Effect of implant design in immediate loading. A randomized, controlled, split-mouth, prospective clinical trial

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BACKGROUND AND AIM: Success of dental implants is mainly the result of primary implant stability following placement. Primary stability is defined as the absence of movement of an implant after surgical insertion and it is influenced by many factors such as bone density and quality, surgical technique and implant body geometry. Achievement of acceptable initial intraosseous implant stability and maintenance within an asserted tolerable micromotion threshold of 50–150 µm are primary concerns during the healing period for immediate loading. Considering that no available method exists to measure the micromotion directly at the bone-implant interface level, collecting implant stability quotients (ISQs), and insertion torque values (ITVs) are common clinical methods in determining initial implant stability for a predictable loading protocol.

The aim of this controlled, split-mouth clinical study is to determine the influence of cylindrical implants with V-shaped threads and narrow pitch thread pattern compared with tapered implants with square threads and wide pitch thread pattern on the primary stability measured with insertion torque values (ITVs) and resonance frequency analysis (RFA) placed in ten edentulous mandibular patients, as well as comparing the marginal bone loss after three months of surgery, during the immediate loading.

METHODS AND MATERIALS: Tapered and cylindrical implants were placed in a split-mouth study using the same implant protocol in ten patients with edentulous jaws (Fig.1). A total of 20 tapered implants (test group) and 20 cylindrical implants (control group) were placed (Fig.2). All implants were loaded immediately with provisional fixed prostheses during the healing period before the final restoration (Fig. 3). The implants were evaluated at the implant placement by analyzing the insertion torque values (ITVs) and the resonance frequency analysis (RFA) and after the healing period of three months, the success of those implants and the marginal bone loss were evaluated.

RESULTS: Two cylindrical implants were mobile within the same patient and no tapered implants failed, resulting in implant survival rates of 90% and 100%, respectively after three months. The ITVs were statistically significantly different (P = 0.0210) for the tapered implants than for the cylindrical implants. However, no statistically significant differences in RFA values were found (P = 0.6063) when comparing the implant designs and the primary stability measured with implant stability quotient (ISQ) values. The control group resulted in a mean bone loss after three months of 0.91 mm while the test group resulted 0.42 mm.

CONCLUSIONS: - The results of this study showed that tapered implants with a wide pitch thread pattern and square thread geometry achieved greater primary stability values than cylindrical implants, with a narrow pitch thread pattern and V-shaped thread geometry measured with ITV.
- The square thread shape can be a more important feature than the number of threads to obtain acceptable implant stability values. Moreover, the combination of tapered implants and a square thread shape can be a good surgical strategy to achieve acceptable implant primary stability in situations of poor bone quality, or when implant primary stability has to be precisely achieved when immediate or early loading protocols are planned.
- Furthermore, the implant neck is also important for the bone loss. These results demonstrated that the rough-surfaced microthread implant neck reduces bone loss compared to the machined neck, after three months surgery.

References: