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IMPLANT PRIMARY STABILITY, A PREDICTOR OF IMPLANT OSSEOINTEGRATION.

A RFA CLINICAL STUDY WITH IMMEDIATELY AND DELAYED LOADED ITI SLA IMPLANTS.

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INTRODUCTION

Resonance Frequency Analysis (RFA) has been recently introduced as a new method to measure implant stability (fig 1). In a previous study (Nedir et al., COIR, 2002), data have been generated for ITI implants and the parameters affecting implant stability have been identified. However, the Osstell has not been investigated as a diagnostic tool. The purpose of this study was, 1) to evaluate the Osstell as a diagnostic tool capable to discriminate between stable and mobile implants, 2) to evaluate a threshold primary stability obtained at implant placement (ISQi) that might be predictive of osseointegration, 3) to compare the predictive ISQi of immediately loaded (IL) implants and those loaded after 3 months (DL) following a classical 1-stage procedure.

MATERIAL & METHODS

Patients with immediately loaded implants (IL) and with delayed loaded implants (DL) have been enrolled in this study. Details of the demographics and the prostheses are given in figure 2 and 3. The ISQ have been blindly recorded at placement, after 1, 2, 4, 6, 8, 10 & 12 weeks. After having recorded the ISQ, implant stability was clinically controlled. Details of the rehabilitation distribution is given in figure 3. The Sensitivity of the diagnostic tool, the Specificity, the Positive Predictive value (PPV) and Negative Predictive Value (NPV) have been recorded for determination of implant mobility and for predicting implant integration of the IL and DL procedures. Implants have been followed for at least 1 year of loading.

Fig 1 : Principle of the Osstell. An ISQ value is obtained, it should orient the practitioner versus IL or versus DL (Fig 1).

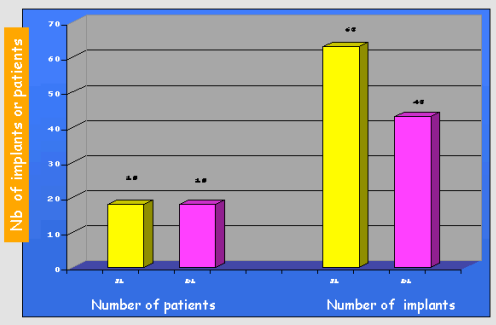

Fig 2 : Patients and implant demographics. 18 patients have been enrolled in both groups with 63 IL and 43 DL implants.

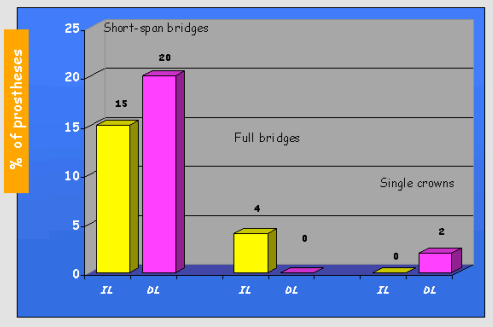

Fig 3 : Rehabilitation type in the IL and DL groups. Most implants supported short-span bridges in the posterior region.

RESULTS

One DL implant failed after 2 weeks, the ISQi was 48 and the ISQ at failure was 43. One IL implant failed after 4 weeks, the ISQi was 53 and the ISQ at failure was 46. At the 1-year loading control, the survival rate of the IL and the DL implants was 98.4 % and 97.7 %. Evolution of the ISQ (dISQ) for the IL and DL implants was similar as shown in figure 4. Evolution of the dISQ differed according to the ISQi. Implants with a lower ISQi increased more than the others (fig. 5). Implants with an ISQi > 69 decreased and remained stable (fig. 6). Figure 6 shows that implants with an ISQi in the 65-69 range decreased in stability and then increased. The cut-off value for implant stability was ISQ 47. The ISQi predicting osseointegration for DL implants was ISQi 49; for IL implants, the predicting ISQi was 54 (fig 9). Implants with a lower ISQi were at higher risk.

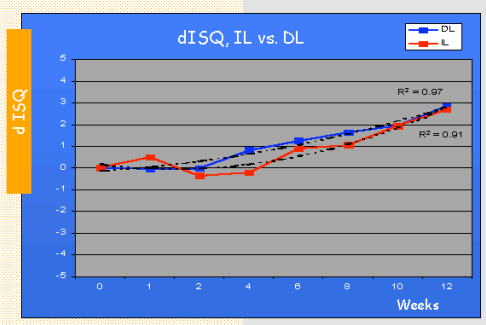

Fig 4 : Variation of implant stability of the IL and DL groups during healing. The curves were not different.

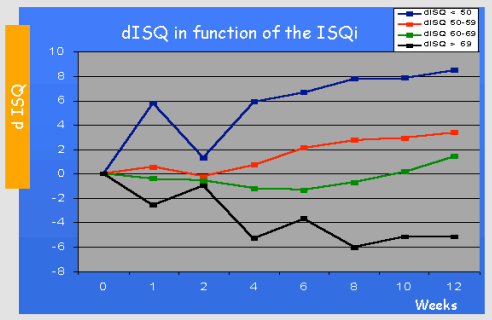

Fig 5 : Evolution of the dISQ in function of the ISQi. Low ISQi increased markedly, high ISQi decreased and remained stable.

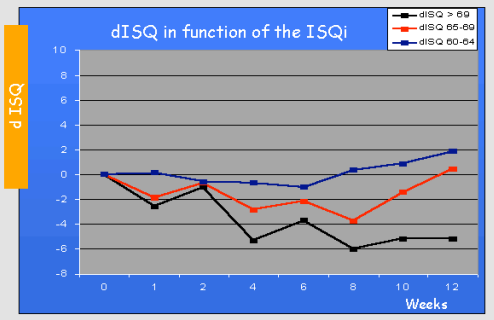

Fig 6 : Evolution of the dISQ in function of the ISQi for the 60-69 group when split in 2 sub-groups.

Fig 7 : Immediately loaded short-span bridge in the mandible. Control X-ray at the 18-month follow-up.

Fig 8 : Immediately loaded short-span bridge in the maxilla. Control X-ray at the 2-year follow-up.

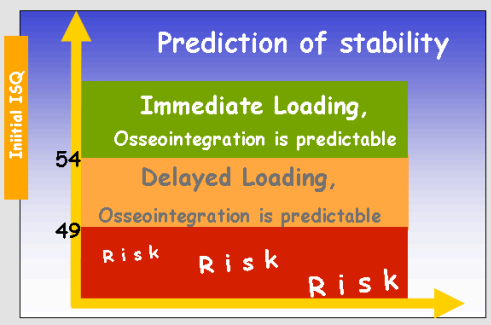

Fig 9 : Determination of the cut-off value predicting osseointegration for IL and DL implants. All DL implants with ISQi ≥ 49 and all IL implants with ISQi ≥ 54 osseointegrated.

DISCUSSION & CONCLUSION

Precision of the Osstell was satisfying (1.14 %). As a diagnostic tool, the RFA method was not reliable to identify the mobile implants. It can be used as a conservative measure to identify stable implants since implant stability could be reliably determined for implants with an ISQ ≥ 47. All implants with an ISQi ≥ 49 osseointegrated when left to heal for 3 months. All implants with an ISQi ≥ 54 osseointegrated when they were immediately loaded. Clinically, during implant healing, a decrease in implant stability for implants with a low ISQi value should alert the practitioner to submit these implants to a tighter follow-up schedule. For implants with a high ISQi value, reduction of implant stability during the first 12 weeks of healing should be considered as a common event, it should not require alteration of routine follow-up unless previous measurements gave markedly higher ISQ values.