketing Errors. Debanding, Retention. TADs, Frenectomy, Risk Management.</b>

*ALL SESSIONS WILL START AT 9AM (registration starts 8.30am)  
LECTURES WILL FINISH APP 5PM WITH CASE REVIEWS TO FOLLOW*

**Location : Hotel Urban [www.hotelurban.com.au/sydney](http://www.hotelurban.com.au/sydney) (complimentary parking)  
194 Pacific Highway (corner Bellevue Ave and Pacific Highway) Greenwich NSW 2065**

IAADent Course is for those who would like a Comprehensive approach to Orthodontic/Orthopaedic treatment. To understand the importance of fundamentals in Total Patient Care approach to diagnosis.

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*for information and registration:*

*[www.iaadent.com](http://www.iaadent.com)  
[admin@iaadent.com](mailto:admin@iaadent.com)*



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**\*\*NOTE\*\*:** ALL DATES ARE SUBJECT TO CHANGE. During the course, there could be some changes to the dates/venue/some contents. Should this happen, you will be notified via email in advance, regarding the date/venue change.



# IAADent

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## IAADent Comprehensive Implant Course 2021

**“ This is a Hands-On Course”**

**Each session incorporates Hands-On and or Live Surgery observation**

Session 1	12-13 March 2021	<b>Introduction to Dental Implants. Science of Dental Implantology Assessment &amp; Diagnosis</b>
Session 2	23-24 April 2021	<b>Surgical site and bone evaluation. Diagnosis &amp; Treatment Planning Surgical setup and augmentation materials</b>
Session 3	25-26 June 2021	<b>Prosthetic Considerations and Classification. CAD/CAM</b>
Session 4	27-28 August 2021	<b>Prosthesis, CT reviews. PIEZO Surgery</b>
Session 5	24-25 September 2021	<b>Osteotome Technique. GBR and GTR Techniques</b>
Session 6	22-23 October 2021	<b>Concentrated Growth Factors. Ridge splitting and Sinus Lifts/Grafts</b>
Session 7	19-20 November 2021	<b>Sinus Lift and Complications</b>
Session 8	10-11 December 2021	<b>The Total Implant Dentist !</b>

**Location : Level 2, 394 Lane Cove Rd, Macquarie Park NSW 2113  
(Hyundai Building) - Offices of Minimax  
Live Surgeries will be at 312 Pacific Highway, Crows Nest 2065**

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to 5pm  
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Presented by :

Dr Kenneth Lee and Dr Jonathan Low



Clinical Tutors

Dr. Marianne Pinto and Dr Sheng Zhang



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# Implant stability and the methods of diagnosis

Dr Sheng Zhang

## Introduction

Dental implants have been researched extensively since Per-Ingvar Branemark put the first dental implant in Gosta Larsson in 1965 and published the first implant papers in 1969<sup>1</sup>. André Schroeder<sup>2</sup> was the first to histologically demonstrate ‘functional ankylosis’. This is now commonly referred to as osseointegration which is defined by Listgarten<sup>3</sup> as “a direct, structural and functional connection between ordered, living bone and the surface of a load bearing implant”.

Over the next half century, dental implants have become a common procedure performed millions of times every year. If one follows good surgical technique, treat the bone with respect, use any of the rough surface implant systems with long term studies and take a conservative approach to loading, osseointegration is an almost given phenomenon.

The first machined surface implants had a healing period of 3-6 months. The introduction of roughened surfaces has shortened the healing period to a widely accepted 3-4 months with some more osteogenic surface treatments such as SLA advocating 6-8 weeks. The advent towards biologically active hydrophilic surface properties has reduced this to just 3-4 weeks<sup>4</sup>. Modern day implant research continues to focus on mechanisms to allow for earlier loading of the implant and as a result shorter overall treatment times for prosthetic rehabilitation of edentulous sites.

This article will review the current knowledge base of implant stability and methods to quantify the degree of stability and hence infer the level of osseointegration with a focus on Resonance Frequency Analysis (RFA).

## Osseointegration

Strictly speaking, the process of osseointegration starts immediately when a dental implant is placed into the bone. This process is then maintained in dynamic equilibrium in the post-integration period. The stages to achieve osseointegration are hematoma, clot resolution, osteogenic cell migration and formation of new bone on the implant surface<sup>5</sup>. Experimental models on dogs conducted by Berglundh<sup>6</sup> and verified by Abrahmsson<sup>7</sup> showed the stages of wound healing around dental implants between 2 hours and 12 weeks and is presented in Figure 1.

A key process of the osseointegration stages is the migration of undifferentiated mesenchymal and differentiating osteogenic cells to the implant surface followed by attachment and proliferation<sup>5</sup>.

The new osteoblasts create matrix calcifications leading to the formation of woven bone which is remodelled by osteoclast recruitment. Importantly new bone deposition can not occur in the absence of bone resorption.

The ability to functionally load an implant however requires stability of the implant in the bone bed. Micromovement of the implant in the initial healing phase is undesirable as it leads to fibrous encapsulation and a loss of osseointegration. Stability of the implant may be divided into two types – Primary (mechanical) or Secondary (biological).

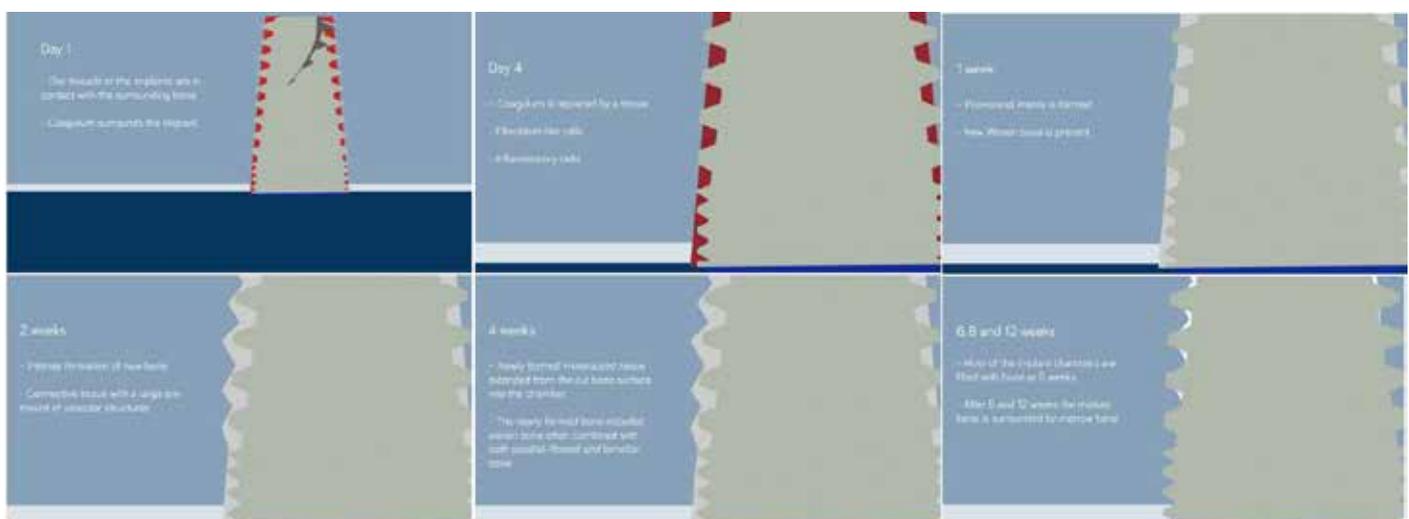


Figure 1 Stages of Osseointegration (adapted from When to Load an Implant Osstell e-book)

## Implant Stability

Primary stability relates to the mechanical engagement of the implant to the surrounding bone. Another way of describing it is how tightly the compressed bone is holding the implant. If this stability is maintained, then the process of osseointegration may occur leading to bone regeneration and remodelling around the implant which gives rise to secondary stability. Secondary stability is a biological phenomenon and does not play a role immediately after implant placement. A high primary stability is positively associated with achieving secondary stability<sup>5</sup>.

Primary stability is therefore directly influenced by quality and quantity of the surrounding 'old' bone, implant geometry and surgical technique. Primary stability increases in the first week then tapers off shortly after. Secondary stability is related to implant surface treatment, patient's healing factors and the formation of 'new' bone around the implant. Secondary stability increases with time and is responsible for the long-term resistance of the implant to functional forces of the attached prosthesis.

Raghavendra<sup>8</sup> and co made famous the implant stability graph (Figure 2) which shows the sum of primary and secondary. Total stability does not remain constant throughout the healing period. Traditional implant healing models describes the phenomenon of a stability dip at the 2-4-week mark. This window represents a 'danger period' for an implant, as it is more susceptible to micro motions which may derail the osseointegration process. This is particularly so if a surgeon needed to replace a temporary prosthesis or retighten a healing abutment.

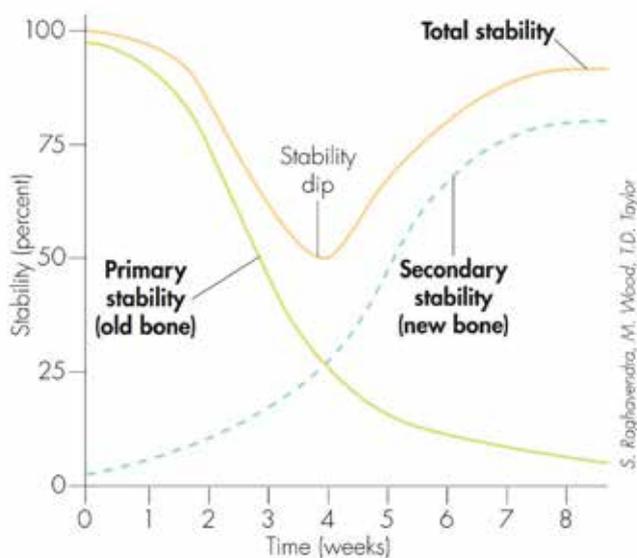


Figure 2 Implant stability curve

Modern implant research looks for strategies to eliminate or reduce the stability dip. The strategies aim to slow down the petering effect of primary stability and speeding up the gain of secondary stability.

Visually it is a shift of the Primary Stability curve to the right and a shift of the secondary stability curve to the left as shown in Figure 3.

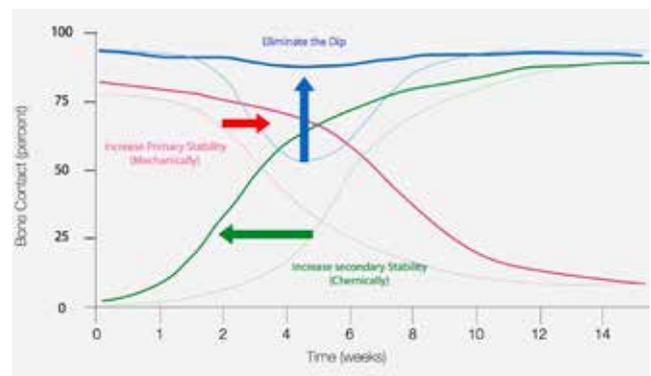


Figure 3 Graph from Neobiotech's Anytime Loading Concept

## Factors Affecting Primary Stability

### Bone quality

From the early dental implant research data, it was obvious there were differences in implant survival rates in the mandible compared the maxilla – especially the posterior maxilla. Bone quality, specifically the amount of cortical and cancellous bone was thought to be responsible for this observation. The maxilla tends to have a thinner cortical bone combined with thick trabecular bone.

These different characteristics of bone resulted in varying amounts of Bone to Implant Contact (BIC). BIC may vary between 7-100% at time of implant placement<sup>9</sup>. The identification of D1 – D4 bone density pre-operatively or during the implant surgery allows for surgical technique adaptation to achieve higher primary stability. D4 bone is hardest to achieve primary stability and are associated with the highest early surgical failures.

### Surgical Techniques

Different techniques are available to increase primary stability by condensing peri-implant bone. Bone condensation and under sizing the osteotomy<sup>10</sup> are tested methods. Summers<sup>11-14</sup> recommended a series of bone condensation techniques utilising osteotomes for sinus lifts, ridge expansion and future site development of implants.

More recently Huwais<sup>15</sup> developed encouraging protocols for bone condensation with the use of proprietary burs (Densah Bur) known as osseodensification. The technique increases primary stability, bone mineral density and the BIC percentage compared to standard osteotomy burs. Further research in this field showed osseodensification resulted in a longer maintenance of the primary stability curve due to autograft compaction and appears to speed up osseointegration by the preservation of bone matrix, cells and biochemicals<sup>16</sup>. This requires further independent research but is a promising space.

Care however needs to be taken not to over condense the bone as this results in loss of blood perfusion and potential for pressure necrosis of the bone. In having too much BIC without space for coagulum formation may in fact slow down the osseointegration process and delay secondary stability.

### Implant Design

The first dental implants were parallel design with smooth machined surfaces. Implants today are predominantly tapered with rough surfaces. Tapered implants provide compressions

of the cortical bone especially if there is poor cancellous bone. Rough surface increases the surface area and gives more friction at the implant to bone interface.

Thread design also plays a critical factor in increasing the total surface area. The pitch and design of the thread itself also allows for engagement of the osteotomy and the design of the thread whether it be 'V', buttress or square (power) have different effects on bone compression<sup>17</sup>. The dimension of the thread depth also plays a critical factor in implant primary stability<sup>18</sup>. An implant on the market (Megagen Anyridge) has a uniform implant body dimension but varying thread depths that allows for implant selection based on the bone density of the osteotomy. Another recently launched implant designed for immediate molars (Straumann BLX) exhibits a self-cutting, asymmetric, and variable double thread design giving extraordinarily high primary stability.



Figure 4 Megagen Anyridge implants with different thread depths on the left and Straumann BLX on the right

Therefore bone quality engineering, and surgical techniques all play a major factor in clinically achieving the desired primary stability.

## Factors Affecting Secondary Stability

### Surface roughness

Implants receive different surface treatments, whether it be additive or subtractive to give implants a rough surface. Surface roughness provides biological advantages of increased surface area bone to implant contact, improved cell attachment to the implant surface and increased biomechanical interaction of the implant with bone<sup>19</sup>. Although there is no consensus on the best surface treatment and its effects on osseointegration, there is no doubt surface roughness plays a critical role in the process. It is not within the scope of this article to compare surface treatments but recommend you refer to Jemats<sup>20</sup> review article.

### Surface Chemistry

The energy at the surface of the implant may be positive, neutral or negative. Charge in turn affects the hydrophilic or hydrophobic properties of the surface. Implant osseointegration benefits from hydrophilic and electropositive surface charges. Hydrophilic surfaces are wettable and are advantageous during the initial healing phase. Cells of mesenchymal origin are also extremely sensitive to surface properties such as surface energy, roughness, and topography.<sup>5</sup>

Buser<sup>4</sup> found implants which were sand blasted, acid etched and submerged immediately into isotonic saline solutions, hence

preventing atmospheric contamination demonstrated faster osseointegration. He concluded the hydroxylated oxide surface enhanced reactivity with surrounding ions, amino acids and proteins at implant site.

Suzuki<sup>21</sup> exposed dental implants to UV light for 15 minutes prior to surgical placement in humans and found a remarkable increase in the speed of osseointegration and observed no stability dip and full osseointegration by 6 weeks. It has been demonstrated UV activated implant surfaces demonstrated superhydrophilicity and hemophilicity in vitro studies.

The growing field of regenerative medicine and the use of autologous blood concentrates such as Concentrated Growth Factor (CGF) has been applied to the implant dentistry. Pirpir coated implants with CGF liquid and placed CGF membrane into prepared osteotomy sites prior to implant insertion and found increased secondary stability<sup>22</sup>. A recent systematic review found the research to date supports CGF at promoting osseointegration and enhancing bone regeneration<sup>23</sup>.

### Host Response

The stages of osseointegration inevitably relies on host response and the biological processes of wound healing and bone formation -this phenomenon is unique to everyone. Age, medical conditions, diet and lifestyle factors will all play a role. Inflammatory pathways especially those related to the function of macrophages<sup>24</sup> appear to be key in determining the healing response. Systemic conditions which affect these inflammatory pathways such as diabetes appear to play a crucial role in poor or delayed osseointegration.

## Quantifying Stability

The factors affecting implant stability means that every case and patient is unique. It is not possible to have a definitive protocol for all implant cases. At the same time, an overly conservative approach may result in unnecessarily long treatment times for the patient. There are many methods advocated to check for implant stability.

### Primary Stability

Primary stability is most easily quantified by the implant insertion torque and final seating torque. Although this is useful for immediate loading cases, it gives little insight into when secondary stability will be achieved. In fact, there is now an understanding that overly high primary stability may lead to a slower attainment of secondary stability due to the need to resorb the cortical bone prior to the stages of osseointegration may begin<sup>21</sup> and is visually demonstrated in Figure 5.

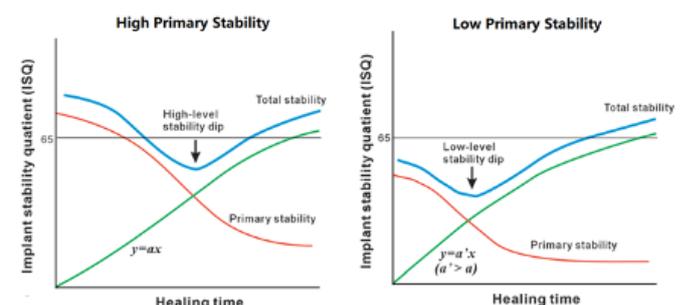


Figure 5 Implant stability curves for high primary stability vs low primary stability implants<sup>21</sup>

### Secondary Stability

Adequate osseointegration or secondary stability may be evaluated with either invasive or non-invasive techniques. The gold standard to verify osseointegration is histological evaluation. Other methods include tensional, push-out, and pull-out tests but all these techniques are destructive and reserved for research evaluation. They serve no benefit in everyday clinical practice.

Traditional non-destructive methods for assessing secondary stability includes percussion test and reverse torque test. Percussion tests are simple and based on vibrational acoustic science much like checking if a tooth is ankylosed. A clear ringing ‘crystal’ sound indicates osseointegration where as a ‘dull’ sound may indicate no osseointegration. This method is subjective and can not give a quantitative assessment of osseointegration.

Reverse torque tests have been advocated as it checks the amount of BIC. However, the degree of osseointegration has varying thresholds among patients, implant designs, bone quality and quantity. Therefore, although classified as non-destructive, there are studies demonstrating the stress of the applied torque may be responsible for implant failure<sup>25</sup>. In D4 bone, BIC levels have been shown to be very low in experimental models with histologically verified osseointegration. These low BIC may require progressive loading to improve peri-implant bone density and hence its ability to resist loading. These implants would be at most risk of negative outcomes with reverse torque testing.

The above methods also do not give an opportunity to chronologically monitor an implant stability. The ability to chronologically monitor stability in a quantitative and objective manner is important to determine the status of implant stability. This then gives the clinician an objective method to assess the ‘readiness’ of the implant to be loaded.

MicroCT radiological evaluation can determine bone density and BIC levels with almost the same accuracy of histological evaluation<sup>26</sup>. It also allows for chronological monitoring but comes at a biological cost due to multiple radiation exposure to the patient and is not supported by ALARA principals.

Schulte<sup>27</sup> introduced the Periotest (Siemens AG Germany) to measure the dampening characteristics of the periodontal ligament and later was suggested to check osseointegration of implants<sup>28</sup>. The handpiece taps the tooth or implant with a metallic rod and measures the movement with an accelerometer. The degree of movement is in a range of -8 to +50 with high values demonstrating greater mobility. The Periotest although a simple and elegant device, is disadvantaged by its low sensitivity and susceptibility to human testing variabilities. The Periotest however does appear to be a good indicator of implants which are not osseointegrating and losing stability<sup>29</sup>.

### Resonance Frequency Analysis

Resonance Frequency Analysis (RFA) is readily available in the Australian market and allow for implant assessment which is non-invasive, repeatable, high sensitivity and specificity and quantifiable for chronological monitoring.

RFA was co invented by Australian Professor Neil Meredith in Sweden over 20 years ago. The RFA is a bending test of the implant to bone interface. A transducer applies an extremely small bending force transmitted laterally to the implant and then its displacement is measured in Hertz. This mimics the clinical loading scenario of a dental implant.

The first RFA device on the market was the Osstell with a direct contact mechanism. Subsequent models utilised magnetic pulses on pegs for a non-touch mode of testing.

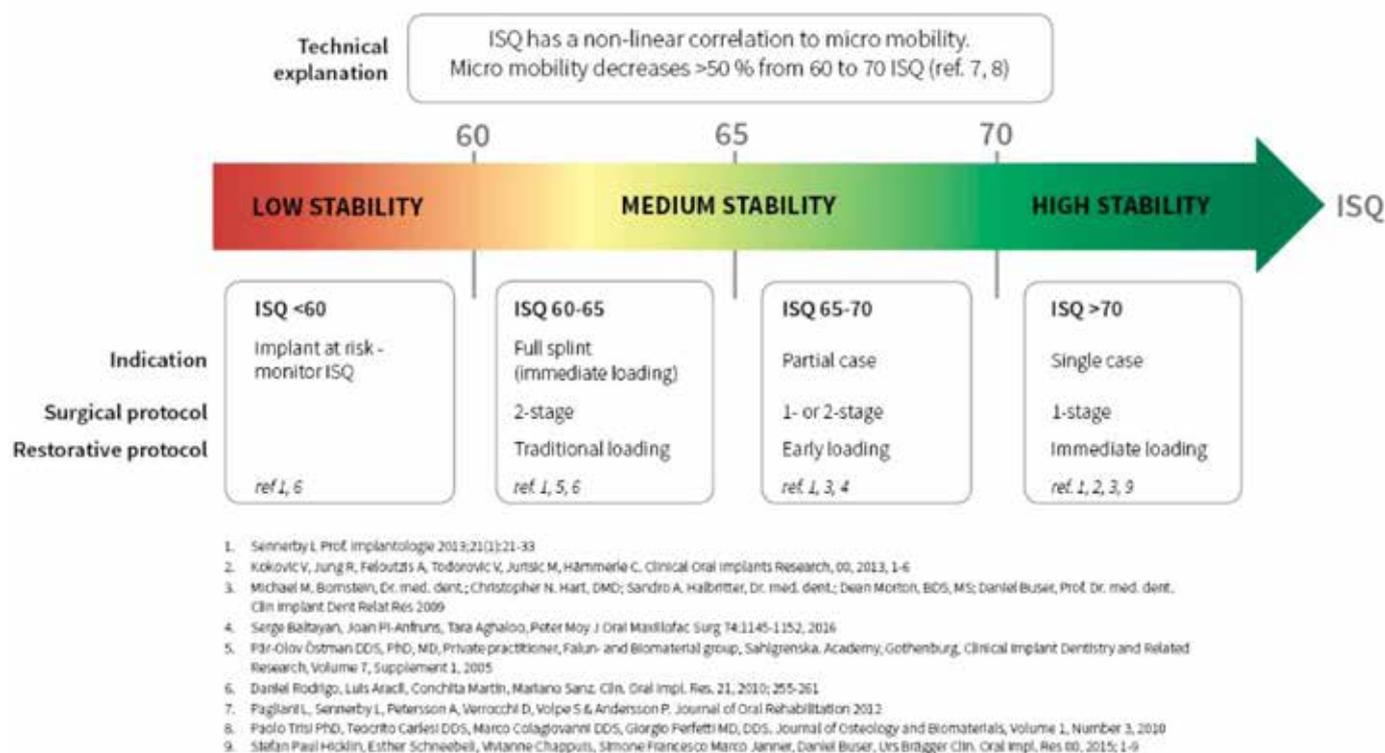


Figure 7 Interpreting ISQ Scale and key research papers

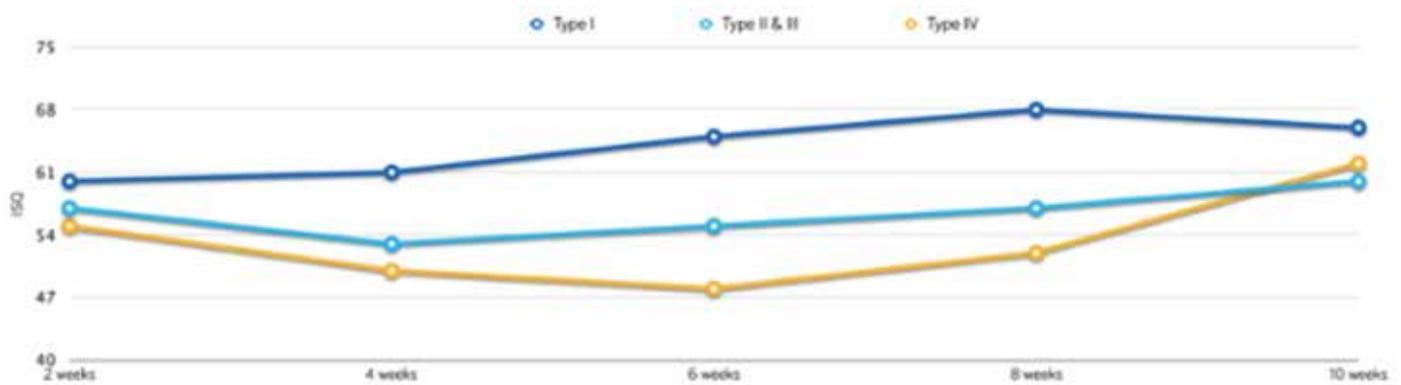


Figure 8 ISQ value curves depending on type of bone



Figure 6 Left side shows original direct contact transducer, right side shows the modern magnetic pulse pegs with a non touch mode of testing<sup>30</sup>.

The displacement in Hertz is converted to a measurement unit called Implant Stability Quotient (ISQ) which ranges from 0 to 100 with higher number indicating greater stability. Most importantly the RFA measures the stiffness of the implant bone contact throughout the entire body of the implant.

### Interpreting and Applying RFA

RFA research now exceed 1000 published and peer reviewed papers. The summary of the evidence can be eloquently described by Figure 7.

In its most simplistic interpretation, ISQ values can give us a gauge of low (ISQ <60), medium (ISQ 60-69) and high stability (ISQ >70). These values apply to the quantitative measurement of primary and secondary stability.

It is important to note ISQ values of implants at the time of surgery does not give accurate prognosis of implant survival regardless of if the implant is placed immediately or delayed, and the fashion of loading employed<sup>31,32</sup>. However, primary stability is a predictor of implant survival so there must be a correlation here that has not been explored in clinical research. Isolated ISQ readings have limited benefit at time of implant placement. The strength of utilising ISQ is its chronological monitoring of an implant and the trend of the ISQ values. If the initial ISQ value is high, a small drop in stability normally levels out with time. A big drop in stability or decrease after the healing period should be taken as a warning sign. Lower ISQ values ought to show a larger increase after the healing period. The opposite could be a sign of an unsuccessful implant and actions should be considered. Rodrigo<sup>33</sup> evaluated 4114 implants and found the ISQ value at restorative phase was a very clear predictor of success and failure of an implant.

Barewal<sup>34</sup> assessed the ISQ values of implants placed into different density of bone and monitored over time (Figure 8). Their research showed regardless of bone type ISQ dropped at

3 weeks and then increases. Depending on the bone type the changes vary but the trend at 10 weeks were the same. Type IV bone had the greatest ISQ drop but also has the steepest climb post 4 weeks.

RFA has particular benefit in high-risk cases. This may include patients with systemic risk factors for poor healing, occlusal risk factors, sites with poor bone quality, simultaneous implant placement with bone augmentation and immediate implant placement.

Sennerby<sup>30</sup>, a co-inventor of RFA advocates for the following interpretation of RFA measurements in clinical practice.

1. Aim for implants with ISQ >55 at implant placement
2. Implants with ISQ <70 at time of insertion needs to be chronologically monitored
3. Falling ISQ in loaded implants indicate unfavourable reaction and needs to be evaluated, occlusally adjusted or unloaded completely.
4. 1mm of bone loss leads to decrease in ISQ of 2-3 so chronological radiographic monitoring is essential
5. Immediate loading should have ISQ > 60 and insertion torque of >30Nm

## Summary

The ability to predictably provide implant rehabilitation in a shorter time has improved in the modern era of dental implantology due to improvements in implant engineering and a better understand of biology. The ability to quantify primary and secondary implant stability is a useful tool in an Implantologists armamentarium to determine the appropriate timing and type of restorative management. Documentation requirements are becoming ever more stringent in Australia for dental treatment provided and RFA is a useful tool to help quantify implant stability. Its ease of use, low barrier to entry, non-destructive nature and high evidence base makes it an excellent tool for assessing implant stability.

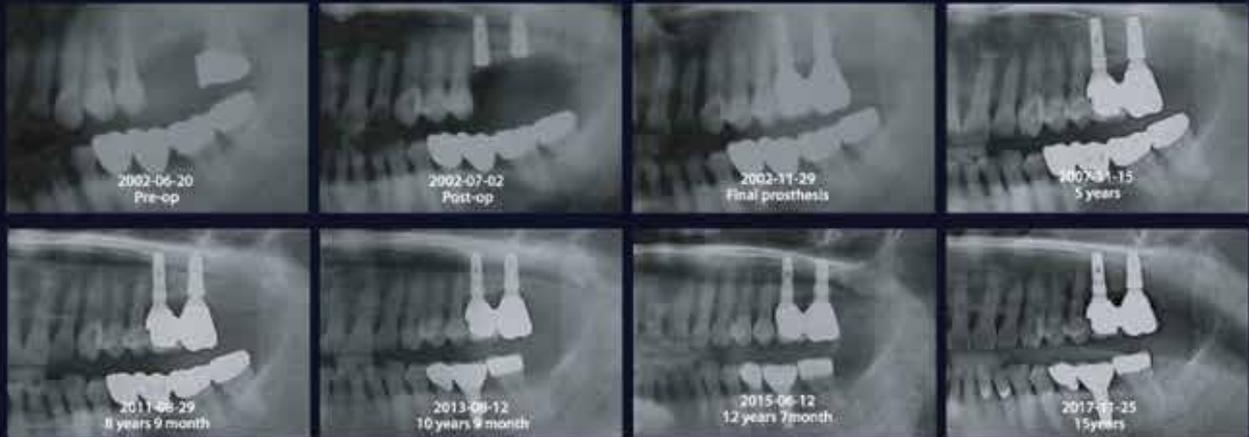
## References

- Brånemark PI, Adell R, Breine U, Hansson BO, Lindström J, Ohlsson A. Intra-osseous anchorage of dental prostheses. I. Experimental studies. *Scand J Plast Reconstr Surg.* 1969;3(2):81-100.
- Schroeder A, Stich H, Straumann F, Sutter F. The accumulation of osteocementum around a dental implant under physical loading. *Schweizerische Monatsschrift für Zahnheilkunde* 1978;88:1051-1058.
- Listgarten M, Lang N, Schroeder H, Schroeder A. Periodontal tissues and their counterparts around endosseous implants. *Clin Oral Implants Res.* 1991;21:1-19
- Buser D, Brogini N, Wieland M, et al. Enhanced Bone Apposition to a Chemically Modified SLA Titanium Surface. *J Dent Res.* 2004/07/01 2004;83(7):529-533.
- Davies, JE. Mechanisms of endosseous integration. *Int J Prosthodont.* 1998;11:391-401.
- Berglundh T, Abrahamsson I, Lang NP, Lindhe J. De novo alveolar bone formation adjacent to endosseous implants. *Clin Oral Implants Res.* Jun 2003;14(3):251-262.
- Abrahamsson I, Berglundh T, Linder E, Lang NP, Lindhe J. Early bone formation adjacent to rough and turned endosseous implant surfaces. An experimental study in the dog. *Clin Oral Implants Res.* Aug 2004;15(4):381-392.
- Raghavendra S, Wood MC, Taylor TD. Early wound healing around endosseous implants: a review of the literature. *Int J Oral Maxillofac Implants.* May-Jun 2005;20(3):425-431.
- Salvi GE, Boschart DD, Land NP. Study Protocols: Osseointegration of Dental Implants. *Osteology Box.* 2011;12.6.
- Degidi M, Dapri G, Piattelli A. Influence of underpreparation on primary stability of implants inserted in poor quality bone sites: an in vitro study. *J Oral Maxillofac Surg.* Jun 2015;73(6):1084-1088.
- Summers RB. A new concept in maxillary implant surgery: the osteotome technique. *Compendium.* Feb 1994;15(2):152, 154-156, 158 passim; quiz 162.
- Summers RB. The osteotome technique: Part 3--Less invasive methods of elevating the sinus floor. *Compendium.* Jun 1994;15(6):698, 700, 702-694 passim; quiz 710.
- Summers RB. The osteotome technique: Part 2--The ridge expansion osteotomy (REO) procedure. *Compendium.* Apr 1994;15(4):422, 424, 426, passim; quiz 436.
- Summers RB. The osteotome technique: Part 4--Future site development. *Compend Contin Educ Dent.* Nov 1995;16(11):1090, 1092 passim; 1094-1096, 1098, quiz 1099.
- Huwais S, Meyer EG. A Novel Osseous Densification Approach in Implant Osteotomy Preparation to Increase Biomechanical Primary Stability, Bone Mineral Density, and Bone-to-Implant Contact. *Int J Oral Maxillofac Implants.* Jan/Feb 2017;32(1):27-36.
- Trisi P, Berardini M, Falco A, Podaliri Vulpiani M. New Osseodensification Implant Site Preparation Method to Increase Bone Density in Low-Density Bone: In Vivo Evaluation in Sheep. *Implant Dent.* Feb 2016;25(1):24-31.
- Falco A, Berardini M, Trisi P. Correlation Between Implant Geometry, Implant Surface, Insertion Torque, and Primary Stability: In Vitro Biomechanical Analysis. *Int J Oral Maxillofac Implants.* Jul/Aug 2018;33(4):824-830.
- Lee SY, Kim SJ, An HW, et al. The effect of the thread depth on the mechanical properties of the dental implant. *J Adv Prosthodont.* Apr 2015;7(2):115-121.
- Cooper LF. A role for surface topography in creating and maintaining bone at titanium endosseous implants. *J Prosthet Dent.* Nov 2000;84(5):522-534.
- Jemat A, Ghazali MJ, Razali M, Otsuka Y. Surface Modifications and Their Effects on Titanium Dental Implants. *BioMed Research International.* 2015/09/07 2015;2015:791725.
- Suzuki S, Kobayashi H, Ogawa T. Implant stability change and osseointegration speed of immediately loaded photofunctionalized implants. *Implant Dent.* Oct 2013;22(5):481-490.
- Pirpir C, Yilmaz O, Candirli C, Balaban E. Evaluation of effectiveness of concentrated growth factor on osseointegration. *Int J Implant Dent.* 2017;3(1):7-7.
- Lokwani B, Gupta D, Agrawal R, Mehta S, Nirmal N. The use of concentrated growth factor in dental implantology: A systematic review. *The Journal of Indian Prosthodontic Society.* January 1, 2020 2020;20(1):3-10.
- Wang X, Li Y, Feng Y, Cheng H, Li D. The role of macrophages in osseointegration of dental implants: An experimental study in vivo. *Journal of Biomedical Materials Research Part A.* 2020;108(11):2206-2216.
- Sullivan DY, Sherwood RL, Collins TA, Krogh PH. The reverse-torque test: a clinical report. *Int J Oral Maxillofac Implants.* Mar-Apr 1996;11(2):179-185.
- Bernhardt R, Kuhlisch E, Schulz MC, Eckelt U, Stadlinger B. Comparison of bone-implant contact and bone-implant volume between 2D-histological sections and 3D-SRμCT slices. *Eur Cell Mater.* Apr 10 2012;23:237-247; discussion 247-238.
- Schulte W, d'Hoedt B, Lukas D, et al. [Periotest--a new measurement process for periodontal function]. *Zahnärztl Mitt.* Jun 1 1983;73(11):1229-1230, 1233-1226, 1239-1240.
- Schulte W, Lukas D. Periotest to monitor osseointegration and to check the occlusion in oral implantology. *J Oral Implantol.* 1993;19(1):23-32.
- Al-Jetaily S, Al-Dosari AA. Assessment of Osstell™ and Periotest® systems in measuring dental implant stability (in vitro study). *Saudi Dent J.* 2011;23(1):17-21.
- Sennerby L. Resonance frequency analysis for implant stability measurements - a review. *Integration diagnostic update.* 2015;1:1-15.
- Kim SJ, Ribeiro AL, Atlas AM, et al. Resonance frequency analysis as a predictor of early implant failure in the partially edentulous posterior maxilla following immediate nonfunctional loading or delayed loading with single unit restorations. *Clin Oral Implants Res.* Feb 2015;26(2):183-190.
- Atieh MA, Alsabeeha NH, Payne AG, de Silva RK, Schwass DS, Duncan WJ. The prognostic accuracy of resonance frequency analysis in predicting failure risk of immediately restored implants. *Clin Oral Implants Res.* Jan 2014;25(1):29-35.
- Rodrigo D, Aracil L, Martin C, Sanz M. Diagnosis of implant stability and its impact on implant survival: a prospective case series study. *Clin Oral Implants Res.* Mar 2010;21(3):255-261.
- Barewal RM, Oates TW, Meredith N, Cochran DL. Resonance frequency measurement of implant stability in vivo on implants with a sandblasted and acid-etched surface. *Int J Oral Maxillofac Implants.* Sep-Oct 2003;18(5):641-651.

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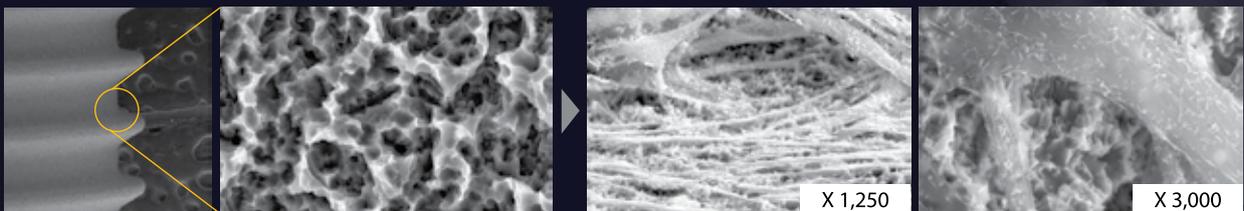
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# Life in Lockdown

IAADent Contribution Article

2020 sounds like a wonderful year to tick off items on my bucket list or finally complete some work resolutions to make it a memorable year. Who would have thought it would become memorable for Covid-19 dashing any travel plans, Australia first recession in 30 years, dental practices forced to work with restrictions for the first time, ADIA cancelling halfway through the exhibition, and attending Dr Kenneth Lee course virtually rather than in person - at least he can't slap anyone virtually!

After managing the first wave well, we all thought the worst was over for all of us in Australia. But like the Spice girls, Victoria just had to do it differently. Poor government control on quarantine meant Victoria went into lockdown once more. Dental practices in Victoria were forced into stage 3 restrictions meaning dentists were limited to emergency treatments only for a few months. It was a difficult time for many practices and dentists in Victoria. For practice owners like myself, it resulted in a big financial hit but also the frustration of trying to follow the ever-changing and conflicting guidelines from the ADA and DHHS. If the ADA and DHS had troubles communicating such simple messages, one can imagine how the ADF and the Victorian government may have issues being on point with quarantine! Such a mess!

All these issues with dental restrictions and people being wary about aerosols was a big concern in many practices such as mine. At the same time my practice in Geelong was going through the new construction of a purpose-built clinic, an upgrade from our existing small clinic in a medical centre. It created quite a bit of mental strain as there was so much uncertainty and financial strain because banks were pulling out of loans for the first time ever (I call it the Covid Budget and I had the temptation to moonlight at a Pathology lab next door as a phlebotomist). Testing times indeed. Many practitioners especially in the hot spots were made to take "forced annual leave" despite the demand from patients wanting to be seen. There was a spike of emergency treatments that needed to be attended to but patients were turned away due to restrictions. Many practitioners including myself were left frustrated by not being able to help out when there was such a demand for our skills. One of the most difficult thing during this time was also dealing with orthodontic patients who were undergoing treatment. Not being able to review them created a lot of uncertainty for the patients and their parents who needed a lot of reassurance. I was also just starting on my orthodontic journey so this further created a lot of stress imagining all the complications that may arise. Due to the restrictions

allowing extractions but prohibiting surgical extractions due to aerosols it means every extraction was approached with trepidation. I readied my mental fortitude and prayed for it to not become a surgical. One positive side effect was I learnt how to luxate and use the periotome very well for atraumatic extraction for implants after this event.

Thankfully one good source of distracted from all the drama of Covid-19 was the introduction of IAADent virtual seminars and studying for the inaugural UJI diploma course. Using the time to refresh things and looking through cases for presentation has helped me increase my knowledge. Furthermore, using this down time to reflect on previous material has ultimately make me a better clinician on the other side of the pandemic. One significant example is reflecting on my TMD notes has helped me manage the spike in TMD patients presenting to my clinic when dental restrictions were eased.

Another positive out of the lockdown was the ability to see how certain life skills can improve my dental skills. Using the spare time to improve my cooking skills, it suddenly dawned upon me why Ken is such a great implantologist: getting the right mix for sauces is like creating "sticky bone", folding a delicate pastry skin around a meat mix and make it presentable is like folding a membrane over a bone graft! Then going to the garage to spend some time to fix some cabinets, getting the right angulation and the type of screws to use for different material is like implant placement! At least I am making sure my hands on skills were up to scratch. Master the kitchen and you shall master grafting. Master the garage and you shall master implant placement!

Overall, this pandemic has its positive moments and it all depends on how one approaches the challenges. It is a rare occurrence that one is forced to take time off work. Covid-19 has allowed me to reflect on my priorities in life, and utilise the down time to try new things which were not possible with a busy work schedule.

Let us push through this challenging period of time and I hope to catch up with the IAADent family in the near future!

*Dr Beng Kai So*

BDS, GradDip Implants  
Geelong Family Dental Care  
IAADent Orthodontic Graduate

# Case Submission

Author: Dr Sheng Zhang

There are many case series documenting the use of RFA to help guide the correct timing to restore an implant. I present a case that was of interest this year where I believe the use of RFA served the patient and I will improve the long-term success and predictability of the implant rehabilitation.

This case documentation will focus more on the use of RFA than any technical aspects of the implant surgery and restoration. It is by no means a perfect implant case and I can critique it ad nauseam.

Male patient 43 years of age, Japanese descent, severe Class III skeletal pattern with asymmetrical unilateral posterior lingual cross bite on RHS. Patient has occlusion on the 5s,6s and 7s only.

Patient referred to me by GDP for extraction and implant rehabilitation of 26 August 2019. The tooth exhibited non-responsive root canal treatment with perforation through the furcation. There was extensive apical abscess associated with the buccal roots and buccal plate resorption. The tooth was deemed to have poor prognosis by endodontist and recommended for extraction.

Patient was given treatment options and ultimately elected for extraction, socket preservation and a 2 stage implant placement with simultaneous sinus lift.



Figure 1 Preoperative PA showing perforation of furcation

Pre surgical site evaluation with 3D CBCT showed vertical ridge dimension of 3mm (mesial) and 5mm (distal) adjacent to future implant site. The ridge width was 8-9mm. A Dentium Superline 5mm x 8mm implant was simulated for the site.

In September 2019, the tooth was extracted, and socket preserved with allograft (Mineross) and non-resorbable membrane (Cytoplast Ti-Reinforced d-PTFE). This approach was selected to maintain and attempt to regain

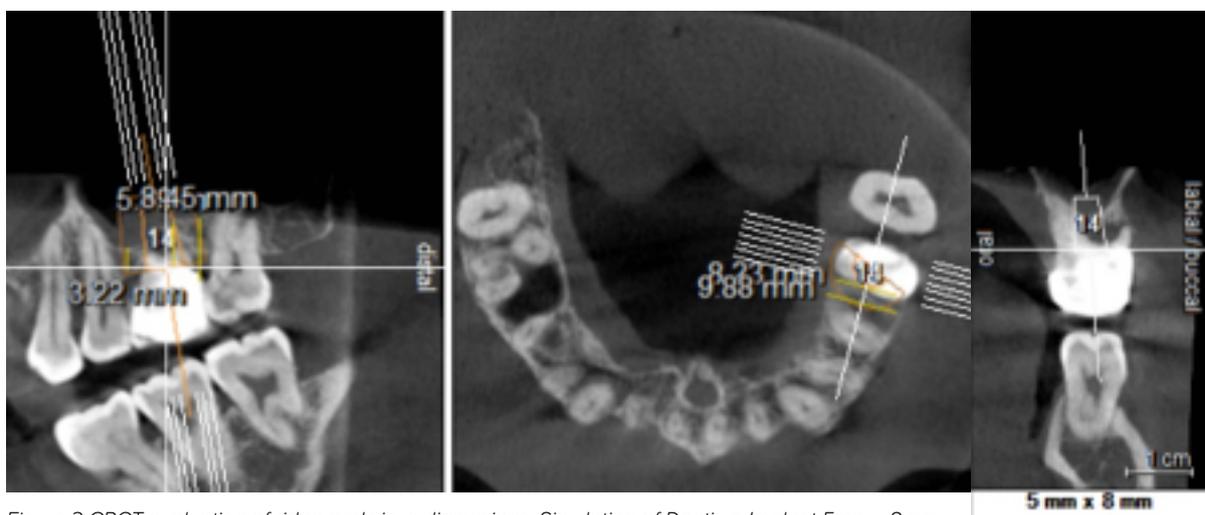


Figure 2 CBCT evaluation of ridge and sinus dimensions. Simulation of Dentium Implant 5mm x 8mm.

as much of the lost buccal plate. Future site development was not deemed to be appropriate at the time of extraction as there as only 1mm of residual bone on sinus floor once macro and micro debridement of the socket was completed.

Healing was uneventful and the membrane stayed in situ until the implant surgery.

In January 2020 the site was re-evaluated noting similar vertical and horizontal ridge dimensions to pre extraction. Implant surgery was performed with an osseodensification protocol (Versah Drills) and osteotome technique sinus lift (Osstem Kit). The bone on re-entry was mix of D2/D3.

A synthetic bone graft consisting of tri-calcium phosphate and calcium sulphate (Ethoss) was used for the sinus lift and a Dentium Superline 5mm x 8mm implant was inserted sub-crestal to 28Nm torque. Penguin RFA ISQ readings at time of implant placement was 67. Cover screw was placed at 5Nm torque. Ethoss was grafted over the implant to improve ridge contour. Primary wound closure was achieved.



Figure 3 Osteotome sinus lift



Figure 4 Implant placement with associated sinus graft

Healing was uneventful and the patient was scheduled for review in May 2020 and second stage surgery. Due to COVID-19 restrictions the patient was not able to be reviewed until June 2020.

PA radiograph showed the sinus graft was turning over to host bone. Second stage surgery was planned to coincide with further easing of COVID-19 restrictions and to allow for the bone to mature further radiographically.

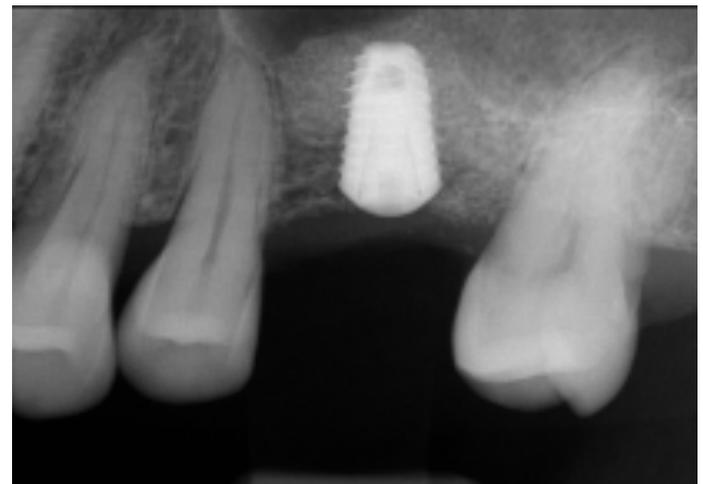


Figure 5 Five months post implant placement.

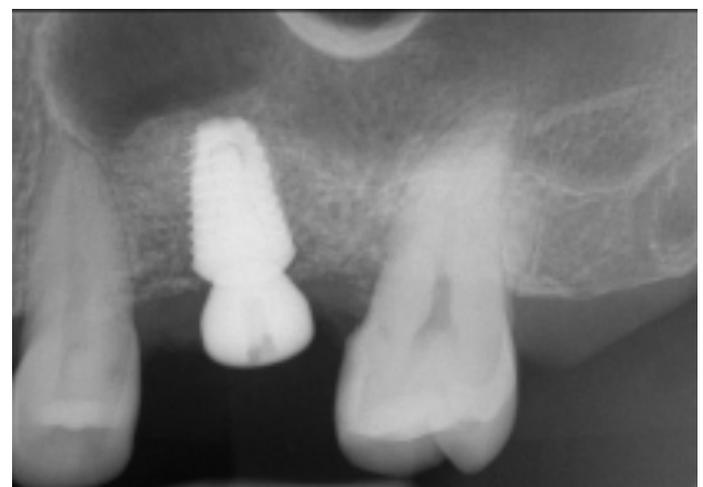


Figure 6 Second stage implant surgery and healing abutment.

Second stage implant surgery was performed in August 2020 and a healing abutment was placed. Frenal pull and a lack of attached gingiva was noted on the buccal aspect of the implant and a free gingival graft from the tuberosity was placed as per the Rocuzzo (2018) technique.

Of note Penguin RFA ISQ reading was 61, lower than the initial placements ISQ. At 7 months post implant placement, this figure is on the low end of the range and warranted caution. Research from Misch (1993) shows that osseointegrated implants in the posterior maxilla may have a Bone to Implant Contact (BIC) of less than 25%. Excessive occlusal loading may result in loss of osseointegration. I believe a Reverse Torque Test in this case may have caused irreversible damage to the osseointegration of the implant.

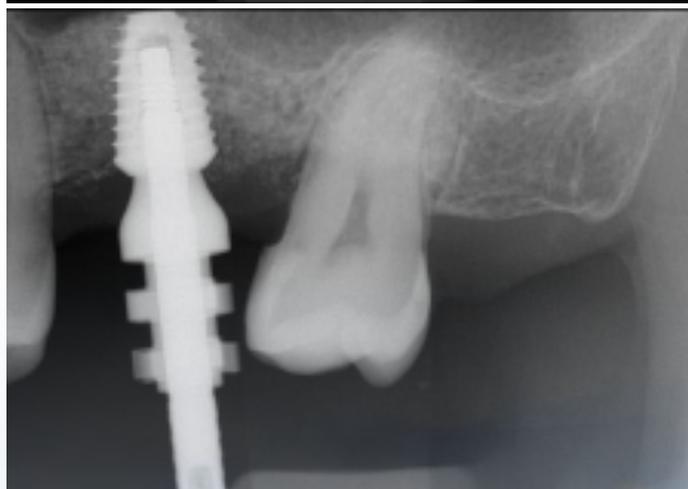
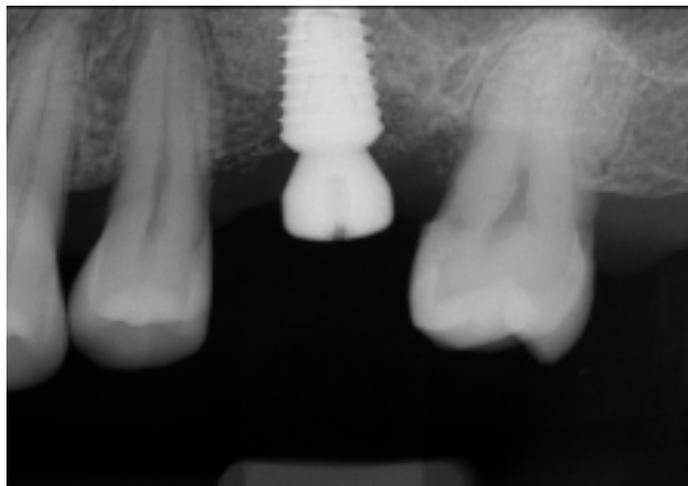
Patient was informed of the options moving forward which included watch and wait, progressive implant loading with temporary prosthesis and consider supplementation with vitamins.

Patient was placed on 180mL D3 + K2 per day and reviewed regularly for the soft tissue surgery and changes

in ISQ readings. At 2 weeks sutures were removed with excellent gingival graft healing.

In October 2020 a follow up ISQ reading was taken showing an improvement to 67. Another reading was taken in November 2020 with an ISQ reading of 73.

The final review in December 2020 showed an excellent ISQ reading of 79. At this point I elected to restore the implant with definitive restoration. An open tray direct pickup impression was taken for fabrication of screw retained, monozirconia crown on custom Ti-base.



Without the RFA and purely relying on 'eye balling' the radiographic changes at 7 months, it would have been logical to functionally load the implant. However, in this case I took an ISQ guided conservative approach and elected to load the implant at 11 months after implant placement and sinus lift. This is an overly long healing period, greater than most would typically accept of an implant placed in the posterior maxilla with sinus lift. The exact reason why it took such a long time for the bone maturation and desired ISQ to be reached is hard to pinpoint. It could be one of many multifactorial reasons. If the ISQ failed to improve in subsequent months I would usually recommend a full blood test investigating serum levels of calcium, vit D and K and if all was in order continue with progressive loading protocols.

This case highlights how RFA can be beneficial in timing when to restore a dental implant. In this case earlier loading may not have had any clinical implications on implant complications or failure, but I sleep better at night with the extra reassurance RFA provides. I am confident the restored implant will serve the patient for many years to come. Best of all he will get his teeth before Christmas - a win and good news for what has been a tough year for most.

*Dr Sheng Zhang*



# Product Review

Author: Dr Sheng Zhang

There are three RFAs in the Australian Market.. All three had the same genesis based off the research by Integration Diagnostics in Sweden.

W&H (Austria) bought the Osstell system and now market it independently.

The original Penguin system has a redesigned sibling brought to market by NSK called the Osseo 100.

This review will look at the Penguin RFA, Osseo 100 and the Osstell Beacon.

## PACKAGING

Osstell is by far the most polished packaging and practical for transporting the RFA.



## CONTENTS OF PACKAGE

Penguin RFA and Osseo 100 both come with the same charger. Osstell comes with a USB-C cable (no power plug), Test Peg, Peg driver and a sample pack of barrier sleeves. A 10 pack of pegs is complimentary with most Osstell purchases once the unit is registered online.



## SIZE COMPARISON

The Penguin and the Osseo 100 are identical in length. The Osstell is marginally longer by 1cm. Weight is very similar. Balance in the hand is essentially the same.



MORE ON THE  
NEXT PAGE...

## DESIGN AND HANDLING

When looking at the Penguin RFA and the Osseo 100 the resemblance clearly indicates identical componentry and architecture. The plastic outer design is slightly different with the Osseo 100 designed modelling a triangular cross section meaning it does not 'roll' around the table. They utilise the same wall charger with a unique port.

Both RFA's have a rubber button to turn on and off. The Osseo 100 has a nicer 'click' when utilising the button than the Penguin. Both have orange LEDs on both sides of the unit to display the ISQ. Both utilise the same noise tones when measuring a peg.

The Osstell has **no** on/off button. It has a flashy gyro-sensor inbuilt which turn on the RFA when picked up. Woah... Fantastic... How cool... Until you realise it is awful if you are constantly moving with it. If the pouch is moved, then the unit powers up and will remain so for a few minutes until it auto powers off. I travel regularly between rooms and practices, so it continues to beep at me like I have mail. Unfortunately this tends to drain the batteries meaning you need to charge the unit regularly. This will not be a problem if you have it just for one practice and not touching it. The saving grace is its USB-C charging port so it can easily be juiced up by connecting to a computer.

The Osstell does however make it easy to explain to patients how their implant is going. The unit flashes Red, Yellow and Green accompanied by a sound that can be best described as Angry, Neutral and Happy respectively depending on the ISQ value.

The shape and style of the RFA's mean that all three fit inside a standard Composite Curing Light Sleeve/Barrier.

Charging time is approximately 3-4hrs for 1 hour of continuous use for all three units.



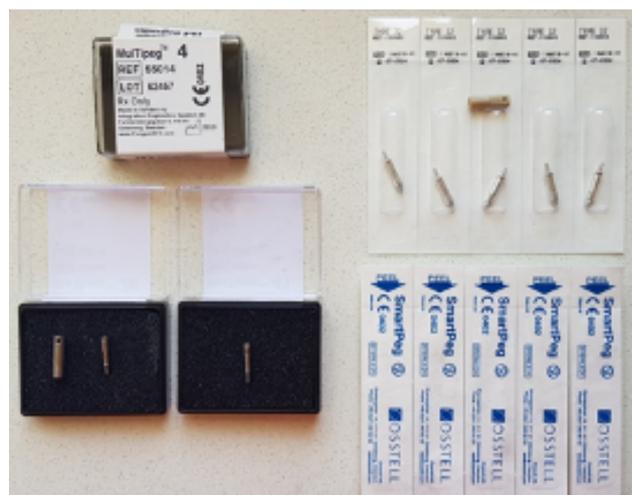
## THE PEGS

All three systems require proprietary peg for use. The pegs are specific to the implant connection and there are over 100 pegs on the market to meet the ever-growing implant systems. Many implant systems share the same connection, so the pegs are often interchangeable between these implant systems. The Penguin RFA and the Osseo 100 use the same "MulTiPeg" by Integration Diagnostics. The Osstell Beacon uses 'SmartPeg' by Osstell.

Here lies the biggest point of difference between the systems.

MulTiPegs are made from Titanium Alloy (Ti-Al-4V) which means they are reusable for a recommended 20 autoclave cycles. The reason why there is a limited cycle is attributed to the potential changes to the thread of the peg which means it is no longer accurately engaging the implant. In my clinical practice I have found them reusable to even 50 cycles without a drop in performance. It is always good to have a new one handy to verify suspect readings.

SmartPegs are made from Aluminium, a much softer material than Titanium Alloy and hence are not recommended to be autoclaved or reused. Many clinicians claim to be able to reuse it, but Osstell claims the validity of the results are in question if autoclaved. If being re-used they benefit from cold sterilisation and many practice have a policy to store the SmartPeg for individual patients to be reused, much like one set of endodontic files for a case from start to finish.



The RRP for MultiPegs are \$70/each and the SmartPegs are \$250/5 pack. Depending on the number of implants placed and the frequency of Pegs being used, this will be the biggest point of difference in long term running costs.

**SmartPegs and MultiPegs are interchangeable**

The ISQ number that is output utilises proprietary formulas and calibrations. Luckily the pegs are interchangeable with the use of the below charts. This means ultimately from a cost perspective, most RFA users ought to be using MultiPegs. This trick is not widely known in the RFA community!

Using an Osstell® together with a MultiPeg®						Using Penguin <sup>SM</sup> together with an Osstell® Smartpeg®					
Measured ISQ	Add	Measured ISQ	Add	Measured ISQ	Add	Measured ISQ	Add	Measured ISQ	Add	Measured ISQ	Add
20	-4	44	0	68	-1	20	4	44	0	68	0
21	-4	45	-1	69	0	21	4	45	1	69	0
22	-4	46	-1	70	0	22	3	46	1	70	0
23	-4	47	-1	71	0	23	3	47	2	71	0
24	-4	48	-1	72	1	24	3	48	2	72	-1
25	-3	49	-2	73	1	25	3	49	2	73	-1
26	-3	50	-2	74	2	26	3	50	2	74	-1
27	-3	51	-2	75	2	27	3	51	2	75	-1
28	-3	52	-2	76	2	28	2	52	2	76	-2
29	-3	53	-2	77	3	29	2	53	3	77	-2
30	-3	54	-2	78	3	30	2	54	3	78	-2
31	-2	55	-3	79	4	31	2	55	3	79	-3
32	-2	56	-3	80	4	32	2	56	3	80	-3
33	-2	57	-3	81	4	33	2	57	2	81	-3
34	-2	58	-3	82	5	34	2	58	2	82	-3
35	-2	59	-2	83	5	35	1	59	2	83	-4
36	-2	60	-2	84	5	36	1	60	2	84	-4
37	-1	61	-2	85	6	37	1	61	2	85	-4
38	-1	62	-2	86	6	38	1	62	2	86	-4
39	-1	63	-2	87	6	39	1	63	2	87	-5
40	-1	64	-2	88	7	40	1	64	1	88	-5
41	-1	65	-2	89	7	41	1	65	1	89	-5
42	-1	66	-1	90	8	42	1	66	1	90	-6
43	-1	67	-1			43	1	67	1		

**OsstellConnect**

This is the biggest update for the Osstell Beacon from its predecessors. It is also why despite Osstell being significantly more expensive than other units and with higher ongoing fees for pegs, it still attracts a wide audience – especially speakers at conferences. Maybe it is because they have more marketing budget from the juicy profits from selling SmartPegs?

The Beacon is integrated by a USB dongle to give Bluetooth data which can be uploaded onto OsstellConnect a web-based application. It allows you to document a patient and follow the ISQ over time in a presentation friendly format which gives you that happy feeling deep inside. Does it add value to your daily practice? Very little... unless you like to show the patient their changing ISQ values and pat them on their heads.

The wider W&H universe now also allows you to save the RPM, Torque and length of surgery from data stored on the W&H ImplantMed surgical unit and marry it with your ISQ values... neat party trick.



**COST**

Penguin RFA and Osseo 100 retail for approximately \$3200 while the Osstell retails for \$4750

## FINAL VERDICT

All three RFAs get the job done. The Penguin is the 'OG' and going on strong. The younger brother Osseo 100 by NSK has a slight face lift but introduces nothing new.

The Osstell Beacon is a more expensive but a flashier unit. It also has the benefit of OsstellConnect which is beneficial if you want to document and download the data for case presentations. Alternatively, manually enter it into an excel spreadsheet and make your own pretty graphs.

Osstell being owned by W&H gives it an opportunity to integrate the Beacon with other W&H systems such as the surgical motor.

Regardless of the RFA unit you end up purchasing, one thing I would recommend is the use of MultiPegs to save on costs!

Minimax has kindly given all IAAdent family a wonderful discount on the Penguin RFA for the month of December 2020 – January 2021. For dental nerds, it makes a great Christmas Present for your colleagues or boss!

*Dr Sheng Zhang*

## Penguin<sup>RFA</sup>

Implant Stability Checker

~~\$3200 +gst~~  
**MEGA SALE \$1650 +gst**

with MultiPeg X 3ea (\$300 Value) **FREE!** 

Product package includes:  
 Penguin RFA + Charger  
 + a choice of MultiPeg x 3ea (free gift)  
 + mount driver



Non-destructive  
 measure method of  
 implant stability

Sometimes you encounter more risky implant cases like bruxism, diabetes, cancer, osteoporosis, bone graft, membrane and etc. In these kinds of complicated cases, the osseointegration becomes less predictable. That is why you will need an accurate diagnostic technique to avoid failures.

### HOW TO USE Penguin<sup>RFA</sup>

<p><b>1</b></p>  <p>Connect the MultiPeg into the implant with the driver</p>	<p><b>2</b></p>  <p>Measure the ISQ with the Penguin RFA              It takes less than a second</p>	<p><b>3</b></p>  <p>Read the ISQ measurement              Above 70 (ISQ) is stable enough to go ahead with the prosthetic</p>
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You can check more information!

 MultiPeg Assortment 

## Medit i500

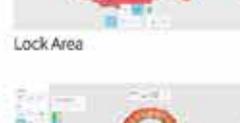
The Easy Entry Into Digital Dentistry

~~\$23000 +gst~~  
**MEGA SALE \$18000 +gst** \*\*

\*\* Discount applied with purchase of 1 package (\$4000+gst)  
 ( Implant Guide Package or Ortho Package)



Perfect Software  
 and Hardware Combination

 <p>User-friendly UI</p>	 <p>Automatic Alignment</p>
 <p>Lock Area</p>	 <p>Undercut Area Analysis</p>
 <p>Occlusion Analysis</p>	 <p>HD Camera</p>



