Acknowledgment

The study was partially funded by MIS implants, Inc.

References


The Effect of Simplifying Dental Implant Drilling Sequence on Osseointegration: An Experimental Study in Dogs.

Gabriela Giro1, Nic Tovar1, Charles Marini2, Estevam A. Bonfante2, Ryo Jimbo3, Marcelo Suzuki4, Makvin N. Janal5 and Paulo G. Coelho6.

Abstract

To test the hypothesis that there is no difference in osseointegration between a simplified and conventional protocol for site preparation.

Introduction

Osseointegration has been defined as the ability of titanium alloy implants to achieve stability in bone. It is a biological process that is time dependent and requires a defined sequence of site preparation. This study aimed to investigate the effect of a simplified drilling protocol on osseointegration.

Materials and Methods

This study utilized 22 screw root form implants (MasterLine, MIS, BarLev Industrial Park, Haifa, Israel). An implant of 3.75 mm in diameter was inserted in the anterior part of the maxilla, and an implant of 4.2 mm in diameter was inserted in the posterior part of the maxilla. The implants were placed using a preclinical technique parafunction and were left for 1 week postoperatively. The dogs were divided into three groups: Group A (treatment only), Group B (treatment + irrigation), and Group C (treatment + irrigation + antibiotic). The implants were harvested 1, 3, and 5 weeks postoperatively.

Surgical Procedure

The surgical procedure was performed under general anesthesia. The preclinical technique parafunction was used to place the implants. The implants were harvested 1, 3, and 5 weeks postoperatively. The dogs were divided into three groups: Group A (treatment only), Group B (treatment + irrigation), and Group C (treatment + irrigation + antibiotic). The implants were harvested 1, 3, and 5 weeks postoperatively.

Hard Tissue Histology Preparation

The specimens were fixed in 10% buffered formalin solution for 20 weeks postoperatively. The specimens were then decalcified and embedded in paraffin. The specimens were sectioned and stained with hematoxylin and eosin. The specimens were evaluated using a light microscope.

Results

The histological evaluation showed that at 1 week postoperatively, the bone interface was clearly visible, and the bone was in direct contact with the implant surface. The bone interface was also visible at 3 weeks postoperatively, but the bone appeared to be more resorbed. At 5 weeks postoperatively, the bone interface was still visible, but the bone appeared to be less resorbed.

Discussion

The present study showed that the osseointegration was significantly higher in the group that was treated with irrigation and antibiotics compared to the group that was treated only with irrigation. This suggests that irrigation and antibiotics may be beneficial for osseointegration.

Conflict of Interests

The authors of this work do not have a conflict of interest.
The Effect of Simplifying Dental Implant Drilling Sequence on Osseointegration: An Experimental Study in Dogs

Gabriela Giro, Nick Tovar, Charles Marin, Estevam A. Bonfante, Ryo Jimbo, Marcelo Suzuki, Makvin N. Janai and Paulo G. Coelho

Materials and Methods

The study utilized 72 screw root form implant systems (Biomet 3i, Boston, MA). An implant of 3.75mm (Ao 275) and 4.2mm (Ao 318) in diameter was inserted into the left and right hemimandibles, respectively, of 12 ridge-implant pairs in each dog. The implants were placed under surgical techniques and procedures recommended as part of the conventional protocol. After implant placement, the healing period was 2 months. After that, the dogs were sacrificed, and the mandibles were removed. The blocks were fixed in 10% formaldehyde and cut along the long axis with a precision saw (Isomet 1000, Buehler Ltd., Lake Bluff, IL, USA) for further histology and histomorphometric analyses. The percentage of bone-to-implant contact (BIC) and bone-implant fibro-osseous tissue interface (BAFO) were assessed. Statistical analyses were performed using a GLM ANOVA. Statistical significance was set at 5% (α = 0.05).

Results

(a) Results for bone-to-implant (BIC) (mean ± 95% CI) as a function of drilling technique and time in vivo where no significant differences were observed between groups for each time point in vivo.

(b) Results for BAFO (mean ± 95% CI) as a function of drilling technique, time in vivo, and implant diameter. No significant differences were observed from 1 to 3 weeks (P = 0.02), this difference was not significant from 3 to 5 weeks (P < 0.01), and no significant differences were observed from 1 to 5 weeks (P = 0.50).

Discussion

This present study showed that the evaluation of conventional procedures as well as the evaluation of simplified procedures is an important tool to understand the biological response to bone implantation. The results of this study indicate that the conventional protocol and the irrigation procedures have been evident in the histology or in the histomorphometric analysis in a wide range of time points. The results of this study strongly suggest that the osteotomy was maintained following surgery and that the healing probably would have delayed for 1 week. The authors of this work do not consider the biological response to bone implantation.

Conflict of Interests

The authors of this work have no conflict of interests.

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The Effect of Simplifying Dental Implant Drilling Sequence on Osseointegration: An Experimental Study in Dogs.

Gabriela Gro, Nick Tovar, Charles Marin, Estefany A. Bonfante, Ryo Jintou, Marcelo Suzuki, Makvin N. Janai and Pablo G. Coelho.

Abstract

To evaluate how the fewest possible number of drills and the fewest possible number of changes in speed and water irrigation could affect the rate of osseointegration. A comparison was made between a simplified drilling sequence (two-step incremental sequence) and the conventional drilling sequence (three drills, three changes in speed). A total of 36 titanium implants (3.75 mm and 4.2 mm diameter) were placed in the tibia of 18 beagle dogs and remained for 1, 3, and 5 weeks. Thirty-six sites were placed under a simplified drilling sequence and the remaining thirty-six sites were placed under a conventional drilling sequence.

Materials and Methods

This study utilized 72 screw cut implants (3.75mm and 4.2mm diameter) in a total of 18 dogs. The implants were placed in the tibia of beagle dogs under a simplified sequence or the conventional sequence. The implants were placed in the bone according to the guidelines of Albrektsson et al. (1981). The implants were placed in the bone using a conventional drilling sequence (pilot drill + final diameter drill) and the other half using the simplified sequence (pilot drill). The implants and surrounding bone were harvested postoperatively and evaluated by light microscopy. The bone-to-implant contact (BIC) and bone-area-fraction (BAFO) were assessed. Statistical analysis was performed using a GLM ANOVA. Statistical significance was set at 5% (p < 0.05).

Introduction

Albrektsson et al. (1981) suggested that there are six factors that determine the success of osseointegration: implant design, surface roughness, and surgical conditions, among others. The present study design allowed the evaluation of the effects of drilling technique as a function of implant diameter, and surgical technique is limited. Especially concerning the implant biocompatibility, the efficiency and temperature profile as a function of drilling technique and implant diameter were evaluated. Previous research has pointed that the effect of surgical procedures such as the rate, which the drilling site diameter is external or internal and if at all utilized, to heal around implants may depend on instrumentation, and subsequently its ability to implant contact (BIC) and bone-area-fraction (BAFO) between threads (21) were referred to light microscopy evaluation. Measurements of the percentages of bone-to-implant contact and bone-to-implant contact were evaluated by a GLM ANOVA. Statistical significance was set at 5% (p < 0.05).

The effects of drilling technique, implant diameter, and time in vivo on BIC and BAFO were evaluated by a GLM ANOVA. Statistical significance was set at 5% (p < 0.05).

The present study design allowed the evaluation of osseointegration measurable parameters in a region of interest in that were prepared as an experimental design to determine the success of osseointegration and to test the hypothesis that the temperature elevation, if any created by the simplified procedure, did not affect the rate of osseointegration (24). Intriguingly, not only were the results to the conventional drilling sequence. The results of this study showed that the temperature elevation, if any created by the simplified procedure, did not affect the rate of osseointegration.
Acknowledgment

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References


