



Osstell IDx  
Less guesswork. More insight.

Clinical benefits of Osstell in daily practice



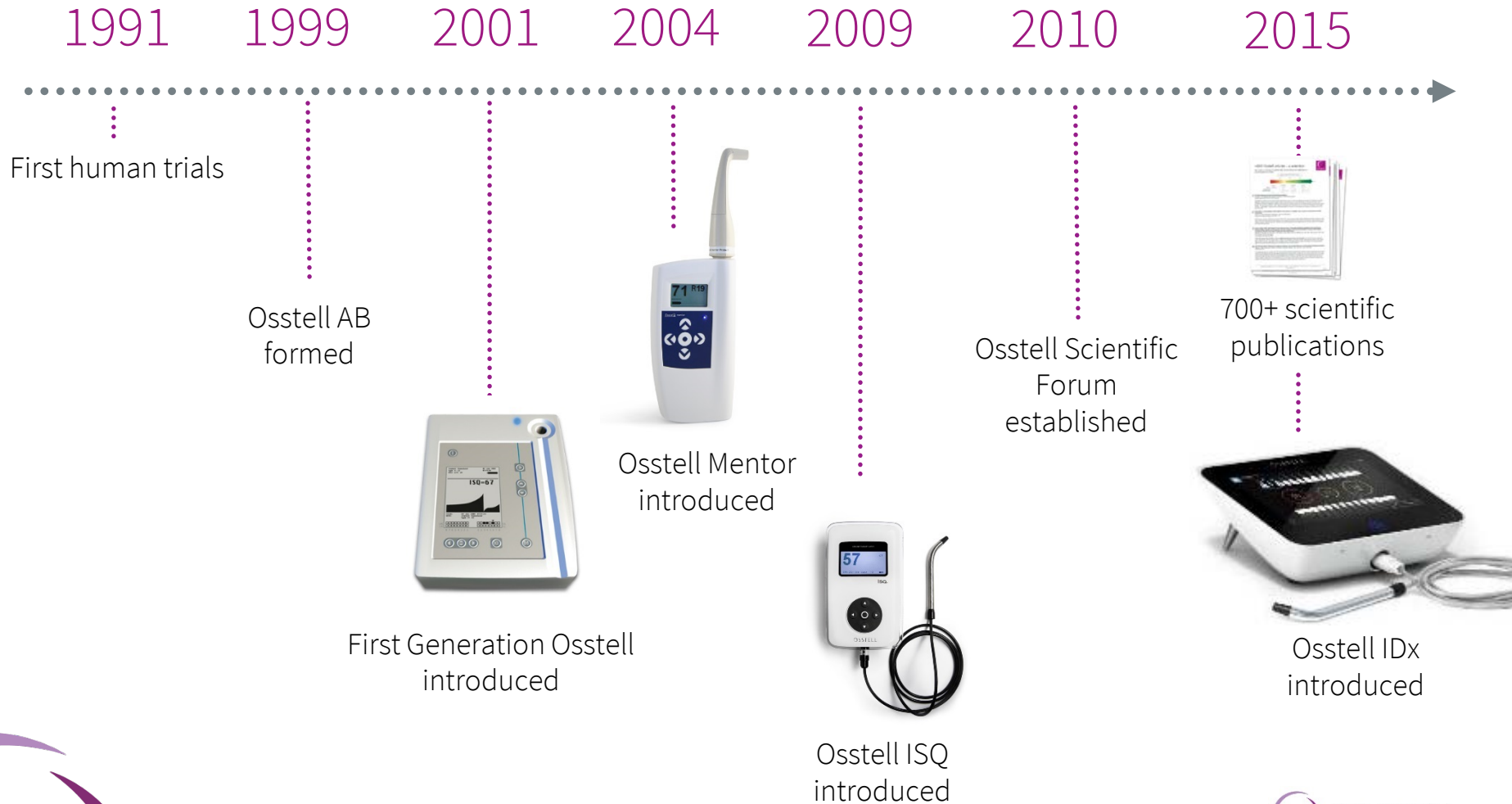
# The Need for Improved Diagnostics

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- ✓ Patients want a nice smile sooner rather than later, and risk patients ask for the treatment too.
- ✓ The changed treatment scenario puts greater requirements on more **capable** diagnostic tools.

# About Osstell



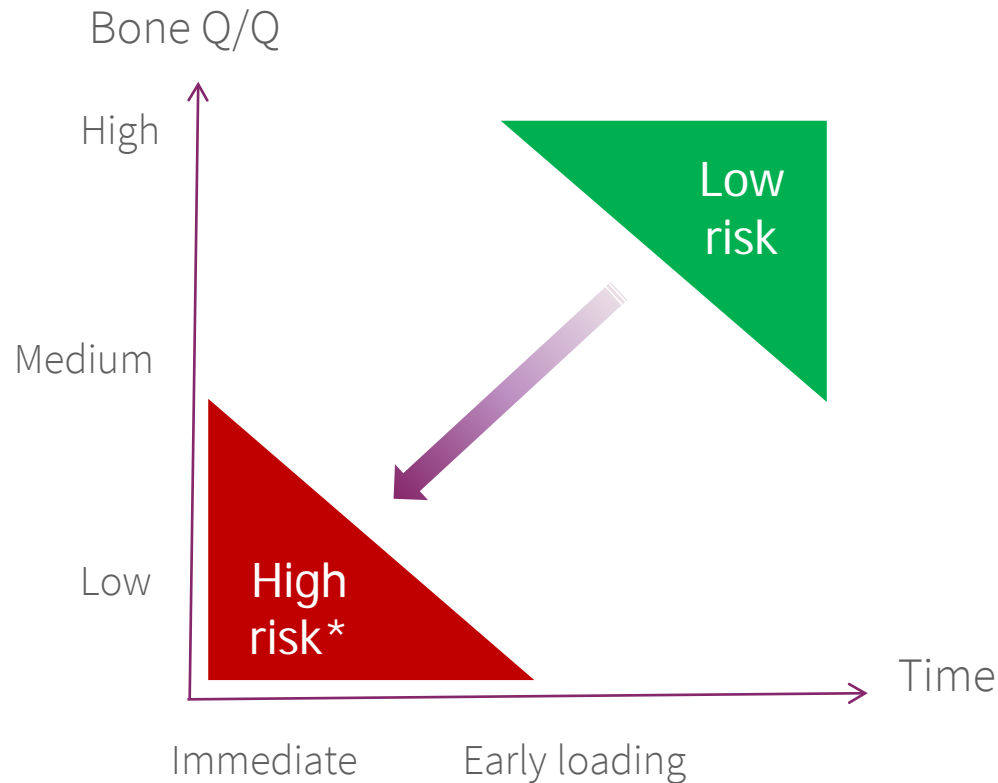


# Increased need for implant diagnostics

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- ✓ Increased demand for reduced treatment time  
One stage, early- or immediate loading
- ✓ More risk patients in daily practice  
Compromised bone, smokers, bruxism,  
diabetic patients, osteoporosis, grafted sites,  
sinus elevation, membranes, extraction  
sockets etc.

# ”Left corner” – Higher Risk



\*Failure rate %:

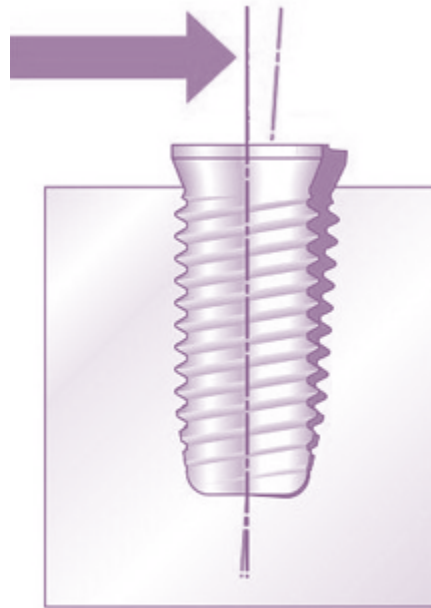
- Iliac crest block + GBR + Sinus graft 50%
- Bruxism 29,3%
- Diabetes 28,6%
- Immediate placement 22,5%
  
- Surgeons experience <5 year 5 times failure

\* Loma Linda, Immediate loading, JOrl, Vol. XXXVIII /Special Issue No. One/2012

# Avoiding Excessive Micro Motion - a key parameter for implant success

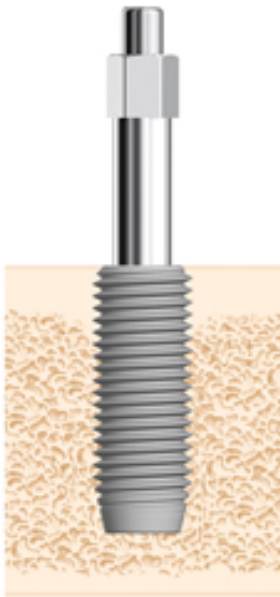
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”The achievement and maintenance of implant stability”\*



Albrektsson T, Zarb GA. Current interpretations of the osseointegrated response: Clinical significance. Int J Prosthodont 1993; 6: 95-105

# The technique behind Osstell Resonance Frequency Analysis (RFA) and ISQ



RFA uses the principle of a tuning fork.

The stiffer the interface between the bone and the implant, the higher the frequency.

ISQ has a non-linear correlation to micro mobility. The scale is from 1-100 ISQ

Increased distance from the bone level to the top of the magnet will lower the ISQ-value.



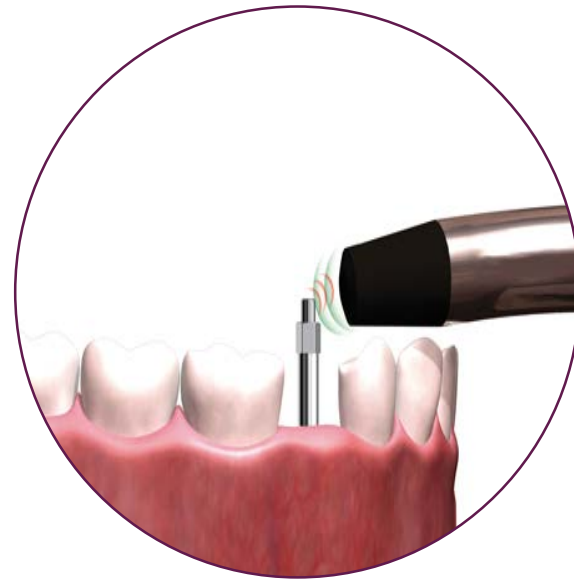
# How it works

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Magnetic pulses vibrates the SmartPeg attached to the implant.

The vibration frequency of the SmartPeg is measured.

The more stable the implant, the higher the frequency (ISQ).



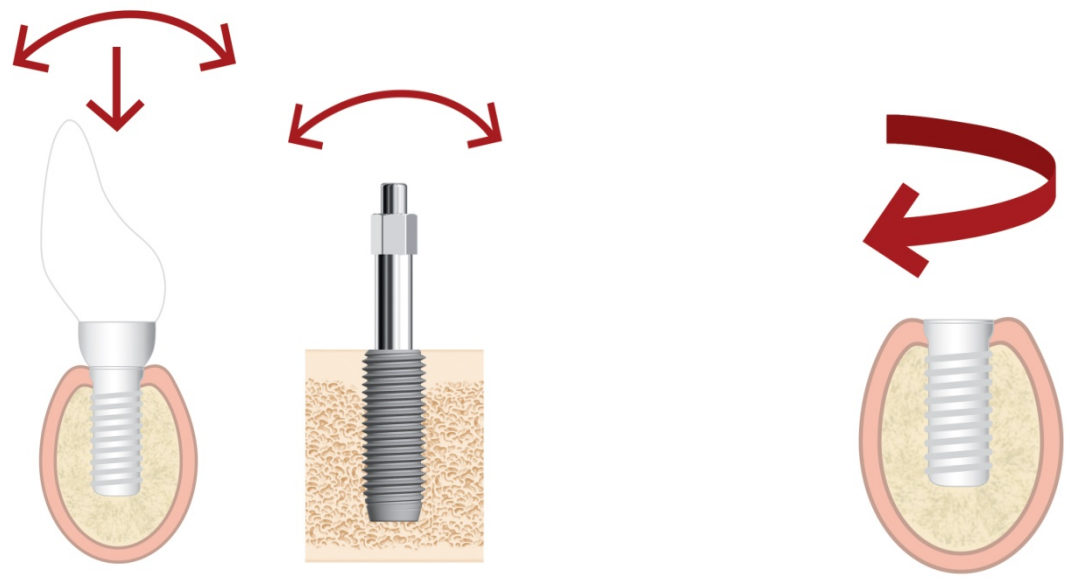
*By measuring on two different occasions, you can verify not only the initial mechanical stability, but also determine the degree of osseointegration.*





# ISQ | Strong Correlation to Micro Mobility

Excessive micro motion could jeopardize the treatment outcome



*RFA measures resistance to lateral micro mobility*

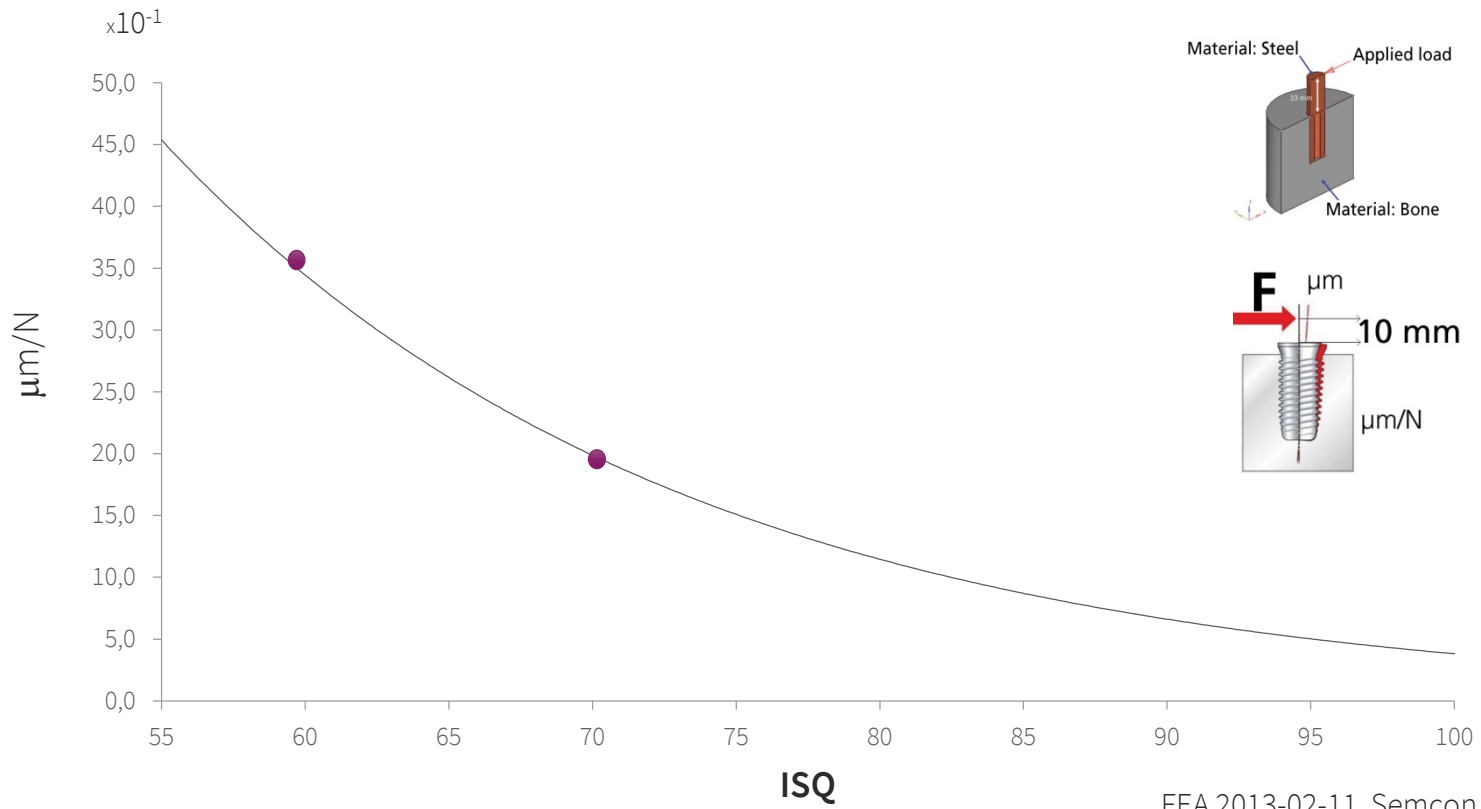
*Torque measures resistance to shear forces*





# ISQ and Micro Mobility

Micro mobility decreases approximately 50% between 60 to 70 ISQ

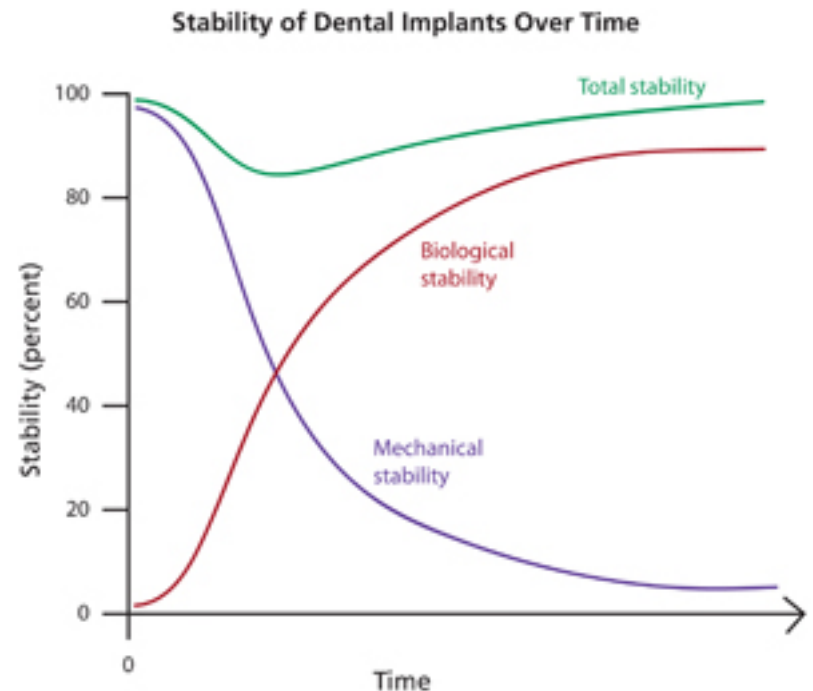


FEA 2013-02-11, Semcon

# Stability Development Over Time

As a result of osseointegration, initial mechanical stability is supplemented and/or replaced by biological stability, and the final stability level for an implant is the sum of the two.

Stability does not generally remain constant after implant placement. For example, there is likely to be an initial decrease in stability, followed by an increase as the implant becomes biologically stable.



# Pros & Cons With Different Techniques

## Resonance Frequency Analysis (RFA)



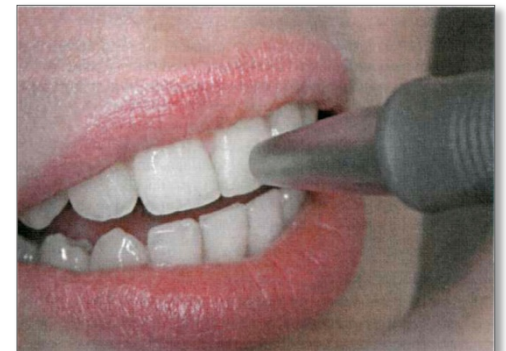
- ✓ *Repeatable, objective and non invasive*
- ✓ *Measures stability in all directions*
- ✓ *Could be used at placement and before final restoration to monitor the degree of osseointegration*

## Torque & tactile feeling



- ✓ *Only at placement.*
- ✓ *Does not measure lateral stability*
- ✓ *Torque test at second stage could be invasive*

## Percussion test



- ✓ *Not optimal for implants*
- ✓ *Operator dependent*
- ✓ *Low sensitivity*

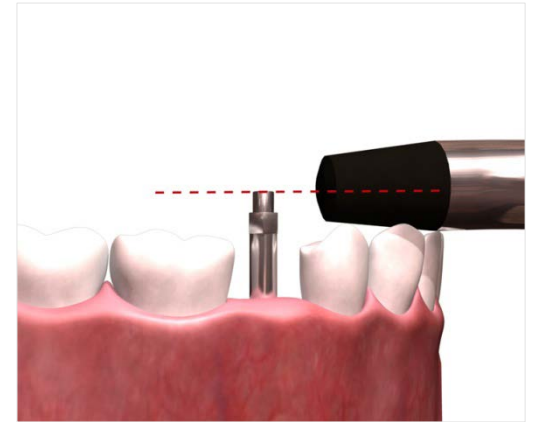
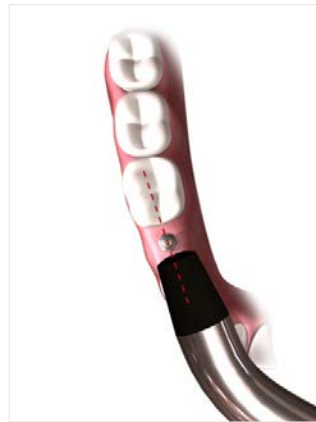
# Measurement Procedure

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1. Attach the SmartPeg  
(4-6 Ncm)



2. Aim for the magnet on top of the SmartPeg to get the ISQ value.  
Repeat the measurement at a different angle (90°)



# When to Measure

At implant placement



- ✓ *Initial mechanical stability*
- ✓ *Baseline ISQ*
- ✓ *Surgical protocol: 1-stage, 2-stage?*
- ✓ *Immediate-, early-, traditional-, delayed loading?*

Before loading/final prosthetics

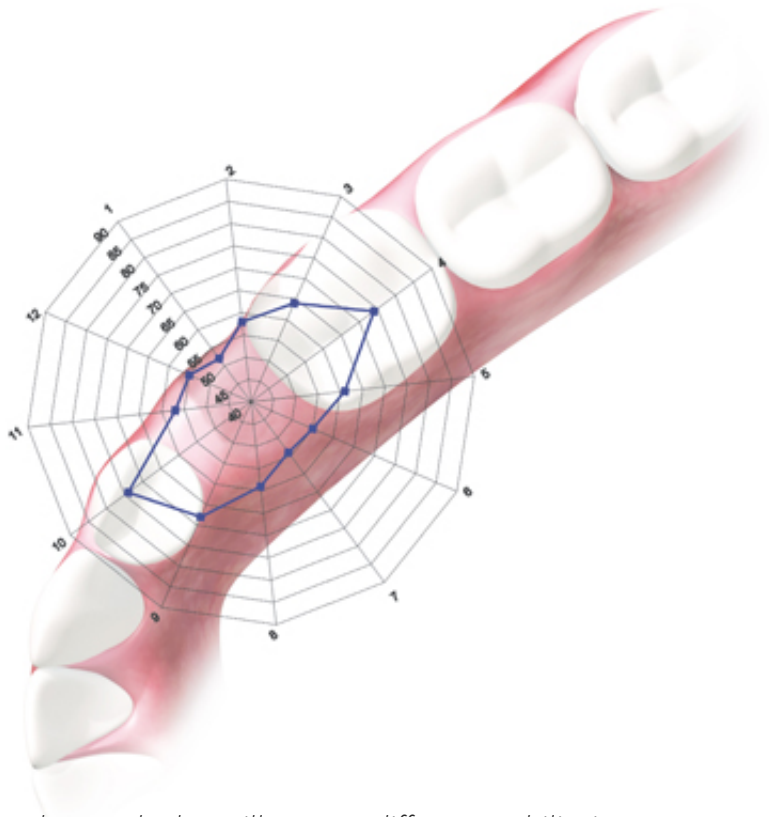


- ✓ *To determine the degree of osseointegration*
- ✓ *Compare with baseline ISQ*
- ✓ *Temporization?*
- ✓ *Modified prosthesis?*
- ✓ *Add time and take a new measurement?*

Time

Tactile feeling or torque will not serve as a baseline for future comparisons and could potentially destroy ongoing osseointegration at second stage.

# The Highest and Lowest Stability Value

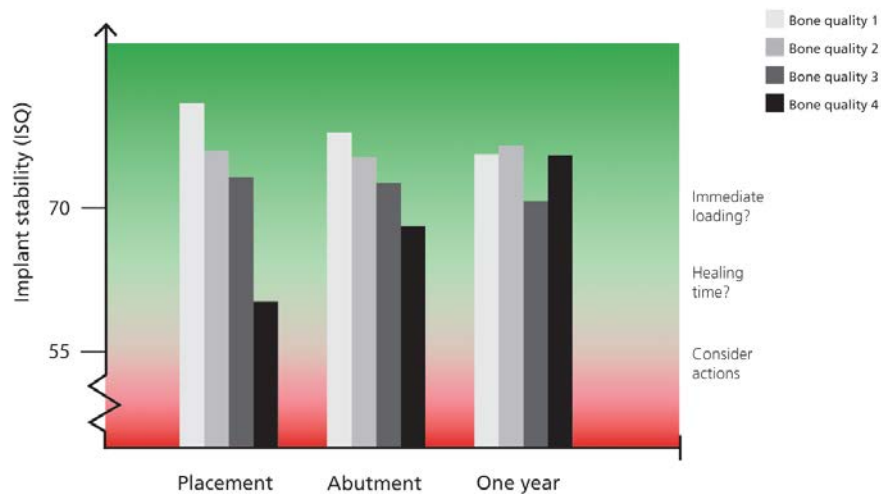


*The graph above illustrates different stability in different directions, ISQ 81 and 53*

Normally, the implant stability is the same in all directions. However, sometimes the bone varies around the implant causing the implant stability to be different in different directions.

Osstell is designed to provide the highest and the lowest ISQ values in such situations. When the stability is high, this difference is less important, but if implant stability is very low in one direction it might require a more conservative approach.

# Stability Development in Different Bone Quality



High initial stability (ISQ values 70 and above) tends to not increase with time, even if the high mechanical stability will decrease to be replaced by a developed biological stability.

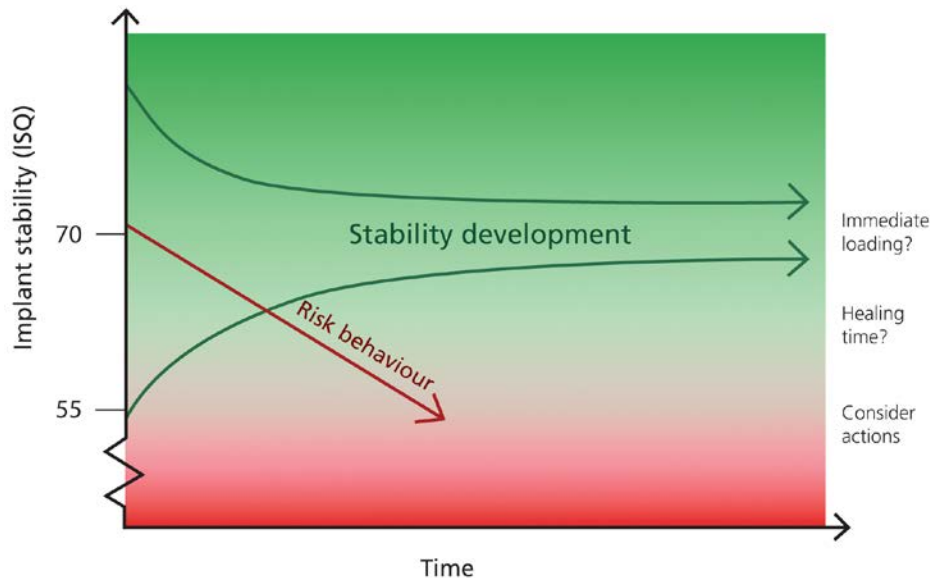
Lower initial stability will normally increase with time due to the lower mechanical stability being enforced by the bone remodeling process (osseointegration).

Values such as ISQ 55 or lower should be taken as a warning sign and actions to improve the stability might be considered (larger implant diameter, prolonged healing time etc.)\*

\* Implant stability measurements using Resonance Frequency Analysis. Biological and biomechanical aspects and clinical implications. Periodontology 2000, 2008. Sennerby & Meredith



# Early Warning

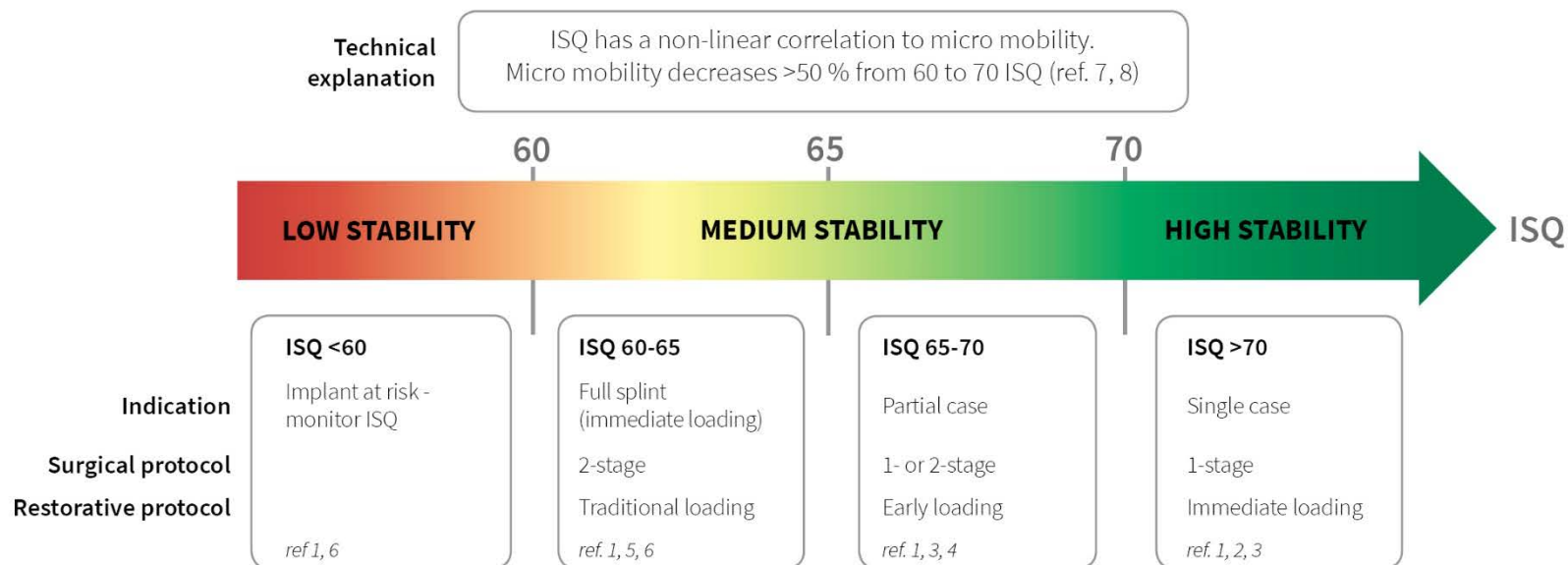


The overall average value of all implants over time is approximately 70 ISQ.

If the initial ISQ value is very high, a small drop in stability normally levels out with time. A big drop in stability or a continuing decrease should be taken as a warning sign.

Lower values are expected to be higher after the healing period. The opposite could be a sign of an unsuccessful implant and actions should be considered.

# The ISQ Scale | Interpreting the values



The above is a summary of scientific data and not an official recommendation by Osstell.  
To monitor osseointegration, measure at placement and before final restoration.  
*For references, please see the backside.*

# The Clinical Use of the ISQ Scale

- ✓ Two values to see the trend  
Two measurements, at placement  
and before final restoration
- ✓ Different indications  
Single, partial or full arch with  
a metal framework




# Scientific References

More than 700 articles has been published, validating the concept.

A searchable database can be found at:  
<http://www.osstell.com/scientific-database/>

>700 Osstell articles – a selection

The model is a summary of scientific data, and should not be interpreted as a recommendation by Osstell



OSSTELL

ISQ has a non-linear correlation to micro-mobility. Micro-mobility decreases >50% from 60 to 70 ISQ (ref. 6, 7)

ISQ	Indication	Surgical protocol	Restorative protocol
ISQ < 60	Implants at risk - monitor ISQ		nr. 1, 4
ISQ 60-65	Full split 6, 2-stage Traditional loading	nr. 1, 2, 6	
ISQ 65-70	Partial case 1- or 2-stage Early loading	nr. 1, 2, 4	
ISQ > 70	Single case 1-stage Immediate loading	nr. 1, 2, 3	

LOW STABILITY      MEDIUM STABILITY      HIGH STABILITY

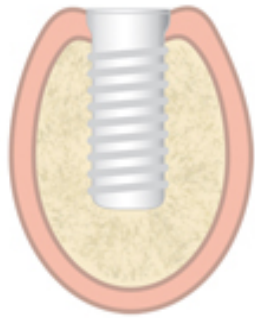
ISQ

- 20 Jahre Erfahrung mit der Resonanzfrequenzanalyse**  
Sennery L, Prof. Sahlgrenska Academy, University of Gothenburg, Sweden  
*Implantologie 2013;21(1):21-33 (In German)*  
Translated from German "It is likely that ISQ measurements can be used as one additional parameter for diagnosis of implant stability and decision-making during implant treatment and follow-up. The threshold values are the present author's own somewhat conservative suggestions and other values may be relevant for other clinicians and implant designs. The green zone contains "safe" implants showing primary ISQ values from, for instance 70 and above. The red zone contains "questionable" implants with an ISQ value below for instance 55. The yellow zone represents implants with an ISQ from 55 to 70".
- Immediate vs. early loading of SLA implants in the posterior mandible: 5-year results of randomized controlled clinical trial.**  
Kokovic V, Jung R, Feloutzis A, Todorovic V, Jurisic M, Hämmerle C  
*Clinical Oral Implants Research, 00, 2013, 1-6*  
After 5 years, survival in the both groups was 100%. The mean value of primary implant stability was 76,92 ± 0,79 ISQ. In the first 6 weeks, ISQ values significantly increased in the test group as well as in the control group. Based on these results, the self-tapping implants inserted in posterior mandible can provide adequate primary stability value as the main factor for immediate and early loading protocol.
- Early Loading of Nonsubmerged Titanium Implants with a Chemically Modified Sand-Blasted and Acid-Etched Surface: 6-Month Results of a Prospective Case Series Study in the Posterior Mandible Focusing on Peri-Implant Crestal Bone Changes and Implant Stability Quotient (ISQ) Values**  
Michael M. Bornstein, Dr. med. dent.; Christopher N. Hart, DMD; Sandro A. Halbritter, Dr. med. dent.; Dean Morton, BDS, MSc; Daniel Buser, Prof. Dr. med. dent.  
*Clin Implant Dent Relat Res 2009*  
If the ISQ value at day to load is < 65, an additional healing period is recommended, and the ISQ values is measured again 3 weeks later until the required level is reached. This approach is practical and well understood by patients. (Prof. Daniel Buser prefers ≥ 70 ISQ, single teeth, early loading/traumann, otherwise add three weeks, according to an oral presentation given at the Osstell Scientific Symposium in connection to the of the EAO 2010.)
- The Predictive Value of Resonance Frequency Analysis in the Surgical Placement and Loading of Endosseous Implants**  
Babayar, Serge; Mandrosan, Martin; El-Ghareeb, Mousafa; Aghaloo, Tara; Pi-Anfruns, Joan; Moy, Peter  
*AAOJ Poster 2011*  
One-stage placement of implants with ISQ values greater than 66 can be performed. Implants with ISQ values less than or equal to 66 should be placed using the two-stage protocol, which shows a higher survival rate. The computed ISQ = 66 cut-off value used to select between one-stage and two-stage placement is validated in this study. Moreover, early loading of implants with ISQ values greater than 64 can be performed. Implants with ISQ values less than 64 should utilize traditional loading, which shows a higher survival rate. The computed ISQ = 64 cut-off value used to select between early and traditional loading is validated in this study. Higher ISQ values at osseointegration correlate with higher survival rates.

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# ISQ and Torque (Ncm)



**Insertion torque** measures the rotational friction together with the force required to cut the bone. The diameter of the implant will influence the torque.

**Peak torque** can give high values due to the “collar effect” when the implant collar is seated in cortical bone.

**Reverse torque** could be invasive as a test of osseointegration

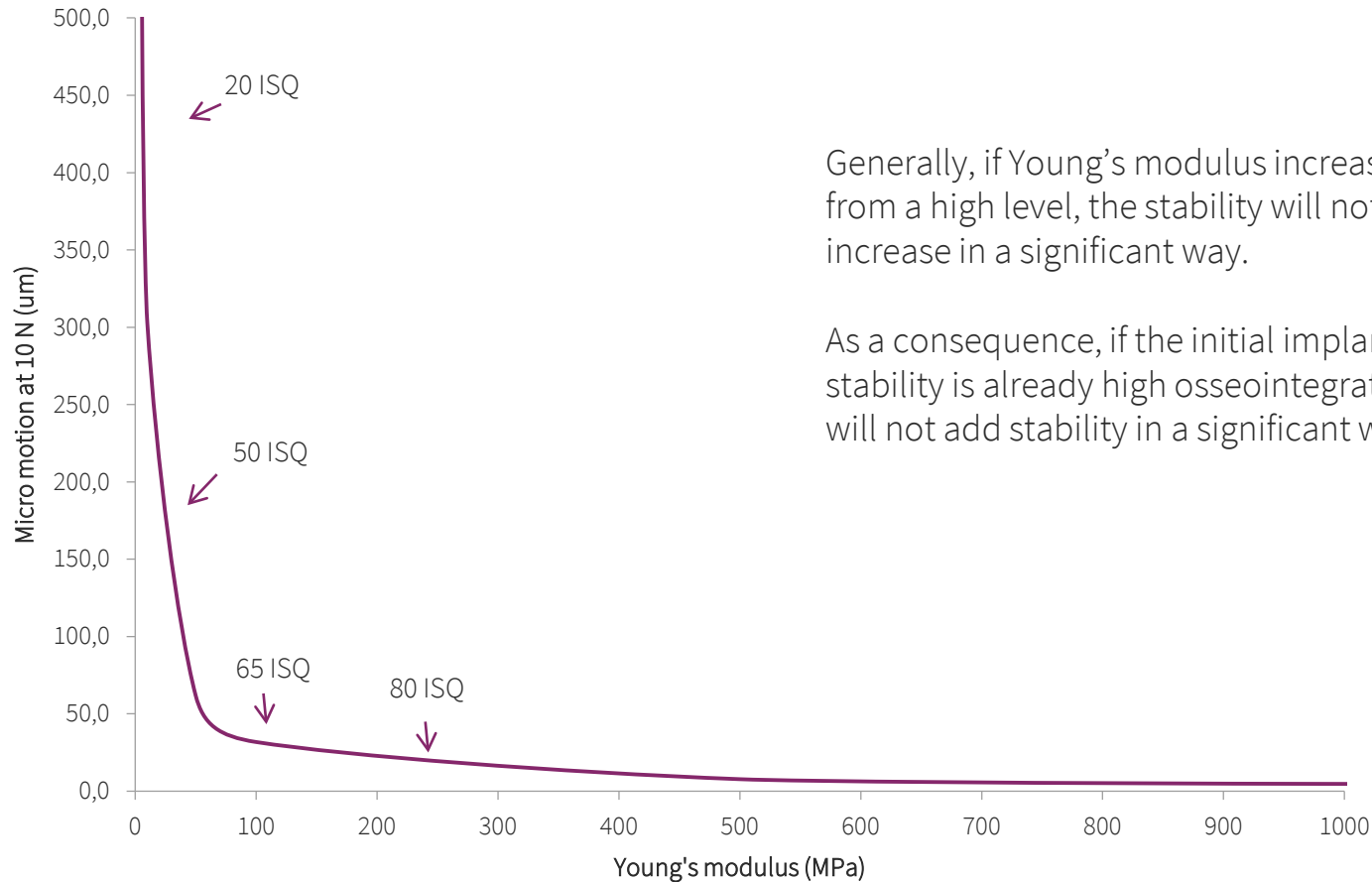
Same torque in different bone qualities can give big differences in micro motion. Different implant designs with the same torque and in the same bone quality gave different micro motion (Trisi, Athens 2010)

Seating torque is sometimes a poor measurement of implant stability (Degidi et al 2010)

A very good correlation between ISQ and micro mobility is shown by Trisi et al (2010) and Pagliani et al (2012)

Torque is a static measurement at placement and we need to monitor the biological dynamic process called osseointegration, Norton (2013)

# Young's Modulus for Different Material



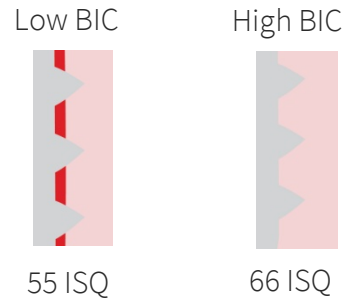
Generally, if Young's modulus increases from a high level, the stability will not increase in a significant way.

As a consequence, if the initial implant stability is already high osseointegration will not add stability in a significant way.

\*FEA 2013-02-11, Semcon

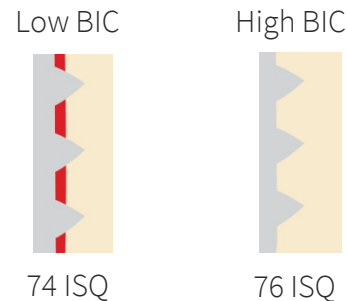
# ISQ and Bone to Implant Contact (BIC)

Low, medium bone density



Increased BIC (osseointegration) will increase the stability if the initial stability is low to medium.

High bone density



Increased BIC (osseointegration) will not affect the stability in a significant way if the initial stability is already very high.

Lack of osseointegration will be shown as a decreased ISQ value

*The above implies that it is possible to have relatively High BIC/Low ISQ in soft bone compared with Low BIC/High ISQ in dense bone.*

# Scientific Advisors

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**Prof. Daniel Buser**

Professor and Chairman, Dept. of Oral Surgery and Stomatology, School of Dental Medicine, University of Bern, Switzerland



**Prof. Peter K. Moy**

Oral & Maxillofacial Surgeon, Professor, Oral & Maxillofacial Surgery, UCLA, Los Angeles, USA, Director, Implant Dentistry



**Dr. Marcus Dagnelid**

DDS, Board Certified Prosthodontist  
CEO, Chief of Staff, Dagnelid Clinic & Falkenberg Clinic, SAACD AB  
CEO, European Dental Academy



**Prof. Neil Meredith**

Professor in Prosthodontics, University of Queensland, Brisbane, Australia

*“As scientific advisors to the Osstell Scientific Forum, we would like to welcome you to make use of it. We have all been using RFA technology and the ISQ scale for many years – in our daily practice as well as in our research.*

*We want to encourage you to explore this useful technology and scale, and to share your data and clinical experience with the ISQ Forum. Together, we can develop a substantial scientific and clinical database that will help all of us optimize the clinical outcome for our patients.”*



# Main Clinical Benefits

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## Reduce treatment time

- ✓ Meet the demand from patient and referrals
- ✓ Increased patient turnover

## Manage risk patients

- ✓ Treat more patients in a predictable way
- ✓ Improved revenues



# Additional Benefits

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- ✓ Know the exact initial stability value
- ✓ Know exactly when to load your implant
- ✓ Choose the right protocol in time
- ✓ Minimize the risk factor of your treatment
- ✓ Take on more difficult cases
- ✓ Work in confidence with immediate loading
- ✓ Load earlier than traditional guidelines
- ✓ Communication to patient/team/referring Drs.
- ✓ Raising the level of quality of Your "work"
- ✓ "Risk Control" and Medical legal