Clinical benefits of Osstnell in daily practice
The Need for Improved Diagnostics

- 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


- First human trials
- Osstell AB formed
- Osstell Mentor introduced
- First Generation Osstell introduced
- Osstell ISQ introduced
- Osstell Scientific Forum established
- Osstell IDx introduced
- 700+ scientific publications
Increased need for implant diagnostics

- 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

**Bone Q/Q**
- High
- Medium
- Low

**Time**
- Immediate
- Early loading

**Low risk**
- High 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, JOri, Vol. XXXVIII /Special Issue No. One/2012
Avoiding Excessive Micro Motion - a key parameter for implant success

”The achievement and maintenance of implant stability”*

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

Magnetic pulses vibrate 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
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

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?

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

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.

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

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

Technical explanation:
ISQ has a non-linear correlation to micro mobility. Micro mobility decreases >50% from 60 to 70 ISQ (ref. 7, 8)

<table>
<thead>
<tr>
<th>ISQ</th>
<th>Indication</th>
<th>Surgical protocol</th>
<th>Restorative protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;60</td>
<td>Implant at risk - monitor ISQ</td>
<td>ref 1, 6</td>
<td></td>
</tr>
<tr>
<td>60-65</td>
<td>Full splint (immediate loading) 2-stage</td>
<td>ref. 1, 5, 6</td>
<td>ref 1, 3, 4</td>
</tr>
<tr>
<td>65-70</td>
<td>Partial case 1- or 2-stage Early loading</td>
<td>ref. 1, 3, 4</td>
<td>ref. 1, 2, 3</td>
</tr>
<tr>
<td>&gt;70</td>
<td>Single case 1-stage Immediate loading</td>
<td>ref. 1, 2, 3</td>
<td></td>
</tr>
</tbody>
</table>

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

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

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

Low, medium bone density

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

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.
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

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

- 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