

# Mechanical Stability of the PALTOP Implant Design

Based on Insertion Torque, Extraction Torque & Resonance Frequency Analysis | In vitro Results

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## Objective

The objective of this study was to measure the mechanical stability of the PALTOP Advanced implant design on the day of insertion into the bone. The PALTOP design was compared to stability measurements for 3 leading implant designs.

## Introduction

**Insertion Torque:** Insertion Torque value of 35Ncm is considered to be optimal for loading. It indicates stable implant placement with high survival rate, without causing over-heating and pressure that may lead to necrosis, tissue damage and bone loss <sup>2,7, 2.8</sup>.

**Extraction Torque:** Extraction torque is deduced by measuring the required torque to unfasten the implant from the implant placement site. High extraction torque indicates implant stability<sup>2,9, 2.10, 2.11</sup>.

**Osstell/ISQ:** Many studies have shown that Resonance Frequency Analysis (RFA) measured by Osstell/ISQ reflects the primary bone to implant contact and hence may be useful in documenting clinical implant stability<sup>2,12</sup>. RFA could serve as a non-invasive diagnostic tool for detecting the stability of dental implants during the healing stages and in subsequent routine follow-up care after treatment<sup>2,13</sup>.

## Materials and Methods

### 4 Implant Types Were Chosen:

- PALTOP Advanced  
4.2mm X10mm Implant,
- Leading Manufacturer "N"  
4.3mm X 10mm tapered implant
- Leading Manufacturer "S"  
4mm X 10mm Bone Level Implant
- Leading Manufacturer "I"  
4mm X 10mm tapered implant

10 osteotomies were performed following the published protocols for each implant.

The implants of each company were inserted into simulated bone type D 1-2 (Sawbone Sweden #1522-04 4 30pcf) and then the whole procedure was repeated in simulated bone type D3 (Sawbone Sweden 1522 02 15pcf) following the companies recommended soft bone protocols.

The insertion torque was measured using the Kavo Intrasurg 300 drilling unit. On implant insertion, the Osstell/ISQ value was measured from 4 directions for each implant. The extraction removal torque was measured using a Kanon (Japan) n6l TDK torque wrench.

### Statistical Analysis

A Wilcoxon Rank Sum Test Was Performed For Pairwise Comparison Of Insertion Torque, Extraction Torque, And Osstell/Isq Values

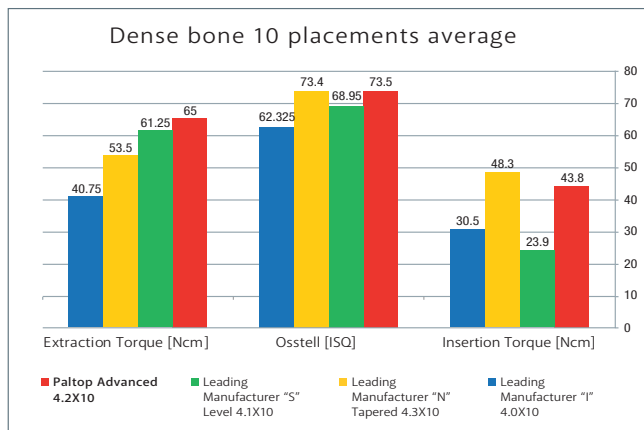


Figure 2.1: Extraction Torque/Osstell Values/Insertion Torque D1 – D2 Average Data

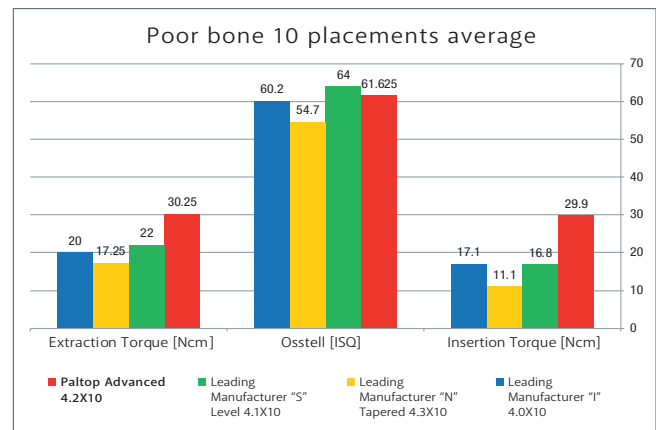


Figure 2.2: Extraction Torque/Osstell Values/Insertion Torque D3 Average Data

## Results

### Insertion Torque D1-D2 Bone

The PALTOP implant design had higher insertion torque values than the Leading Manufacturer "S" and Leading Manufacturer "I" implant designs.

### Extraction Torque D1-D2 Bone

The PALTOP implant design had higher extraction torque values than the Leading Manufacturer "N" Leading Manufacturer "S", and Leading Manufacturer "I" implant designs.

### Osstell Values D1-D2 Bone

The PALTOP implant design had higher Osstell values than the Leading Manufacturer "N", Leading Manufacturer "S" and Leading Manufacturer "I" implant designs.

### Insertion Torque D3 Bone

The PALTOP implant design had higher insertion torque values than the Leading Manufacturer "N", Leading Manufacturer "S" and Leading Manufacturer "I" implant designs.

### Extraction Torque D3 Bone

The PALTOP implant design had higher extraction torque values than the Leading Manufacturer "N", Leading Manufacturer "S" and Leading Manufacturer "I" implant designs.

### Osstell Values D3 bone

The PALTOP implant design had higher Osstell values than the Leading Manufacturer "N", and Leading Manufacturer "I" implant designs, Leading Manufacturer "S" had significantly higher Osstell values than PALTOP, Leading Manufacturer "N" and Leading Manufacturer "I" implant designs.

## Conclusion

The Implant Stability Analysis demonstrated the effectiveness of the PALTOP implant design to be equal to or superior to the implant designs of Leading Manufacturer "N", Leading Manufacturer "S" and Leading Manufacturer "I" implant designs.