



XiVE[®]
Bibliography

*Treatment success –
clinically documented*

DENTSPLY
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INTRODUCTION

The present list of publications on the XiVE® implant system provides a systematic survey on studies which document the clinical application of the XiVE® implant system and the FRIADENT® plus surface by DENTSPLY Friadent.

In the first part of the bibliography you will find publications which document the long-term success of the implant system. The two following chapters present numerous articles regarding the stable situation of peri-implant hard and soft tissue during a treatment with the XiVE® implant system. They are followed by a number of scientific articles on the prosthetic treatment of the XiVE® system.

Subsequent to the documentation of the successful clinical application the next chapter of the bibliography covers different treatment approaches resp. treatment concepts for the XiVE® implant system.

Moreover you will find publications on the FRIADENT® plus surface in combination with XiVE®. Please contact us for a separate bibliography for the FRIADENT® plus surface.

The present bibliography aims at a transparent scientific back-up of the successful use of the XiVE® implant system and the FRIADENT® plus surface. It also offers support regarding the search for relevant articles on the XiVE® implant system.

All articles of the bibliography are published as abstracts.

Bibliographies on the ANKYLOS® implant system, the FRIALIT® implant system and the FRIADENT® plus surface are also available. Further publications on the systems and the surface can be found in relevant databases (e.g. PubMed).

For additional information, please contact your DENTSPLY Friadent partner or info@friadent.de. We will be pleased to help you.

DENTSPLY Friadent

User notes: *The instructions for use that we supply for every product are the final authority for the use of our products with the approved indications. It is possible that the applications and indications described in this bibliography are not yet scientifically accepted or not recommended by us in our instructions for use. The therapist is solely responsible for the selection of a treatment method in every individual case. We cannot accept any liability for the selection of an unsuitable treatment method.*

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X1

Degidi M, Piattelli A: Comparative analysis of immediate functional loading and immediate non-functional loading to traditional healing periods: A 2-year follow-up of 702 dental implants.

Int J Oral Maxillofac Implants 2005; 20 (1): 99 – 107.

PURPOSE:

The aim of this study was to clinically evaluate immediate functionally loaded (IFL) and immediate non-functionally loaded (INFL) implants for various indications compared to a control group with a conventional healing period.

MATERIALS AND METHODS:

Two hundred fifty-three patients took part in the study. A total of 702 XiVE® implants (FRIADENT GmbH, Mannheim, Germany) were placed: 253 IFL implants, 135 INFL implants, and 314 controls.

RESULTS:

In each of the 3 groups, 2 implants failed. For all the other implants involved, from a clinical and radiographic point of view, osseointegration was successful.

DISCUSSION:

As long as the prerequisites are fulfilled, immediate functional loading and immediate non-functional loading are predictable techniques, not only in completely edentulous patients but also in partially edentulous patients.

CONCLUSION:

Immediate functional loading and immediate non-functional loading appear to be techniques that can provide satisfactory implant success rates in selected cases.

Dental School, University of Chieti-Pescara, Chieti, Italy.

Implant success of immediate functionally loaded implants (IFL Group) and of immediate non functionally loaded implants (INFL Group)*

Anatomic configuration	No. of patients	No. of implants	No. of failed implants	% Implants success	% Prosthetic success
<i>IFL Group</i>					
Edentulous mandible	14	92	0	100.0	100.0
Edentulous maxilla	20	161	2	98.7	100.0
Total	34	253	2	99.2	100.0
<i>INFL Group</i>					
Anterior mandible	10	25	0	100.0	100.0
Posterior mandible	16	50	0	100.0	100.0
Anterior maxilla	6	14	0	100.0	100.0
Posterior maxilla	9	24	0	100.0	100.0
Single	22	22	1	95.4	95.4
Total	63	135	1	99.2	98.4

*In the original article, two separate tables (1 x IFL group and INFL group) are listed.

Degidi M, Piattelli A, Felice P, Carinci F:
Immediate functional loading of edentulous maxilla:
A 5-year retrospective study of 388 titanium implants.
J Periodontol 2005; 76 (6): 1004 – 1012.

BACKGROUND:

Immediate functional loading is a new surgical-prosthetic technique that can be used extensively in implant placement. Because of a lack of experimental reports regarding edentulous maxilla, we decided to evaluate the survival rate of immediately loaded implants in this area.

MATERIALS AND METHODS:

Forty-three patients (44.4% male) with a median age of 55 years receiving 388 implants (mean 8.6 per case) were enrolled in this study. Cross-arch acrylic provisional restorations were performed in the same stage. Data were analyzed by Kaplan-Meier product limit estimation. Stratification of implant survival was performed for the available variables of interest, and comparisons were analyzed by log rank test. Cox algorithm was used for multivariable analysis.

RESULTS:

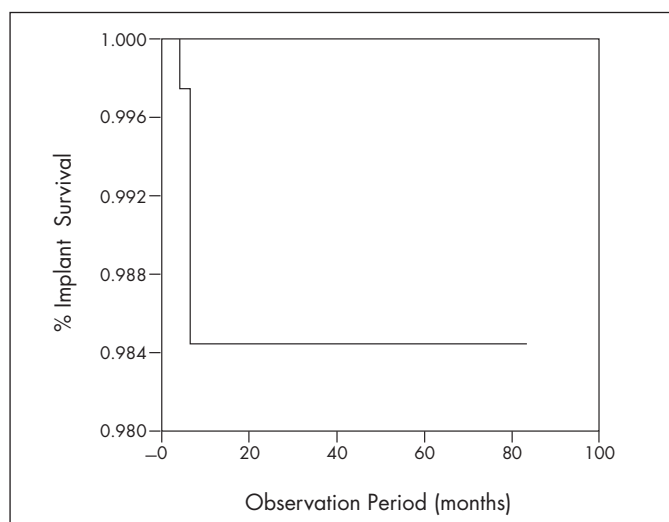
At 5-year follow-up, the crude survival rate (overall survival not stratified according to any available variable) was 98%. All failures occurred within 6 months from loading. We found differences in survival relating to:

- 1) implant diameter (99.37% for diameter \leq 5 mm and 93.75% for diameter $>$ 5 mm);
- 2) number of implants (99.29% for \leq 10 implants and 96.30% for $>$ 10) and
- 3) gender (97.08% and 99.54% for males and females, respectively). Cox regression analysis showed that diameter of implants adjusted for patient age and gender was associated to an average risk of failure (hazard rate) of 3.13 (p value = 0.042) 5% confidence interval 1.04 – 9.43) per mm (from 3 to 6.5).

CONCLUSION:

Immediate functional loading is a reliable surgical-prosthetic procedure in the edentulous maxilla. Implants with wider diameter are associated with an higher risk of failure.

Dental School, University of Chieti-Pescara, Chieti, Italy.



Implant survival curve
according to Kaplan-Meier
Number of implants: 382
Failures: 6
Survival rate: 98,45%

X3

**Degidi M, Piattelli A, Gehrke P, Carinci F:
Clinical outcome of 802 immediately loaded and two-stage submerged
implants with a new grit-blasted and acid-etched surface:
A twelve months follow-up.**

Submitted to Int J Oral Maxillofac Implants in April 2005.

BACKGROUND:

The texture of the implant surface has been recognized to be a decisive factor to achieve osseointegration. It has been claimed that implants with an enhanced surface roughness may promote the rate and degree of osseointegration and eventually improve the clinical success rate.

PURPOSE:

Aim of this study was an evaluation of the clinical outcome of three different implant macrodesigns with a new microstructured implant surface.

MATERIALS AND METHODS:

In the period between July 2003 and December 2003, 321 patients (128 men, 193 women, between the ages of 18 to 88) were enrolled. A total of 802 implants were placed, of which 255 (31.8%) in men and 547 (68.2%) in women. Immediate loading was chosen for 423 (52.7%) implants and delayed loading for 379 (47.3%) implants. In this case a submerged technique (two-stage) or single-stage procedure was used. The following variables were statistically analyzed: implant length (minimum length 8.0 mm), implant diameter (minimum diameter 3.0 mm), implant type (FRIALIT® plus, XiVE® S plus and XiVE® TG plus), receptor site (anterior and posterior region of maxilla and mandible: incisor, cuspid, premolar and molar region), IT (Insertion Torque) (minimum > 30 Ncm), RFA (Resonance Frequency Analysis) (minimum > 60 ISQ), CD (use of crestal drill) (minimum > 0), type of loading (immediate or delayed) and bone quality (D I – D IV).

RESULTS:

Only three of 802 implants failed to integrate. An implant success rate of 99.6% was achieved for a period of twelve months post placement. Four implants had a crestal peri-implant bone resorption higher than 1.5 mm during the first year. The mean crestal bone loss was 0.15 mm (ranging from +0.9 to -2.0). Only the type of implant, the RFA value, and the implant length showed statistically significant differences. A higher crestal bone loss has been observed in immediate post-extraction cases and in D III – D IV bone quality.

DISCUSSION:

Beside defined surgical and prosthetic approaches, the good clinical outcome of the present study can be attributed to the use of implants with a microstructured surface.

CONCLUSION:

The results of this study provide evidence that immediate loading of dental implants represents a viable treatment alternative to classic delayed loading protocols. Within the limits of the present study, the preliminary data indicate that immediate loading of implants in the anterior and posterior maxilla and mandible can result in successful implant integration and stable peri-implant conditions up to one year.

Dental School, University of Chieti-Pescara, Chieti, Italy.

Degidi M, Piattelli A.:

Immediate functional and non-functional loading of dental implants:

A 2- to 60-month follow-up study of 646 titanium implants.

J Periodontol 2003; 74 (2): 225 – 241.

PURPOSE:

The aim of this study was the evaluation, from a clinical point of view, of implants subjected to immediate functional loading (IFL) and to immediate non-functional loading (INFL) in various anatomical configurations.

MATERIALS AND METHODS:

The study included 152 patients who had given their informed consent. A total of 646 implants were inserted. The implants were placed in 39 totally edentulous mandibles, 14 edentulous maxillae, 23 edentulous posterior mandibles, 16 edentulous anterior mandibles, 16 edentulous anterior maxillae, and 15 edentulous posterior maxillae. Fifty-eight implants were used to replace single missing teeth. In 65 cases, IFL was carried out for 422 implants. INFL was carried out in 116 cases (224 implants).

RESULTS:

In the IFL group 6 of 422 implants failed (98.5% success), in the INFL group only 2 of 224 implants failed (99.1% success). All the other implants appeared, from clinical and radiographic observations, to have successfully osseointegrated and have been functioning satisfactorily since insertion. All failures were observed in the first few months after implant loading.

CONCLUSION:

Immediate functional and non-functional loading with XiVE® implants seems to be a technique that gives satisfactory results in selected cases.

Dental School, University of Chieti-Pescara, Chieti, Italy.

X5

Khoury F, Becker C, Hanser T, Berger F-M, Degidi M, Piattelli A: A prospective study on immediate loading of dental implants.

Scientific Poster, International Congress on Reconstructive Preprosthetic Surgery, April 5 – 7, 2003.

INTRODUCTION:

High success rates, progress in therapy and technical innovations provided cause for accelerate implant protocols. The presentation reports the results of a study evaluating the clinical performance of immediate loading of dental implants.

MATERIALS AND METHODS:

Between 1999 and 2001 210 XiVE® screw-type implants with a grit-blasted and acid-etched surface were consecutively placed in 62 patients and immediately loaded having a placement torque of minimum 35 Ncm. 186 were placed in the mandible and 24 in the maxilla. Most of these implants were inserted in the interforaminal area of the mandible (172 implants), restored with a bar and overdenture and functionally loaded. 31 implants mainly in the esthetic area of the maxilla were immediately restored but without functional loading (out of occlusion), most of them for restoration.

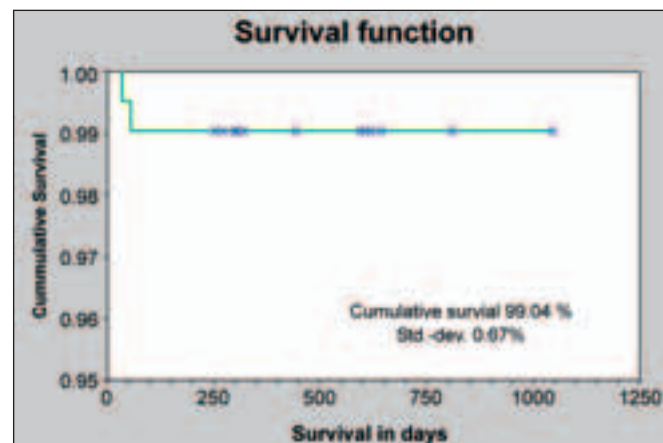
RESULTS:

After a follow-up of 12 to 36 months (average 27.3 months) 2 implants failed in the edentulous mandible, both during the first 2 months of loading (99.5% success). All other implants are still in function with acceptable peri-implant parameters. Bone loss > 3 mm was observed in 6 implants placed in the edentulous mandible. The 31 non-functionally loaded implants osseointegrated and were restored with a functionally loaded ceramic crown 3 months after implant placement. Peri-implant probing depth and bone loss showed no significant difference between functional and non-functional implant loading.

DISCUSSION:

The data and the experience described of this 3-year analysis indicate that immediate loading of implants using appropriate surgical and restorative techniques can be a predictable technique for shortening dental rehabilitation time with relevant satisfaction for patients in restricted indications. Immediate restoration of implants in the esthetic area without functional loading seems to be a successful method in cases of implants with a high primary stability.

Clinic Schloss Schellenstein, Olsberg, Germany.



**Degidi M, Scarano A, Iezzi G, Piattelli A:
Histological analysis of an immediately loaded implant retrieved after
2 months.**

J Oral Implantol 2005; 31 (5): 247 – 254.

INTRODUCTION:

Human biopsy of immediately loaded implants is the most important way to determine the occurrence of osseointegration. Implants inserted in sites with poor bone quality have been associated with lower success rates.

AIM:

The aim of this study is to document the early healing processes in a man around an immediately loaded implant retrieved after a 2-month loading period.

MATERIALS AND METHODS:

An implant was inserted in the mandible of a 32-year-old patient and was loaded into a non-functional loading mode with a fixed provisional prosthesis the same day of the implant surgery. After 2 months, because the patient had difficulty accepting the implant, the implant was retrieved with a 5-mm trephine drill.

RESULTS:

Before retrieval, the implant appeared to be clinically osseointegrated, and no mobility was present. The pre-existing bone quality was type D IV. The implant was surrounded by newly formed bone lamellae with a width of 200 to 400 μ m. In many areas it was possible to observe osteoblasts producing osteoid matrix directly on the implant surface. Bone-to-implant contact percentage was 71 % \pm 3.2%.

CONCLUSION:

Even in a poor bone site and after a healing period of only 2 months, we observed a high bone-to-implant contact percentage. We can confirm that immediately loaded implants placed in soft spongy bone after a 2-month healing period can present mineralized tissue at the interface.

Dental School, University of Chieti-Pescara, Chieti, Italy.



The implant (XiVE® plus) was surrounded by lamellar and woven bone. The bone was in close contact with the implant surface. At the coronal level, no infrabony pocket, howship lacune, or osteoclasts were present (magnification x12).



Lamellar and woven bone were observed in direct contact with the implant surface; no gaps or connective tissue were present at the bone-implant interface. No apical epithelial migration was found. No inflammatory infiltrate was present around the implant (original magnification x100).

Degidi M, Scarano A, Piattelli M, Perrotti V, Piattelli A.:
Bone remodeling in immediately loaded and unloaded titanium dental implants: A histological and histomorphometrical study in humans.

J Oral Implantol 2005; 31 (1): 18 – 24.

BACKGROUND:

Remodeling is thought to prevent micro damage accumulation caused by repetitive loading and to increase the fatigue life of bone. The bone remodeling rate (BRR) is the period of time needed for new bone to replace the existing bone and to allow for the adaptation of bone to its environment. BRR is expressed as a percentage or volume of new bone within a specific time period.

PURPOSE:

The aim of the present study was to evaluate bone remodeling events on submerged and immediately loaded dental implants.

MATERIALS AND METHODS:

Twelve patients with edentulous mandibles participated in this study. All patients were rehabilitated with fixed mandibular prostheses, with 10 dental implants per patient. An additional implant was inserted in the most distal posterior mandibular jaw region. In 6 patients, these additional implants were loaded with a fixed provisional prosthesis the same day of the implant surgery and loaded. In the other 6 patients, the additional implants were left submerged and not loaded. After 6 months, all the additional implants were retrieved with a trephine. The percentage of woven and lamellar bone, number of osteoclasts and osteoblasts, and percentage of bone labeled by tetracycline at 0.5 mm and 2 mm from the implant surface were evaluated.

RESULTS:

The percentage of lamellar bone, number of osteoblasts, and percentage of bone tetracycline labeling was significantly higher in the loaded implants than in the unloaded implants ($P = .0001$). Also in the loaded implants, the percentage of woven and lamellar bone, number of osteoclasts and osteoblasts, and percentage of bone tetracycline labeling was significantly higher at 0.5 mm than at 2 mm from the implant surface ($P = .0001$). No such differences were found in unloaded implants ($P = .377$).

CONCLUSION:

In conclusion, we found that (1) loading appeared to stimulate bone remodeling at the interface, (2) a higher percentage of lamellar bone was found in loaded implants, (3) the percentage of bone labeling was higher at the interface of loaded implants, (4) no differences were found in the BRRs between immediately loaded and unloaded implants, and (5) immediate loading had not interfered on the lamellar bone formation at the interface and had not produced formation of woven bone at the interface.

Dental School, University of Chieti-Pescara, Chieti, Italy.

**Degidi M, Scarano A, Piattelli M, Piattelli A:
Histological evaluation of an immediately loaded titanium implant
retrieved from a human after 6 months in function.**

J Oral Implantol 2004; 30 (5): 289 – 96.

BACKGROUND:

Clinical and histological studies have demonstrated that immediate loading can be successfully used in implant dentistry. Many factors are thought to be of importance in obtaining mineralized tissues at the interface.

PURPOSE:

This study describes the implant interface of an immediately loaded implant with a conical implant-abutment connection that had been inserted in the posterior mandible for 6 months.

RESULTS:

Histology showed that mineralized tissue was present at about 74% \pm 6% of the implant interface. No gaps, fibrous tissue, or inflammatory infiltrate were present at the interface. The bone adjacent to the implant was mainly lamellar (90% \pm 4.5%). Tetracycline was used to label trabecular bone, and labeled bone was found in direct contact with the implant surface. The extensive labeling by tetracycline demonstrated a large quantity of newly formed bone at the implant interface. The distance between the 2 lines marked by tetracycline was 85 \pm 5 μ m.

CONCLUSION:

The results of this study show that immediately loaded dental implants can form mineralized tissues at the bone-implant interface.

Dental School, University of Chieti-Pescara, Chieti, Italy.

X9

Degidi M, Petrone G, Lezzi G, Piattelli A:
Histological evaluation of 2 human immediately loaded and 1 titanium implant inserted in the posterior mandible and submerged retrieved after 6 months.

J Oral Implantol 2003; 29 (5): 223 – 9.

BACKGROUND:

Immediate loading can be successfully used in implant dentistry. Many factors are thought to be of importance in obtaining mineralized tissues at the interface. One such factor is the implant surface characteristics.

MATERIALS AND METHODS:

The authors retrieved, after a 6-month loading period, 2 immediately loaded implants and 1 submerged implant, each of which had been inserted in posterior mandibles.

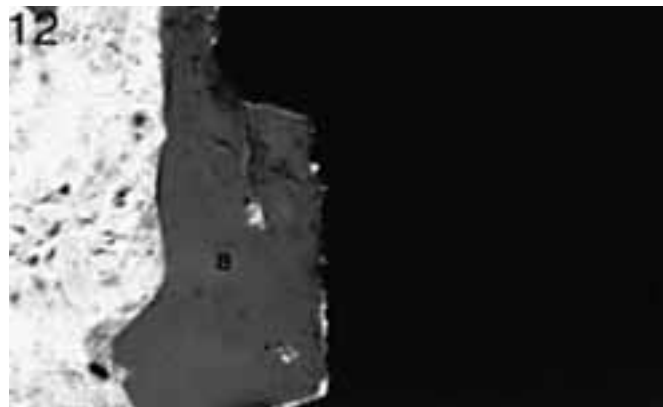
RESULTS:

Histology showed that, in both immediately loaded implants, mineralized tissue was present at the interface, and the bone-implant contact percentage was about 65% to 70%. No gaps, fibrous tissue, or inflammatory infiltrates were present at the interfaces. In the submerged (control) implant, the bone-implant contact percentage was much lower (about 35%).

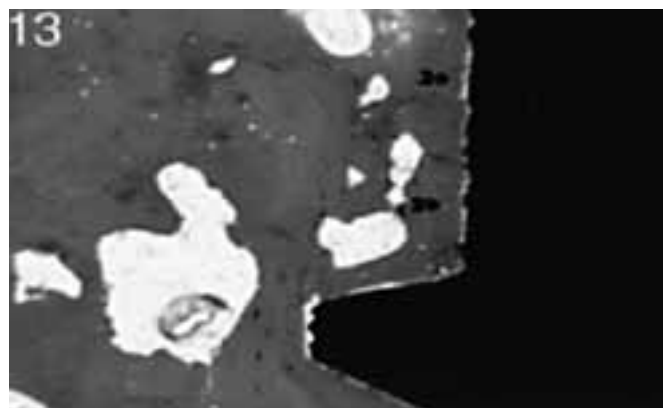
CONCLUSION:

Our results showed that immediate loading of dental implants, even in the posterior regions of the jaw bones, hadn't caused untoward effects on the formation of mineralized tissues at the interface, producing, on the contrary, a higher bone-implant contact percentage than in the control implant, and thus, immediate loading can be a possible alternative procedure in implant dentistry.

Dental School, University of Chieti-Pescara, Chieti, Italy.



Immediately loaded implant at 6 months. The implant shows newly formed bone (B) all around its perimeter. Original magnification x20.



Immediately loaded implant at 6 months. At higher magnification, a very intimate contact between implant and bone can be observed. No gaps are present at the interface. Original magnification x50.

**Iezzi G, Degidi M, Scarano A, Periotti V, Piattelli A:
Bone response to submerged, unloaded implants inserted in poor bone sites: A histological and histomorphometrical study of 8 titanium implants retrieved from man.**

J Oral Implantol 2005; Vol 31 (5): 225 – 233.

INTRODUCTION:

An important parameter that influences the long-term success of oral implants is the bone quality of the implant bed. Posterior areas of the jaws have been avoided in implant dentistry because of their poor bone quality, higher chewing forces, and presumed higher implant failure rates. Several researchers have deemed soft bone implant sites to be a great potential risk situation, and most failures have been found in sites where the bone density was already low. The inferior success rates in the posterior maxilla have been attributed to a lower bone density and a lesser bone-implant interface.

AIM:

The aim of the present study was a histological and histomorphometrical analysis of the bone response to submerged implants inserted in posterior areas of the human jaws and retrieved, for different causes, after healing periods varying from 6 weeks to 12 months.

MATERIALS AND METHODS:

Eight submerged implants that had been retrieved for different causes after different healing periods were evaluated in the present study. All implants were submerged and unloaded.

RESULTS:

Three implants had been removed for inadequate patient adaptation, 2 for inability of the implant to meet changed prosthetic needs, 1 for not optimal position from esthetic and hygiene aspects, and the last 2 for pain and dysesthesia. All the implants were retrieved with a 5-mm trephine bur. Newly formed peri-implant bone was found in all implants even after shorter healing periods. The bone-implant contact percentage varied from 30% to 96%.

CONCLUSION:

In conclusion, some surfaces have an improved characteristic of contact osteogenesis in soft bone, with coverage of the implant surface with a bone layer as a base for intensive bone formation and remodeling. We documented osseointegration of implants with a rough surface even after an insertion period of less than 2 months, both in the mandible and in the maxilla. From these results, we tentatively extrapolate that these implants might be carefully loaded after 2 months of healing, even when inserted in soft bone. A higher removal torque value might lead to a more predictable use of shorter implants, to support a prosthesis with fewer implants, or to shorter healing periods.

Dental School, University of Chieti-Pescara, Chieti, Italy.

Retrieval times, sites, types of implants, and bone-to-implant contact (BIC)*

Retrieval time	Site	Type of implant	% BIC*
6 wk	Mandible	XiVE® plus	96
7 wk	Mandible	XiVE® plus	55
8 wk	Maxilla	XiVE® plus	68
6 mo	Mandible	FRIALIT®-2 Synchro	70
6 mo	Mandible	XiVE® DPS	51
12 mo	Maxilla	XiVE® DPS	30

* This is an excerpt from the author's original table.

Karapetian VE, Neugebauer J, Zöller JE:
Resonance frequency analysis of implants in augmented bone.
*Scientific Poster, 18th Annual Meeting of the Academy of
Osseointegration, February 27 – March 1, 2003.*

INTRODUCTION:

Primary stability and mechanical interlocking are stated as success factors for osseointegration [3]. The quality of implant sites prepared by bone grafts varies depending on the kind of the grafting material. The evaluation of the mechanical stability was done by the RFA method (Osstell®, Integration Diagnostic Inc). The ISQ were taken after implant placement and after second stage surgery.

PURPOSE:

The aim of this pilot study was to measure the stability of clinically successful implants in partially or entirely edentulous patients after jaw augmentation using the distraction osteogenesis or hip graft.

MATERIALS AND METHODS:

In this clinical study 29 patients were implanted with 160 implants of two different types (FRIALIT®-2 stepped cylinder and XiVE® parallel walled screw, FRIADENT GmbH, Germany). In case of atrophied jaws, all patients had to undergo an augmentation treatment before implants could be inserted. The two augmentation methods used in this study: Hip graft and distraction osteogenesis. After an adequate healing time of 4 month the implants were inserted in the augmented jaw. ISQ values were measured with the Osstell® device (Integration Diagnostic Inc) at the time of implant insertion and 4 month later after re-opening which was necessary to continue with the prosthetic treatment.

RESULTS:

The ISQ results for both augmentation procedures had a mean of 66.64, with a minimum of 48 and a maximum 89. At the re-opening the average was 74.16 with minimum of 52 and a maximum 90. These results differ significantly between surgery and re-opening. The values in the 113 mandible implants were the following: mean 68.64, at implant placement and for the re-opening mean 75.27. The values of the implants in the maxilla (47) were the following: mean 61.83 at implant placement and for the re-opening mean 71.51. No correlation was found between implant length and stability within the hipbone augmented group. Within the distracted group, stability correlated to the length. Implants that were long enough to reach through the distracted bone were more stable than implants that only reached the new distracted bone. Of course there was a difference between ISQ results between the first measurement and after osseointegration time. The comparison of implant designs regarding to the ISQ values showed no significant differences ($p = 0.132$ for ISQ surgery, $p = 0.639$ for ISQ re-opening).

Department of Oral and Maxillofacial Surgery, University of Cologne, Germany.

**Neugebauer J, Traini T, Thams U, Piattelli A, Zöller JE:
Peri-implant bone organization under immediate loading state:
circularly polarized light analysis. A mini-pig study.**

Accepted in 2005 for publication in J of Periodont.

BACKGROUND:

Immediate loading of dental implants is one of currently most examined topics in implant dentistry. Utilizing screw implants with a micro-structured surface and bone quality adapted insertion procedures, osseointegration is achieved when implants are initially stable and when splinted with the superstructure. Despite reported success, there is a shortage of information relating to remodeling and the peri-implant bone formation with immediately loaded implants.

MATERIALS AND METHODS:

Four to six immediately loaded and unloaded dental implants with a micro-structured surface were placed in the mandible and the maxilla in seven mini pigs. A total of 85 implants were placed. After a four-months healing period all implants were retrieved. Histomorphometry was performed using a light microscope in transmitted polarized light connected to a high-resolution video camera interfaced to a monitor and PC. This optical system was associated with a digitizing pad and a histomorphometry software package with image capturing capabilities.

RESULTS:

Implants showed osseointegration if the average insertion torque of the implants within one bridge was above 35 Ncm. If the primary stability of the bridge was below 35 Ncm all implants of this quadrant were lost after four month. The multivariant discriminate analysis showed the highest correlation for implant stability by bridge insertion torque (BIT), localization (mandible or maxilla) and implant insertion torque (IIT) as success parameter. The loaded implants displayed collagen fibers, which were oriented in a more transverse way. In addition a higher quantity of secondary osteons was present. In comparison, the unloaded implants had collagen fibers with a more parallel orientation and a higher quantity of marrow spaces was present.

CONCLUSION:

When observed after four month, immediately loaded implants showed a higher degree of bone formation and remodeling in comparison to unloaded implants. Immediately loaded implants also demonstrated a prevalence of transversely oriented collagen fibers in the peri-implant bone. In this animal model, an average insertion torque of the implants within one bridge above 35 Ncm was used for the most successful implants.

Department of Craniomaxillofacial and Plastic Surgery, University of Cologne, Germany.

X13

**Neugebauer J, Thams U, Románm S, Steveling H:
Clinical procedure and first results of immediately restored implants –
A study in mini-pigs.**

*Scientific Poster, 10th Annual Congress European Association for
Osseointegration, September 13 – 15, 2001.*

INTRODUCTION:

The immediate loading of dental implants in partially edentulous patients has not been widely investigated. Following the experience of the treatment of the anterior mandible, immediate loading requires pre-conditions such as immobilization of the implants with a superstructure and shortened surgical and prosthetic treatments. The preparation of the receptor site in the mandible is accomplished with drills. In soft bone, improvement of the bone quality can be achieved by BoneCondensing. This technique can also be used to perform minor lift procedures. Adaptation of the receptor site by "under-sizing" the osteotomy relatively to the implant is another option to help achieve primary stability.

AIM:

An animal study on mini-pigs was performed to evaluate the clinical success and bone reaction during the course of osseointegration for implants in the mandible and maxilla.

MATERIALS AND METHODS:

The premolars and the first molar were removed. After three months, implant placement and prosthetic temporization was performed for 61 XiVE® implants (FRIADENT GmbH, Mannheim, Germany). 27 implants were placed in the maxilla and 34 in the mandible. The preparation in the mandible was performed with drills. The preparation in the maxilla was performed by BoneCondensing technique to increase the local bone quantity and quality with an internal sinus-lift. The special thread design with a lower thread profile in the crestal portion allows a differentiated implant site preparation with the final crestal drill. Based on the bone quality, internal condensation by the implant is used to improve the final insertion torque. 49 implants were stabilized with prefabricated caps and glass fiber ribbons. The bridges were cemented onto the abutments at the end of surgery and controlled until the animals were sacrificed.

RESULTS:

Due to the adaptation of the receptor site preparation based on the bone quality, utilizing cortical drills in the mandible and bone condensing instruments in the maxilla, 92% of all implants were placed with an insertion torque (IIT) above 25 Ncm. The mean value of the insertion torque per bridge (BIT) was evaluated. If the BIT was less than 35 Ncm the bridges were not stable and the implants were lost after torque analysis loaded implants (failures) a few weeks prior to the first recall. In the mandible, of the directly loaded implants (N = 27) two failures occurred (92.6% success). The control implants in the mandible had a 100% success rate (N = 7). Three out of 22 directly loaded implants in the maxilla were stable after three months (13.6% rate). Two out of 5 control implants in the maxilla were stable (40% success rate).

Department of Craniomaxillofacial and Plastic Surgery, University of Cologne, Germany.

Nkenke E, Lehner B, Fenner M, Roman FS, Thams U, Neukam FW, Radespiel-Troger M:

Immediate versus delayed loading of dental implants in the maxillae of mini pigs: Follow-up of implant stability and implant failures.

Int J Oral Maxillofac Implants 2005; 20 (1): 39 – 47.

PURPOSE:

To assess the course of the stability and the failure rate of dental implants placed in the partially edentulous maxillae of mini-pigs.

MATERIALS AND METHODS:

Three months after tooth removal, implants were placed in 9 mini-pigs. Six implants (XiVE®; FRIADENT GmbH, Mannheim, Germany) were placed on each side of the posterior maxilla after preparation of the implant sites either by an osteotome technique or with spiral drills. Implant stability was assessed by resonance frequency analysis (RFA) at the time of placement, at second-stage surgery (which took place after a healing periods of 1, 2, 3, 4, or 5 months), and after a loading period of 6 months.

RESULTS:

Implant stability was significantly influenced by the healing period (P = .007). Implant stability decreased after 1 to 3 months of healing for both of the placement techniques and increased after a healing period of 4 months. After implant site preparation by an osteotome technique, 6 of 12 immediately loaded implants, 18 of 24 implants loaded after healing periods of 1 to 3 months, and 1 of 18 implants loaded after a healing period of 4 or 5 months were lost. After implant site preparation using spiral drills, 7 of 12 immediately loaded implants, 12 of 24 implants loaded after healing periods of 1 to 3 months, and 2 of 18 implants loaded after healing periods of 4 or 5 months were lost.

DISCUSSION AND CONCLUSION:

Implant loading after healing periods of 1 to 3 months did not improve implant survival compared to immediate loading in the posterior maxillae of mini-pigs. Not until a healing period of 4 months was reached did implant stability begin to increase. Only when functional loading was started at this point in time was maximal implant survival achieved.

Department of Oral and Maxillofacial Surgery, University of Erlangen, Germany.

Distribution of implant stability (Resonance Frequency Analysis)*

Healing period (mo)	No. of implants	Implant stability		After 6 mo of healing No. of implants	Mean (Hz)
		Initial Mean (Hz)	Second-Stage surgery No. of implants		
<i>Osteotome technique</i>					
0	12	6,959.8	–	6	6,641.2
1 to 3	24	6,604.4	18	6	6,555.8
4 or 5	18	6,991.3	17	17	6,674.8
<i>Spiral drill technique</i>					
0	12	7,130.8	–	5	6,624.0
1 to 3	24	6,676.6	22	12	6,170.9
4 or 5	18	6,935.5	17	16	6,484.9
0 = immediate loading					

* This is an excerpt from the author's original table.

X15

Nkenke E, Lehner B, Weinzierl K, Thams U, Neugebauer J, Steveling H, Radespiel-Troger M, Neukam FW:

Bone contact, growth, and density around immediately loaded implants in the mandible of mini-pigs.

Clin Oral Implants Res 2003; 14 (3): 312 – 21.

PURPOSE:

The aim of the study was to compare the bone mineral apposition rate (BMAR) of immediately loaded implants with an unloaded control during the early healing phase in the partially edentulous mandible.

MATERIALS AND METHODS:

In seven mini pigs, three premolars and the first molar were removed in the left mandible. Three months later, five implants were installed. Four implants received a fixed provisional restoration and were loaded immediately. The most anterior implant was used as unloaded control. Polychromatic fluorescence labeling was performed to assess the BMAR. After 4 months, the implants were retrieved together with the adjacent bone. Histological specimens were prepared and subjected to a fluorescence microscopic and histomorphometric analysis.

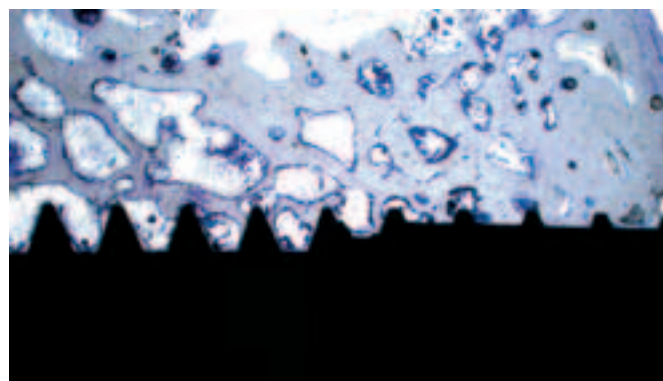
RESULTS:

Two provisional restorations were found partially lost at the end of the observation period. One implant that had lost the splinting fixation showed soft connective tissue healing. The BMAR did not differ statistically significantly between loaded and unloaded implants and within the single groups during the observation period (BMARloaded days 14 – 42 = 1.8 +/- 0.2 microm/d, BMARloaded days 42 – 70 = 1.8 +/- 0.1 microm/d, BMARloaded days 70 – 98 = 1.6 +/- 0.1 microm/d, pBMARloaded days 14 – 42/42 – 70/70 – 98 = 0.156, BMARunloaded days 14 – 42 = 1.7 +/- 0.1 microm/d, BMARunloaded days 42 – 70 = 1.8 +/- 0.2 microm/d, BMARunloaded days 70 – 98 = 1.6 +/- 0.4 microm/d, pBMARunloaded days 14 – 42/42 – 70/70 – 98 = 0.368, pBMARloaded/unloaded days 14 – 42 = 0.073, pBMARloaded/unloaded days 42 – 70 = 0.098, pBMARloaded/unloaded days 70 – 98 = 0.262). Four months after implant placement, the bone-to-implant contact was 77.8 +/- 17.3% for the loaded and 78.0 +/- 5.8% for the unloaded implants (P = 0.753).

CONCLUSION:

Immediate loading does not affect the bone mineral apposition rate when compared with unloaded implants. Rigid splinting seems to be the crucial factor for implant success. Uncontrolled masticatory forces can cause failure after partial loss of the provisional restoration.

Department of Oral and Maxillofacial Surgery, University of Erlangen, Germany.



Histologic section: Specimen of an immediately loaded implant retrieved after 4 months of healing, toluidine blue staining. Final magnification x7.

Novaes Jr AB, Oliveira RR, Taba Jr M, Souza SL, Palioto D B, Grisi MF, Papalexiou V:

Crestal bone loss minimized when following the crestal preparation protocol: A histomorphometric study in dogs.

J Oral Implantol 2005; 31 (6): 276 – 282.

PURPOSE:

Initial breakdown of the implant-tissue interface generally begins at the crestal region in successfully osseointegrated implants. The purpose of this study was to evaluate the effect on crestal bone loss (CBL) around implants specially developed for immediate loading with a unique crestal drill.

MATERIALS AND METHODS:

After 8 weeks postextraction, 6 young male mongrel dogs received 48 implants (XiVE®) in the region corresponding to the 4 mandibular premolars. The implant sites were prepared according to the manufacturer's protocol with conventional standard drills. Before implant placement, the crestal drill was used in the experimental group but not in the control group. After a healing period of 12 weeks, the dogs were sedated and euthanized. Through linear measurements, from the top of the implant to the first bone-implant contact, the amount of CBL was determined.

RESULTS:

The histomorphometric results of CBL (mean ± SEM) were 0.88 ± 0.13 mm (range 0.0 – 3.0 mm) in the experimental group and 1.69 ± 0.17 mm (range 0.0 – 4.2 mm) in the control group. The difference was statistically significant ($P < .05$) when the implants were used as the experimental units. The statistical analysis also revealed significance when the dogs were used as the experimental units ($P < .05$). When the median was used for analyses, the CBL was 0.44 mm for the experimental group and 1.91 mm for the control group. Crestal bone loss was minimized when the crestal preparation protocol was carefully followed by using the osseocondensating XiVE implant system.

Department of Bucco-Maxillo-Facial Surgery and Traumatology and Periodontology, School of Dentistry of Ribeirão Preto, University of São Paulo, Ribeirão Preto, Brazil.

X17

**Oliveira RR, Novaes Jr AB, Taba Jr M, Papalexiou V, Souza SL, Palioto DB, Grisi MF:
The effect of bone condensation and crestal preparation on the bone
response to implants designed for immediate loading.**

A histomorphometrical study in dogs.

Submitted to Int J Oral Maxillofac Implants.

AIM:

The aim of this study was to evaluate the influence of bone condensation and crestal preparation on osseointegration of implants specially designed for immediate loading and that promotes bone condensation.

MATERIALS AND METHODS:

In the first phase, the mandibular bicuspids were extracted bilaterally. After 8 weeks of healing period, each dog received 8 implants (XiVE®, DENTSPLY Friadent, Mannheim, Germany) placed randomly at the edentulous areas of the first to fourth premolars of both sides in 6 dogs. The implant site was prepared according to the protocol using conventional standard drills. Previously to the implant placement the crestal drill was used in the experimental group but not in the control group. After a healing period of 12 weeks, the animals were sedated and sacrificed. The hemi-mandibles were removed, dissected, fixed and prepared for histomorphometrical analysis of bone/implant contact (BIC) and bone density of the adjacent and distant areas from the implant surface.

RESULTS:

The results showed that the percentages of BIC were $71.1 \pm 11.8\%$ and $45.1 \pm 11.8\%$ for experimental and control group respectively. The bone density analysis revealed that the percentages of bone in adjacent areas were $71.1 \pm 8.6\%$ and $55.6 \pm 11.3\%$, and in the distant areas from the implants were $51.7 \pm 11.8\%$ and $50.7 \pm 17.9\%$, for experimental and control group, respectively. The differences were statistically significant for both parameters, BIC and bone density in adjacent areas ($p < 0.0001$).

CONCLUSION:

In conclusion, crestal bone preparation is of fundamental importance for this implant system since it leads to better bone response, represented by the improved BIC and density.

Department of Bucco-Maxillo-Facial Surgery and Traumatology and Periodontology, School of Dentistry of Ribeirão Preto, University of São Paulo, Ribeirão Preto, São Paulo, Brazil.

**Piattelli A, Traini T, Degidi M, Neugebauer J, Caputi S:
Bone collagen fibers orientation in the loaded osseointegrated XiVE®
dental implants in human.**

*Scientific Poster, European Association for Osseointegration,
October 9 – 11, 2003.*

PURPOSE:

Immediate loading quite often shows higher risk for implants, if the preconditions are not clear and micro-movement disturb the course of osseointegration. The clinical experience shows a high success rate, if the appropriate protocol is used. This study investigates the birefringence in the human peri-implant bone after loading.

MATERIALS AND METHODS:

The osseointegrated XiVE® dental implants, retrieved from five patients were used in the present study. The implants, immediately loaded after surgical procedures, were left in function for 6 month before retrieving. Undecalcified cut sections were prepared by using the Precise automated system 1 (Assing, Roma, Italy). One central section from each sample was ground to final thickness of 40 µm. Birefringence was measured as an indicator of transverse collagen fibers orientation using circularly polarized light (CPL). The measurements were performed on digitized images stored in format .tif with NxM = 768 x 1024 grid of pixels for a 24 bit, after converting in gray scale at 8 bit. A semi-quantitative digital densitometry of the black and white areas related to longitudinally or transverse collagen fibers was made by a software image analysis. The area of analysis was standardized for all implants in 9.707 mm² measured at 100x and restricted to the first two threads under cortical bone.

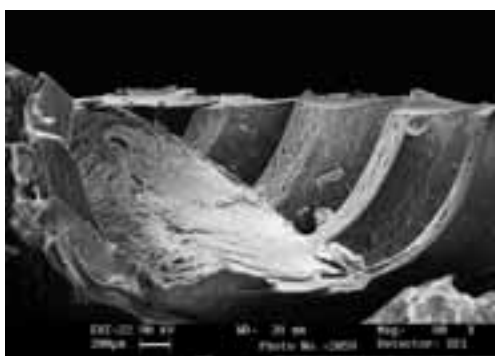
RESULTS:

A 33% (3.208 +/- 0.435 mm²) of the examined area was composed of transverse collagen fibers while only a 20.1% (1.957 +/- 0.253) was composed of longitudinally collagen fibers. The difference was statistically significant (P < .05).

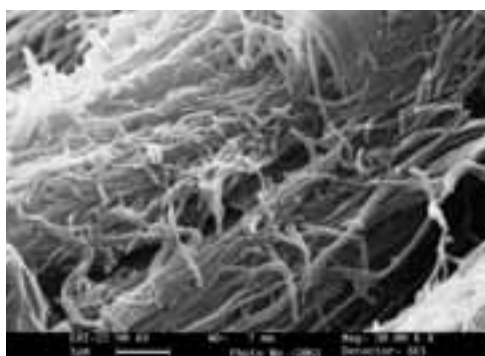
CONCLUSION:

The collagen fibers were more transversally orientated under the horizontally portion on the threads where the compression loads act.

Dental Practice, Chieti, Italy.



Bone block removed from XiVE® implant for SEM evaluation of collagen structure.



Collagen fibre orientation in transversal orientation. Macrostructure of thread is visible. (x30.000).

X19

**Weinländer M, Lekovic V, Neugebauer J, Plenk H, Zöller JE:
Mechanical and histological evaluation of immediate-loaded implants
with various surfaces and designs.**

*Scientific Poster, 18th Annual Meeting of the Academy of
Osseointegration, February 27 – March 1, 2003.*

INTRODUCTION:

Immediate loading is stated to be the most innovative technique in implant therapy. Various designs claim to be beneficial for a time-reduced implant treatment protocol. Different implants are available with various modifications of the macro and micro-morphology.

AIM:

Different surgical approaches are discussed to reach osseointegration while performing immediate loading. To determine the relevant factors for implant success four different implants were placed in each quadrant on two mongrel dogs. Immediate loading was performed in the maxilla and the mandible. The RFA-values were documented, to compare the values with the results with the histological findings.

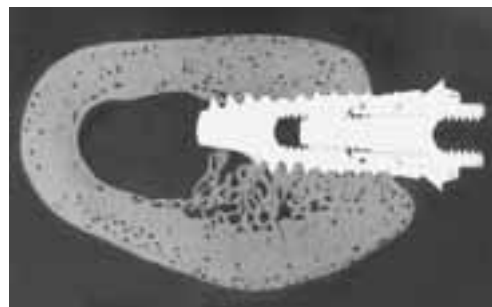
MATERIALS AND METHODS:

To prepare an edentulous alveolar ridge all premolars were removed in general anesthesia. After a regeneration period of 3 months implant placement was performed. In each animal four different implants were placed per quadrant and immediate loading with gold casted bridges was achieved a week post implantation. The ISQ-values (Osstell, Integration Diagnostic) were measured after implant placement and after sacrifice respectively.

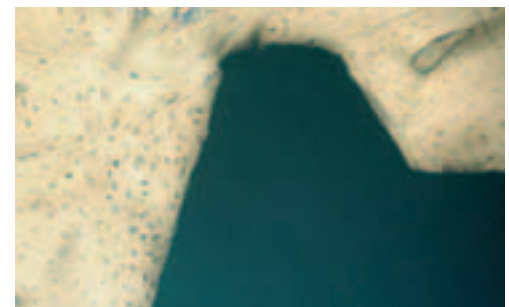
RESULTS:

All 16 bridges were in function after a five-month loading period. No implant was lost or did not show osseointegration. Crestal bone loss was observed in a small amount mainly up to the first thread. Depending on the surgical protocol this bone loss was different for each system. The ISQ values showed an increase between surgery and recall in average 9.25. In marrow bone early formation of new bone was observed. In cortical bone new bone formation was noticed mainly after 3 months of loading. At the loading area of the threads some less intensive bone contact is detectable by micro-radiography. All implants showed a good bone-to-implant contact.

Dental Practice, Vienna, Austria.



MRG with good bone contact at rough surface.



*Good bone contact along implant surface in region
of change of thread designs.*

Hanser T, Becker C, Berger F, Khoury F:

Immediate loading of dental implants: a prospective clinical study.

Scientific Poster, 18th Annual Meeting of the Academy of Osseointegration, February 27 – March 1, 2003.

INTRODUCTION:

High success rates, progress in therapy and technical innovations provided cause for accelerate implant protocols. The presentation reports the results of a study evaluating the clinical performance of immediate loading of dental implants.

MATERIALS AND METHODS:

Between 1999 and 2001 210 XIVE® screw type implants with a grit-blasted and acid-etched surface were consecutively placed in 62 patients and immediately loaded having a placement torque of minimum 35 Ncm. 186 were placed in the mandible and 24 in the maxilla. Most of these implants were inserted in the interforaminal area of the mandible (172 implants), restored with a bar and overdenture and functionally loaded. 31 implants mainly in the esthetic area of the maxilla were immediately restored but without functional loading (out of occlusion), most of them for restoration.

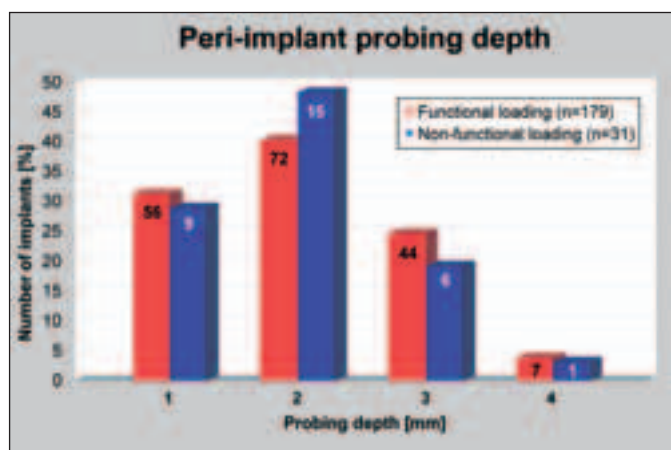
RESULTS:

After a follow-up of 12 to 36 months (average 27.3 months) only 2 implants failed in the edentulous mandible, both during the first 2 months of loading. All other implants (208; 99.05% success) are still in function with acceptable peri-implant parameters. The 31 non-functionally loaded implants osseointegrated and were restored with a functionally loaded ceramic crown 3 months after implant placement. Peri-implant probing depth and bone loss showed no significant difference between functional and non-functional implant loading.

DISCUSSION:

The data and the experience described of this 3-year analysis indicate that immediate loading of implants using appropriate surgical and restorative techniques can be a predictable technique for shortening dental rehabilitation time with relevant satisfaction for patients in restricted indications. Immediate restoration of implants in the esthetic area without functional loading seems to be a successful method in cases of implants with a high primary stability.

Clinic Schloss Schellenstein, Olsberg, Germany.



X21

Gross M, Hartmann H-J, Neugebauer J: Non-functional immediate progressive loading of root-analog implants – Clinical aspects.

*Scientific Poster, 17th Annual Academy of Osseointegration Conference,
March 14 – 16, 2002.*

INTRODUCTION:

Immediate loading has become one of the most interesting challenges in implant dentistry. Many authors have advanced in the field of immediate implant placement. Experiences in early loading with provisional crowns lead to treatment protocols of non-functional loading and progressive loading to achieve a predictable high success rate.

AIM:

The aim of this poster is to present the clinical aspects following the protocol of non-functional immediate progressive loading. The surgical and restorative procedure is shown in comparison with immediate replacement of a maxillary central incisor and delayed implant placement of the posterior area in the mandible. The surgical and restorative procedure is shown step-by-step in order to explain the different approach of immediate restoration dependent on implant placement time. Different surgical techniques are shown to maintain or to create a natural contour of the soft tissue.

MATERIALS AND METHODS:

Immediate Implant Placement. After atraumatic extraction, a 15 mm FRIALIT®-2 implant with 5.5 mm diameter was placed without flap incision and immediately restored with a provisional crown without functional contact. After 4 months the final esthetic restoration was placed. This case shows the excellent tissue reaction and adaptation if atraumatic surgical procedures are applied for maintenance of gingival contour. **Late Implant Placement With Immediate Restoration.** After preprosthetic and pre-surgical planning, 3 XiVE® implants were placed with help of FRIADENT® Select Sleeves and Try-in Abutments. For emergence profile contouring a tissue punch has been used. The provisional restoration was produced with help of TempBase Caps and Fibrecor. This case shows a simple way to create a natural gingival contour and an accelerated fabrication of provisional restoration by use of prefabricated components.

DISCUSSION:

Immediate progressive loading is achieved by provisional restoration without functional contact in final occlusion. In cases of immediate replacement the goal is to maintain the natural gingival contour with atraumatic surgical procedure. In cases of late implant placement the approach is different because a natural emergence profile has to be created. Simplified procedures like the use of a tissue punch enable a fast and predictable result.

FRIADENT GmbH, Mannheim, Germany.

**Khoury F, Becker C, Hanser T, Berger F, Neugebauer J:
A prospective study on immediate loading of dental implants.**

Scientific Poster, International Congress on Reconstructive Preprosthetic Surgery, April 5 – 7, 2003.

INTRODUCTION:

High success rates, progress in therapy and technical innovations provided cause for accelerate implant protocols. The presentation reports the results of a study evaluating the clinical performance of immediate loading of dental implants.

MATERIALS AND METHODS:

Between 1999 and 2001 210 XiVE® screw type implants with a grit-blasted and acid-etched surface were consecutively placed in 62 patients and immediately loaded having a placement torque of minimum 35 Ncm. 186 were placed in the mandible and 24 in the maxilla. Most of these implants were inserted in the interforaminal area of the mandible (172 implants), restored with a bar and overdenture and functionally loaded. 31 implants mainly in the esthetic area of the maxilla were immediately restored but without functional loading (out of occlusion), most of them for restoration.

RESULTS:

After a follow-up of 12 to 36 months (average 27.3 months) 2 implants failed in the edentulous mandible, both during the first 2 months of loading. All other implants are still in function with acceptable peri-implant parameters. Bone loss > 3 mm was observed in 6 implants placed in the edentulous mandible. The 31 non-functionally loaded implants osseointegrated and were restored with a functionally loaded ceramic crown 3 months after implant placement. Peri-implant probing depth and bone loss showed no significant difference between functional and non-functional implant loading.

DISCUSSION:

The data and the experience described of this 3-year analysis indicate that immediate loading of implants using appropriate surgical and restorative techniques can be a predictable technique for shortening dental rehabilitation time with relevant satisfaction for patients in restricted indications. Immediate restoration of implants in the esthetic area without functional loading seems to be a successful method in cases of implants with a high primary stability.

Clinic Schloss Schellenstein, Olsberg, Germany.

X23

Kielhorn J, Haessler D, Neugebauer J: From early loading to a tension-free superstructure.

*Scientific Poster, Deutsche Gesellschaft für Implantologie,
December 4 – 7, 2002.*

INTRODUCTION:

A tension-free passive fit of superstructures while maintaining the maximum precision is a condition sine qua non for the long-term success of every implant-prosthetic rehabilitation. Especially in early loading the formation of tension peaks or micro-recesses must be carefully avoided in order to guarantee the treatment success. A case report shows a step-by-step treatment concept for early and progressive loading – from the long-term temporary to the final restoration – which moreover guarantees an objective tension-free and most exact fit.

DISCUSSION:

The TempBase not only serves as a placement head for the XiVE® implant system (FRIADENT GmbH, Mannheim) but also as an impression coping for index registration. It can moreover be used as a temporary abutment resp. implant analog. This innovative solution allows an easy impression taking immediately after the implant placement with a good determinability of the centric relation. In addition, a too eccentric stress on the implants which is caused by a frequent changing of the abutments is avoided. A reduced number of abutment components is also more economic. We are always using a lab-side produced long-term temporary (immediate provisionalization) in immediate or early loading in order to coordinate the progressive functional loading of the implants and abutments as well as the shaping of the tegument. Here the main focus should be on merely centric contact patterns (centric stops, static occlusion). All extra-axial loading (dynamic occlusion) should be avoided. The symbiosis of CAD/CAM (zirconium oxide) and galvanofarming guarantees the highest possible precision and biocompatibility with excellent material properties. In combination with the intraoral bonding technique an objective tension-free and most exact fit is achieved without any problems caused by casting. Thus mechanical irritations of the peri-implant tissue, the formation and colonization of micro-recesses as well as a stress-induced bone atrophy can be excluded. The consecutive development of a peri-implantitis or even the loss of an implant is therefore eliminated.

Dental Practice, Oppenheim, Germany.

**Kielhorn J, Haessler D, Neugebauer J, Jansen R:
Preserving papillae by immediate implantation –
loading after immediate implant placement?**

Scientific Poster, Europerio 4, June 19 – 21, 2003.

INTRODUCTION:

Alveolar ridge resorption and soft tissue recession after tooth extraction inevitably disrupts the pre-existing periodontal complex. Although numerous surgical procedures had been developed for the enhancement of the alveolar ridge and for the soft tissue management, questions remain regarding the viability and predictability. This is a challenge especially in the maxillary anterior region.

MATERIALS AND METHODS:

Two different standard procedure protocols will be demonstrated. The techniques of immediate implant placement and immediate provisionalization lead to a predictable preservation of the soft tissue architecture around implants. In both cases implant placement and provisionalization was performed directly after tooth extraction without reflecting a flap. Two different implant systems were used (case 1: FRIALIT®-2, case 2: XiVE®. Both DENTSPLY Friadent, Mannheim, Germany). An impression was taken directly after implant insertion, to fabricate the temporary crown in the lab. This crown was placed one hour post OP.

DISCUSSION:

Immediate implant placement is a proven and predictable treatment concept in implant dentistry if the indications are carefully assessed. In combination with customized, anatomic healing abutments or immediate provisionalization, implant placement at this time prevents the atrophy of the alveolar bone and collapse of the peri-implant soft tissue. Healing time is reduced and surgical trauma is minimized. In addition, the contouring of the peri-implant soft tissue offers best esthetic results. An important aspect of immediate implant placement is to decide whether to load directly or to avoid loading the implant. In cases of low primary stability, bruxism or difficult types of occlusion customized, anatomic healing abutments (EsthetiCap) should be used in order to preserve the papillary structures without compromising the success of this treatment. Whenever possible, though, immediate provisionalization should be achieved avoiding any dynamic occlusion (no functional loading!). In cases of immediate provisionalization the XiVE® implant system has proven to be ideal for meeting these requirements.

Dental Practice, Oppenheim, Germany.



X-ray after surgery (XiVE® implants).



Cemented calvanic crowns. Complete preservation of the papillary structures.

X25

Kielhorn J, Haessler D, Jansen R: Immediate implant placement and immediate loading – the innovative possibilities of the XiVE® implant system.

*Scientific Poster, 10th International FRIADENT Symposium,
May 16 – 17, 2003.*

INTRODUCTION:

Achieving natural esthetic results with implants after tooth loss has become one of the greatest challenges in implant dentistry, particularly in the esthetically relevant anterior region. To compensate the collapsed interdental structures and the atrophy of alveolar ridge, which starts only a few weeks after extraction, different concepts are described. Nevertheless, these complex techniques have to be proven on feasibility and predictability. Immediate implant placement appears to be a proven method to reduce the collapse of the extraction alveolar ridge and resorption of the alveolar bone to a minimum. However, the peri-implant soft tissue and the papillae can only be retained in the long term by simultaneous temporary restoration conducted as socket preservation. The temporary restoration should match the emergence profile of the replaced tooth that is being replaced.

AIM:

We wish to use the following case presentation to demonstrate a practical concept of immediate implant placement with immediate temporary restoration.

DISCUSSION:

Immediate implant placement is a proven and predictable treatment concept in implant dentistry when combined with careful assessment of the indications. In combination with immediate temporary restoration, implant placement at this time prevents atrophy of the alveolar bone and collapse of the peri-implant soft tissue. This avoids complex surgical procedures for bone augmentation or regeneration of papillary structures. Healing time is reduced and surgical trauma is minimized. In addition, the retention and contouring of the peri-implant soft tissue by the temporary reconstruction offers optimum esthetic results. An important aspect in this case is a restoration immediately after implant placement. The provisional restoration should have an ideal contour (contact points, emergence profile) for effective soft tissue support and also a high surface-quality in terms of a machine-polished, laboratory-fabricated plastic temporary crown. This virtually eliminates tissue irritation. The XiVE® implant system (DENTSPLY Friadent, Mannheim, Germany) has proven to be ideal for meeting these requirements. In this system the pre-mounted TempBase abutment initially serves as a placement head for the implant. It can also be used as an index coping and as a lab analog. Ultimately, it can also be used as a base for the temporary reconstruction. This offers an option for an immediate and ideal temporary restoration after immediate implant placement that can be integrated into the daily routine of the practice. This method also avoids the rotation forces that occur during frequent changes of abutments and soft tissue irritation caused by temporary plastic materials.

Dental Practice, Oppenheim, Germany.

Grubeanu D, Neugebauer J, Grubeanu-Block B:
Implant-prosthetic immediate restoration of the edentulous mandible.
ZWR 2002; 111 (9): 479 – 483.

INTRODUCTION:

The process of immediate loading in the edentulous mandible by primary splinting with a bar has already been described by Ledermann in 1979. The procedure described in the present publication is based on the immediate loading of 4 intraforaminally placed XiVE® implants. The implants are immediately restored with a conical crown-retained prosthesis. The secondary crowns which were fabricated prior to surgery are polymerized in the existing denture immediately after surgery. They are supported by the corresponding conical implant abutments which were also fabricated before surgery.

RESULTS:

Initial healing proceeded without any complications. The radiological control at 3 and 6 months after implant placement and prosthetic loading showed a complete osseointegration and no sign of a pathological bone loss.

Dental Practice, Trier, Germany.

X27

Haessler D:

Healthy primary stability – limiting the insertion torque in very hard bone with the example of a late implant placement in the atrophied mandible in region 33 and 43.

identity, FRIADENT GmbH 2003; 2: 30 – 31.

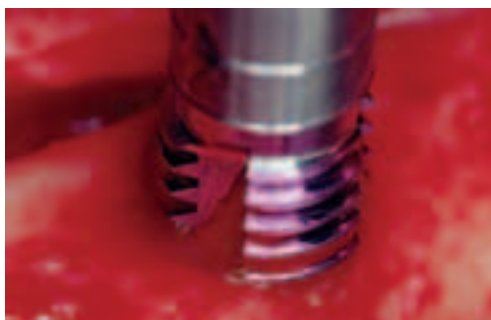
INTRODUCTION:

Clinical research and years of successful insertion of dental implants in everyday practice have verified the requirements for safe bone healing and they have been described in great detail. Without any doubt the primary stability of the placed implant is essential. The most important aspect is undoubtedly the primary stability of the implant placed. The insertion torque allows not only conclusions on the intensity of the bone-implant contact but also plays a decisive role with respect to early function of implants. Solid anchoring in the peri-implant bone is the only way of reducing macromovements at the implant to prevent ingrowth of connective tissue.

AIM:

The use of the XiVE® tap is described and documented with clinical photographs.

Dental Practice, Oppenheim, Germany.



Application of the XiVE® tap



The implant site in regio 33 and 34 is prepared for the placement of XiVE® implants



The XiVE® implants are placed under irrigation

Karapetian VE, Neugebauer J, Zöller JE:

Immediate implant loading in augmented upper and lower jaw.

*Scientific Poster, Academy of Osseointegration Annual Meeting,
March 10 – 12, 2005.*

INTRODUCTION:

Immediate loading in lower jaw is a common treatment method today. Immediate loaded implants after hipbone graft, let alone immediate loading of implants in the upper jaw with and without hipbone grafting have not been examined. The quality of implant sites prepared by bone grafts varies depending on the kind of the grafting material. The evaluation of the mechanical stability was done by the RFA method (Osstell®, Integration Diagnostic Inc).

PURPOSE:

The aim of this study was to show the success of immediate loading in upper and lower jaw and to compare success rates with and without hipbone graft. Primary stability and mechanical interlocking are stated as success factors for osseointegration. Also it should be shown, that immediate loaded implants show comparable stability in the upper jaw without and after hipbone grafting.

MATERIALS AND METHODS:

To evaluate the implant stability of immediate loaded compared to delayed loaded implants a group of 10 patients each was examined after implantation and 3 months after prosthetic loading. Within the group of immediate loaded patients we implanted a minimum of six implants in the upper and/or 4 implants in the lower jaw. If the mean insertion torque of the implants within one bar reconstruction was higher than 35 Ncm, immediate loading was performed and the bar-supported denture was inserted few hours post operationem.

RESULTS:

Comparison of the data did not show significant differences in implant stability between the regular loaded implant and the immediate loaded implants at implant placement and at recall. A mean of 77.25 ISQ (Implant Stability Quotient) was found in the immediate loaded group for the lower jaw implants and 70.53 ISQ in the upper jaw, compared to 75.67 ISQ in the upper and 83.50 ISQ for the lower jaw after 3 months of loading. Furthermore no clinical and radiological difference was visible. On the basis of the data collected, it can be shown that independent of augmentation an immediate loading can be realized with 6 connected implants in the upper and 4 connected implants in the lower jaw.

CONCLUSIONS:

The treatment results showed that the immediate loading treatment method in augmented upper and lower jaws is a treatment technique without any problems, if surgical and prosthetic treatment rules are followed correctly. The primary stability of the inserted implants should not undergo the 35 Ncm insertion torque. Also it has to be mentioned that the implant length stands in no correlation to the primary stability, which is explained by the bone density. The clinical and radiological success also showed that the osseointegration of the immediate loaded implants worked in upper and lower jaw.

Department of Craniomaxillofacial and Plastic Surgery, University of Cologne, Germany.

X29

Lorenzoni M, Pertl C, Jakse N, Wegscheider WA:
Immediate loading of screw-type implants in the posterior mandible.
*Scientific Poster, 13th Annual Scientific Congress of EAO,
September 16 – 18, 2004.*

INTRODUCTION:

According to the Brånemark protocol, a stress free healing period is one of the most emphasized requirements for implant integration. Based on the high success rates of implants, recent articles have focused on the immediate restoration of not splinted implants in the anterior maxilla. In clinical studies several authors including our team found 86 to 100% survival rate of immediately restored replacements. The concept of immediate loading in the posterior mandible in partially edentulous patients has been investigated in some publications. The results revealed encouraging data for immediately loaded implants placed in the molar regions in the lower jaw.

AIM:

The aim of this ongoing study was to evaluate clinical and radiographic data around immediately loaded implants placed in the posterior region of the lower jaw.

MATERIALS AND METHODS:

In the present study 24 patients have been treated following an immediate loading protocol. 40 XiVE® (DENTSPLY Friadent) implants were placed in the mandibular premolar and molar region. Peri-apical, and panoramic radiographs were evaluated for adequate amount of bone height and width. Patients were excluded from the study if uncontrolled periodontal disease was present, the patient's cooperation appeared questionable, or the patients did not give their informed consent to participate. Installation of the screw-type implants was achieved with a step-by-step increasing torque up to 45 Ncm thus estimating primary stability of the implants. Clinical stability (Periotest), radiographic coronal bone defects (CBD) and survival rate were evaluated at delivery of the definitive superstructures 6 months post insertion.

RESULTS:

A total of 40 XiVE® implants were placed in the mandibular premolar and molar regions length. All implants were inserted with a final torque of more than 45 Ncm. All implant sites showed good bone quantity and all implants demonstrated intact buccal and lingual bone walls. 19 sites were implants. 21 implants supported 2- to 3-unit bridges. 5 patients received two restorations. The median Periotest value 6 months after insertion was -5 with a minimum of -7 and a maximum of -2. No implant failed up to a maximum observation period of 2 years resulting in a 100% survival rate.

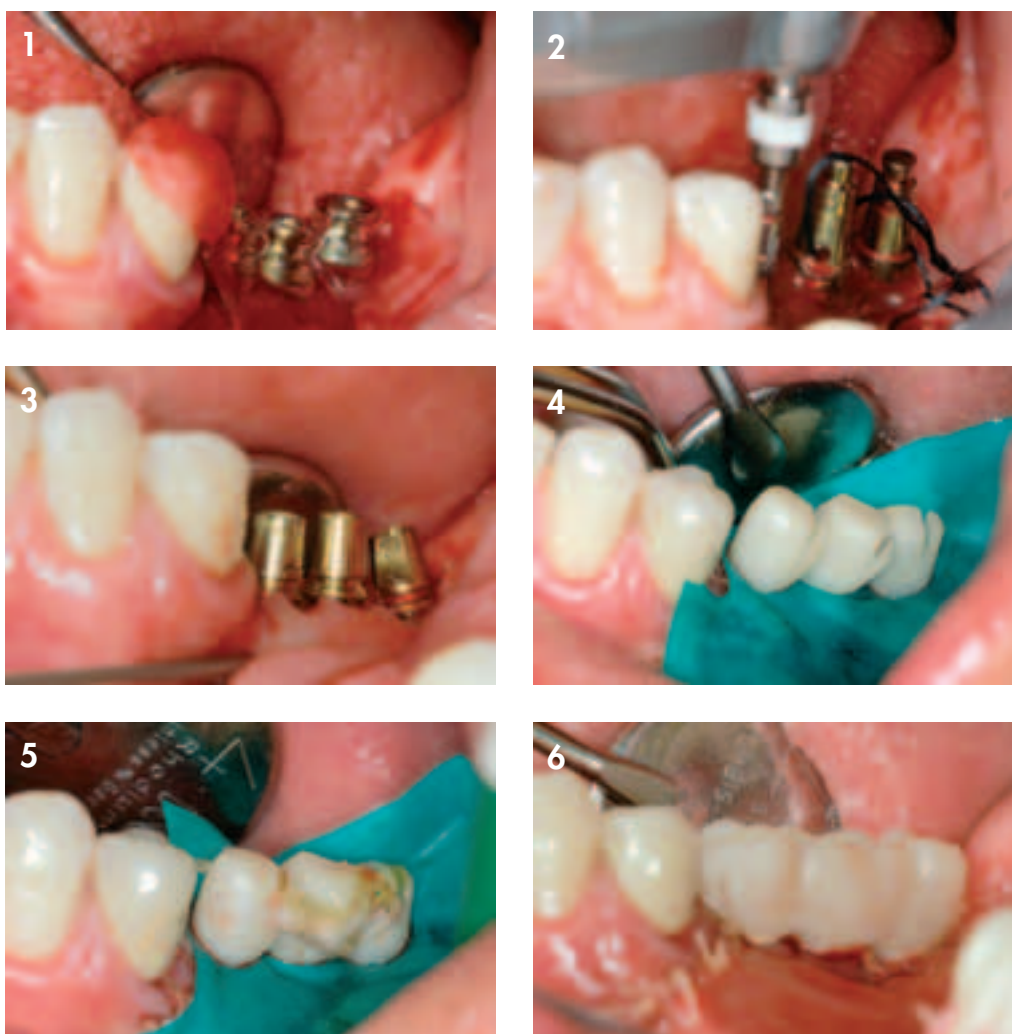
Department of Prosthodontics, School of Dentistry, University of Graz, Austria.

**Neugebauer J, Rogalski S, Zöller JE:
Clinical procedure with immediately loaded implants in the posterior
mandible: A case report.**

International Magazine of Oral Implantology 2002; 3 (1): 30 – 33.

Immediate loading of dental implants is a well-documented treatment for the anterior mandible. A standard protocol for the posterior mandible has not yet been developed. Based upon prior animal studies, the authors recommend the following criteria: High primary stability at implant insertion, tripod implant positioning, standardized surgical procedure. Remounting of secondary components should be avoided to reduce chair side treatment time. A wax-up for the fabrication of a template and the use of prefabricated caps for the fabrication of the temporary prosthesis are most effective.

Department of Craniomaxillofacial and Plastic Surgery, University of Cologne, Germany.



1. The surgical template is fabricated from the diagnostic wax-up. Sleeves are used as pilot drill guides.
2. Different crestal preparations based upon the bone quality.
3. TempBase abutment in place prior to suturing.
4. The surgical site is protected by a rubber dam prior to temporary fabrication. Prefabricated sleeves are inserted on the abutment.
5. The sleeves are splinted with FibreCor™.
6. The transitional bridge is finalized and cemented at the end of the surgical and prosthetic treatment.

X31

Neugebauer J, Thams U, San Roman F, Steveling H, Zöller JE: Immediate bridge restored implants under functional loading: A study in mini-pigs.

Scientific Poster, 17th Annual Meeting of the Academy of Osseointegration. March 14 – 16, 2002.

INTRODUCTION:

The immediate loading of dental implants in partially edentulous patients has not been widely investigated. Following the experience of the treatment of the anterior mandible, immediate loading requires pre-conditions such as immobilization of the implants with a superstructure and shortened surgical and prosthetic treatments. The preparation of the receptor site in the mandible is accomplished with drills. In soft bone, improvement of the bone quality can be achieved by BoneCondensing. Adaptation of the receptor site by "undersizing" the osteotomy relatively to the implant is another option to help achieve primary stability.

AIM:

An animal study on mini-pigs was performed to evaluate the clinical success and bone reaction during the course of osseointegration for implants in the mandible and maxilla.

MATERIALS AND METHODS:

The premolars and the first molar were removed. After three months, implant placement and prosthetic temporization was performed for 61 XiVE® implants (FRIADENT GmbH, Mannheim, Germany). 27 implants were placed in the maxilla and 34 in the mandible. The preparation in the mandible was performed with drills. The preparation in the maxilla was performed by BoneCondensing-technique to increase the local bone quantity and quality with an internal sinus-lift. Based on the bone quality, internal condensation by the implant is used to improve the final insertion torque. 49 implants were stabilized with prefabricated caps and glass fiber ribbons. The bridges were cemented onto the abutments at the end of surgery and controlled until the animals were sacrificed.

SUMMARY:

Immediate loading of dental implants in the partially edentulous patient has not been investigated widely. Immediate loading requires immobilization of the implants by the superstructure. An animal study was performed to evaluate the clinical success and the bone metabolism during the course of osseointegration on 12 implant borne bridges. Three months after tooth extraction implant insertion and prosthetic treatment was performed. 29 implants out of 62 had an insertion torque (IIT) above 35 Ncm. The average insertion torque of the implants per bridge (BIT) was determined. If the BIT was higher than 35 Ncm the bridges were successful after 4 months of loading. The histomorphometric finding of loaded and unloaded implants shows no significant difference. The procedure with prefabricated auxiliary parts allows fabricating a bridge reconstruction during one appointment as a predictable procedure if the parameters for success were considered.

Department of Craniomaxillofacial and Plastic Surgery, University of Cologne, Germany.

**Neugebauer J, Karapetian V, Boessler C, Haessler D, Zöller JE:
Clinical and mechanical considerations of resign bridges for immediate loaded implants.**

Scientific Poster, 18th Annual Meeting of the Academy of Osseointegration, February 27 – March 1, 2003.

INTRODUCTION:

Immediate loading in the posterior arch requires a quick and reliable fabrication of the superstructure during the implant placement. By placing the superstructure at the end of the surgery the implants can be splinted at the first day of incorporation. Complications like pain or difficult check of the precision of the superstructure due to the postoperative swelling are avoided. The temporary prosthesis is needed during the first three month until the implants reach osseointegration.

AIM / MATERIALS AND METHODS:

An in-vitro study was performed to evaluate the mechanical stability for different combinations of fibres and auto curing resins (ProtempGarant, 3M-Espe, Seefeld, Germany) in combination with XiVE® implants and TempBase with TempBaseCap (FRIADENT GmbH, Mannheim, Germany).

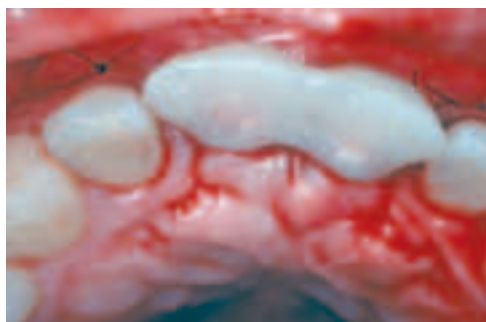
RESULTS:

The mechanical data showed different results due to the design of the bridges. The Protemp material without reinforcement showed the lowest fracture stability with $415 \text{ N} \pm 130 \text{ N}$. The reinforcement with Connect showed $754 \text{ N} \pm 198 \text{ N}$ and Ribbond $838 \text{ N} \pm 163 \text{ N}$ fracture load. The best values showed FibreCor with $898 \text{ N} \pm 97 \text{ N}$. The recommendation of the Ribbond to use the S-shape formation showed a fracture load of $736 \text{ N} \pm 132 \text{ N}$. The initial plastic deformation was observed with the lowest values for the bridge without reinforcement and the Connect fibres. The Ribbond showed a decreased plastic behavior. FibreCor showed the best value with the lowest plastic deformation. The behavior after the fracture showed a stable situation for the bridge without reinforcement, Ribbond straight and FibreCor. Connect showed a fracture of the complete bridge. FibreCor reinforcement showed an elastic behavior after the fracture. The S-Shaping of the fibres lead to a high tension and a fracture of these fibres.

Department of Craniomaxillofacial and Plastic Surgery, University of Cologne, Germany.



Clinical situation after splinting of two TempBase Caps with FibreCor and shortening of the retention.



Temporary restauration with ProtempGarant to splint two implants for non-functional loading of two XiVE® implants.

X33

Perrotti V, Neugebauer J, Iezzi G, Scarano A, Fischer HJ, Zöller JE, Piattelli A: Bone defect healing with four different grafting materials: An experimental study in mini-pigs.

*Scientific Poster, 4th World Congress of Osseointegration,
October 14 – 16, 2004.*

AIM:

The aim of this work was an histological study of bone healing of defects treated with bone chips, phytogene hydroxyapatite (ALGIPORE®), bovine hydroxyapatite (Osteograf®/N) and bovine hydroxyapatite enhanced with P-15 (PEPGEN P-15®).

MATERIALS AND METHODS:

A total 107 XiVE® implants (DENTSPLY Friadent, Mannheim, Germany) were inserted in mini-pigs. Prior to the implant placement defects were created at the crestal or apical area. The defects were filled with bone chips (Group I), phytogene hydroxyapatite (Group II), bovine hydroxyapatite (Osteograf®/N) (Group III), and bovine hydroxyapatite enhanced with P-15 (PEPGEN P-15®) (Group IV). Mini-pigs were killed after 4 months, with an intravenous injection Tanax, and the block sections, containing implants and defects were retrieved. The specimens were processed to obtain thin ground sections with the Precise 1 Automated System. The slides were stained with acid fuchsin and toluidin blue. The slides were observed in normal transmitted light under a Leitz Laborlux microscope.

RESULTS:

At the end of the study all bridges were in function. 3 out of 107 implants showed no osseointegration (2.7% failure). The average insertion torque was 32.2 Ncm. The minimum insertion torque was 15 Ncm, the maximum 55 Ncm. The mean Ostell-RFA-value at surgery was 72.9 +/- 6.7 and at recall after 4 months 75.3 +/- 14.4. There was found no correlation between insertion torque and the RFA surgery and no correlation for RFA surgery and RFA recall. A significant correlation for insertion torque and RFA recall could be found. Most of the crestal defects showed no regeneration of the graft. The apical defects were regenerated with the different materials. If an infection occurred at the grafted side the synthetic materials showed a higher loss of original bone than grafting with harvested bone chips.

CONCLUSION:

All the biomaterials examined resulted biocompatible and seemed to improve new bone formation in crestal and apical alveolar bone defects.

Dental School, University of Chieti, Italy.



*Apical defect treated with
OSTEOPRAF® N (left) or with
ALGIPORE® (right).*



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Class I medical products compliant with Directive 93/42/EEC are

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- components for impression technique that do not remain in the patient's mouth
- non-active components for the planning phase

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- components for impression technique and prosthetic restoration that remain in the patient's mouth

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