



FRIALIT[®]
Bibliography

*Treatment success –
clinically documented*

INTRODUCTION

The present list of publications on the FRIALIT® implant system provides a systematic survey on studies which document the clinical application of the FRIALIT® 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 FRIALIT® implant system. They are followed by a number of scientific articles on the prosthetic treatment of the FRIALIT® 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 FRIALIT® implant system.

Moreover you will find publications on the FRIADENT® plus surface in combination with FRIALIT®. 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 FRIALIT® implant system and the FRIADENT® plus surface. It also offers support regarding the search for relevant articles on the FRIALIT® implant system.

All articles of the bibliography are published as abstracts.

Bibliographies on the XiVE® implant system, the ANKYLOS® 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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F1

Degidi M, Piattelli A:
7-year follow-up of 93 immediately loaded titanium dental implants.
J Oral Implantol 2005; 31 (1): 25 – 31.

BACKGROUND:

Recently several experimental and clinical investigations found, that immediately loaded implants were able to obtain satisfactory levels of osseointegration with high success percentages. Only a few long-term studies of immediately loaded implants have been reported in the literature.

AIM of this study was a 7-year clinical and radiographical follow-up of 93 immediately loaded dental implants in man.

MATERIALS AND METHODS:

Eleven patients were consecutively enrolled in this study. A total of 7 full and 9 partial edentulous arches were rehabilitated. Six patients presented a completely edentulous mandible, 1 patient a complete edentulous maxilla, 5 patients mandibular posterior edentulous areas, 1 patient posterior maxillary edentulous area. In 4 cases the patients were rehabilitated with a bar and an overdenture, in 11 with a provisional prosthesis of 3 to 12 elements, and in 1 case with a 10 elements metal-ceramic bridge. A total of 93 implants were inserted. All implants were loaded within a 24-hour timeframe.

RESULTS:

Six implants failed in the first year after loading. In the following six years no more failure were observed, and all the other implants seemed to be well integrated from clinical and radiographical point of view. The cumulative survival rate at 7 years was 93,5%, while the prostheses survival was 98,5%. The mean marginal bone loss was 0.6 mm after the first year and 1.1 mm at the 7-year evaluation.

DISCUSSION:

Primary stability seems to be one of the most important parameters in immediately loaded implants because it avoids micromotion at the bone-implant interface. Four of the six failures in our patients occurred in partially edentulous patients and an excessive load applied to these small bridges could be the reason for the failure. Also the bone quality seems to be important and, in fact, 3 of our failed implants had been inserted in D III bone.

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

**Gehrke P, Jansen R, Eisenmann E, Dohm G, Neugebauer J:
Preliminary results of a prospective clinical study on the FRIADENT® plus
surface: A two year follow-up.**

EDI Journal 2005: 2 – 6.

BACKGROUND:

Implant surfaces characteristics are widely recognized as being of fundamental importance in achieving long-term implant success. It has been suggested that implants with micro-roughened surfaces produce a more rapid bone response and more bone-to-implant contact.

AIM:

The aim of the present study was an evaluation of the clinical outcome of the new grit-blasted and high-temperature acid-etched FRIADENT® plus surface.

MATERIALS AND METHODS:

In the period between July 2003 and July 2005, 77 patients (36 men, 41 women, between the ages of 17.3 to 78.7) were enrolled in this study at 10 private and university centers. Informed written consent was obtained from patients to use their data for research purpose. Subjects were screened according to the following inclusion criteria: controlled oral hygiene, the absence of any lesion in the oral cavity, and sufficient residual bone volume to receive implants of at least 3.8 mm in diameter and 10 mm in length. Immediate loading was performed when implant insertion torque values were above 30 Ncm (26 implants). Alternatively a conventional two-stage surgical protocol with 3 to 6-month healing time was used (129 implants). In cases of insufficient bone volume, augmentation procedure were performed prior to (19 cases), and / or at the same time of implant placement (39 cases). Exclusion criteria were as follows: A high degree of bruxism or parafunction, smoking more than 20 cigarettes/day, excessive consumption of alcohol, localized radiation therapy of the oral cavity, anti-tumor chemotherapy, liver diseases, kidney diseases, blood diseases, immunosuppressed patients, corticosteroid treatment, pregnancy, inflammatory and autoimmune diseases of the oral cavity, poor oral hygiene.

RESULTS:

Of the 155 implants placed, a total of 152 implants osseointegrated, 3 implants failed. One implant failed after 35 days, prior to loading, and was categorized as early implant failure. One implant failed at 4 months, and one at 8 months post loading. An implant success rate of 97.37% was achieved for a period of 24 months post placement. The mean crestal bone loss after one year was 0.99 mm, respectively 1.16 mm after two years.

CONCLUSIONS:

The two-year interim report indicates that FRIADENT® plus implants achieved a high rate of integration that remained stable during the course of implant function. In addition, the plus surface has provided a high level of prosthetic predictability. With an implant success rate of 97,37% and a mean marginal bone loss of 1,16 mm after two year post-loading recall visit, the investigated implants demonstrated a predictable clinical outcome of implant-supported treatment concepts for the rehabilitation of partially and totally edentulous patients.

Dental Practice, Ludwigshafen a.R., Germany.

F3

Gómez-Román G, Kruppenbacher M, Weber H, Schulte W: Immediate postextraction implant placement with root-analog stepped implants: Surgical procedure and statistical outcome after 6 years. *Int J Oral Maxillofac Implants* 2001;16 (4): 503 – 513.

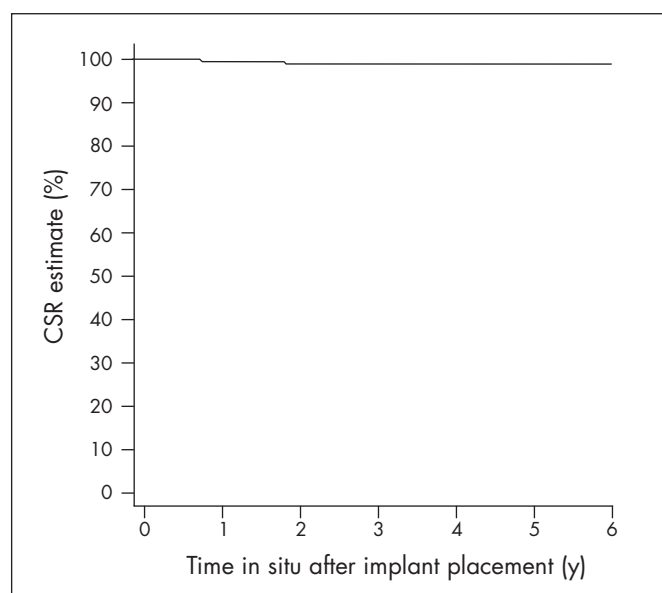
INTRODUCTION:

The present study investigated 124 stepped-screw implants (grit blasted and acid-etched surface) placed in 104 patients immediately after tooth extraction or implant explantation and followed between August 1990 and December 1996. Implants of varying diameters and lengths were used to cover a wide range of indications in both the maxilla and mandible; 68% of the implants supported single tooth replacements. The study parameters included Plaque index, Gingival index, probing depth, periotest values, and peri-implant bone loss.

RESULTS:

Statistical analysis according to Kaplan-Meier revealed a 97% survival rate.

Department of Oral Surgery and Periodontology, University of Tübingen, Germany.



Implant survival curve according to Kaplan-Meier. Cumulative survival rate (CSR): 99% at 1 year, 97% at 5 years and 97% at 5.6 years.

**Gómez-Román G, Schulte, W, d'Hoedt B, Axman-Krcmar D:
The FRIALIT®-2 implant system: Five year clinical experience in single
tooth and immediately postextraction applications.**

Int J Oral Maxillofac Implants 1997;12 (3): 299 – 309.

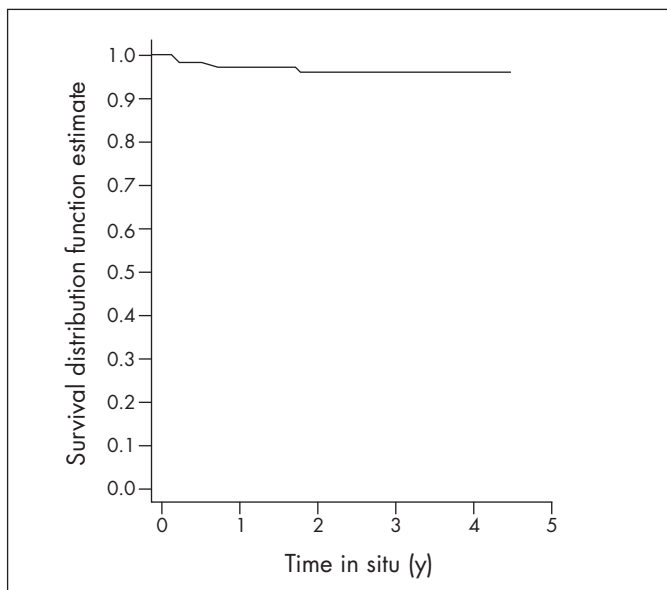
INTRODUCTION:

In an observational study of 696 FRIALIT®-2 implants in 376 patients that was carried out between 1990 and 1995 implants of varying diameters and lengths were delivered for a range of indications in the maxilla and mandible. Single tooth replacement was performed in 42% of cases; of these, 22.4% were placed immediately following extraction. Study parameters (Plaque index, Gingival index, probing depth, periotest value, and peri-implant bone loss) are reported in detail. Statistical analysis is based on a 97.6% rate of recall.

RESULTS:

The overall success rate was found to be 96% using the Kaplan-Meier statistical analysis. No difference was apparent between single tooth applications and prosthesis restorations.

Department of Oral Surgery and Periodontology, University of Tübingen, Germany.



Implant survival curve according to Kaplan-Meier.

Cumulative survival rate: 98% at 1 year and 96% at 4.5 years.

F5

Krennmair G, Schmidinger S, Waldenberger O: Single tooth replacement with the FRIALIT®-2 system: A retrospective clinical analysis of 146 implants.

Int J Oral Maxillofac Implants 2002;17 (1): 78 – 85.

PURPOSE:

This study was intended to provide a report of experience and results with FRIALIT®-2 implants used for single tooth replacement.

MATERIALS AND METHODS:

Over a 7-year period (1994 – 2000), 146 single tooth implants (84 maxilla, 62 mandible) were placed in 112 patients (67 females, 45 males). The sites included maxillary anterior teeth (n = 38) as well as the mandibular premolars and molars (n = 57). Ninety-three crowns were cemented and 53 crowns were screw mounted (22 with vertical, 31 with horizontal screws) on standard abutments. The follow-up time varied between 3 and 80 months.

RESULTS:

Two implants (1.4%) were lost, 1 during early loading and the other after 6 years. The most frequent prosthetic complication was isolated crown loosening of cemented crowns requiring re-cementation of 9 crowns (9.9%). Crowns with vertical screws showed no crown and/or screw loosening. Four crowns (2.8%) were replaced because of ceramic fracture.

DISCUSSION:

Peri-implant soft tissue condition, bone resorption, and Periotest values indicated satisfactory results. The cumulative implant survival rate during the follow-up period was 97.3%, and that of the crowns 96.4% (total cumulative survival rate 93.7%).

CONCLUSIONS:

With the low number of abutment screw loosening (3.5%), the deep internal hexagonal retention compared favorably to external retention methods. The predominant use of long implants allowed a favorable implant-crown ratio with the potential for problem-free, long-term results.

Dental School University of Vienna, and Dental Practice, Wels, Austria.

Survival rate of implants and crowns (n = 146)*

Follow-up period	No. of implants	No. of failed implants	Cumulative survival rate implants (%)	Crown fracture	Cumulative survival rate crowns (%)
<i>Loading period</i>					
0 – 0.5 year	146	1	99.3	0	100.3
0.5 – 1 year	131	0	99.3	2	98.5
1 – 2 years	114	0	99.3	1	97.6
2 – 3 years	79	0	99.3	1	96.4
> 3 years	48	1	97.3	0	96.4

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

Wheeler S:**Use of the FRIALIT®-2 implant system in private practice:****A clinical report.**

Int J Oral Maxillofac Implants 2003;18 (4): 552 – 555.

INTRODUCTION:

This retrospective study presents the results of the use of the FRIALIT®-2 system in a private practice setting. A total of 802 implants, both threaded and press-fit, were placed between February 2, 1996, and March 6, 2002.

RESULTS:

The overall success rate was 97%, and the cumulative survival rate using life table analysis was 96.1%. The statistical breakdown and an analysis of the results of the treatment of this patient population are presented.

Dental Practice, Encinitas, California, USA.

Cumulative survival rate of implants placed*

Time (year)	No. of implants	No. of failed implants	Survival rate implants (%)	Cumulative survival rate implants (%)
<i>All implants</i>				
0	802	7	99.1	99.1
0 – 1	643	16	97.5	96.7
1 – 2	170	1	99.4	96.1
2 – 3	78	0	100.0	96.1
3 – 4	35	0	100.0	96.1
4 – 5	14	0	100.0	96.1

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

F7

**Degidi M, Scarano A, Petrone G, Piattelli A:
Histological analysis of clinically retrieved immediately loaded titanium
implants: A report of 11 cases.**

Clin Implant Dent Relat Res 2003; 5 (2): 89 – 94.

BACKGROUND:

Several investigators have reported high survival rates for early or immediately loaded dental implants.

PURPOSE:

The aim of the present study was to analyze histologically the peri-implant tissue reactions and the bone-titanium interface of clinically retrieved immediately loaded titanium implants.

MATERIALS AND METHODS:

Eleven implants were inserted in the posterior jaw regions of six patients, serving as the most distal abutments of fixed provisional bridges and subjected to immediate occlusal loading. After a 10-month loading period, all 11 implants were retrieved with a trephine.

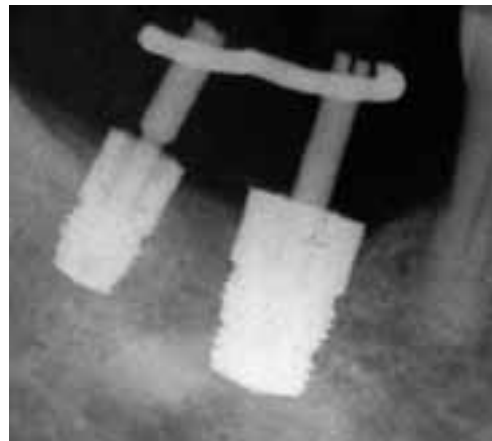
RESULTS:

Mature bone was present at the interface of all implants. Some vertical bone loss was observed; this was more pronounced for cylindrical implants. The bone-implant contact was approximately 60 to 65% for all implants.

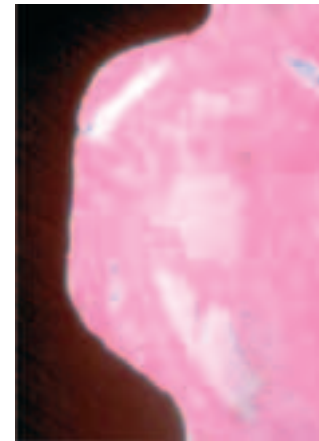
CONCLUSION:

The results demonstrate that osseointegration of dental implants occur during immediately loading.

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



FRIALIT®-2 implants. Periapical radiography after 10 months of loading. It is possible to observe stable bone levels.



FRIALIT®-2 implant. Mature bone is seen in direct contact with the implant surface. No fibrous tissue or inflammatory cells are present at the interface (x50 original magnification).

Gómez-Román G:

Influence of flap design on peri-implant interproximal crestal bone loss around single tooth implants.

Int J Oral Maxillofac Implants 2001;16 (1): 61 – 67.

BACKGROUND:

The anterior maxilla represents a therapeutic challenge for single tooth replacement with implants. The surgical trauma delivered to soft and hard tissues during implant placement can influence the future esthetic result. The clinician should use surgical techniques that prevent esthetic complications, such as increased crown length or loss of interdental papillae, without compromising osseointegration.

AIM:

This prospective study investigated the interproximal crestal bone loss occurring after placement of single tooth implants using 2 different flap designs: a widely mobilized flap design that included papillae, and a limited flap design that protected papillae.

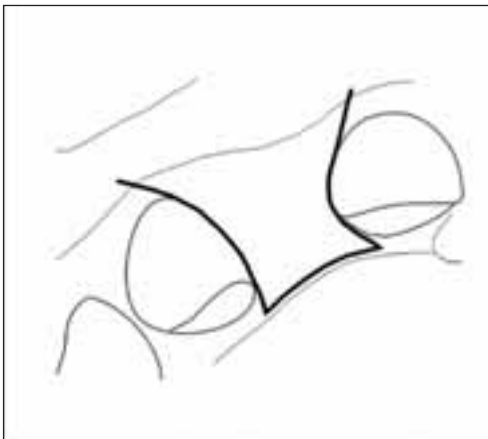
RESULTS:

The interproximal crestal bone loss was of practical importance and statistically significantly less following the use of a limited flap design versus the widely mobilized flap procedure.

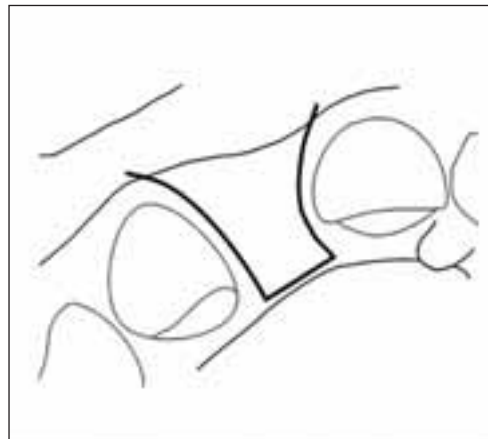
CONCLUSIONS:

The use of a limited flap design for single tooth implants is indicated to avoid possible loss of the papillae and minimize interproximal bone loss. Good esthetic outcomes can be achieved predictably when the corresponding surgical technique and principles described in this article are used.

Department of Oral Surgery and Periodontology, University of Tübingen, Germany.



Widely mobilized flap, which includes the interproximal papillae.



Limited flap design, which protects the papillae (minimum width of the interdental papillae is 1 mm).

F9

Jansen R, Kielhorn J, Schmenger K, Eisenmann E, Neugebauer J: Clinical results after 2-year experience with a three-dimensional surface on screw-type implants.

*Scientific Poster, 20th Annual Meeting of the Academy of
Osseointegration, March 10 – 12, 2005.*

INTRODUCTION:

Predictable osseointegration is one of the main goals in dental implantology. However the treatment should also focus on the long-term success. As demonstrated in recent studies the micro-morphology of the implant surface could influence the initial cell contact positively. The best results were shown with grit-blasted and high temperature etched surfaces. In addition the 3-dimensional surface appeared to have a positive effect on the implant-bone contact and the bone quality. The histological investigation of unloaded implants with the plus surface has shown a BIC (bone implant contact) after osseointegration that is comparable to loaded implants with conventional surfaces.

AIM:

To verify these initial results the stability of the achieved situation after implant placement and restoration was the main objective in the second part of the investigation with FRIALIT® implants (DENTSPLY Friadent, Mannheim, Germany) with this new surface type. 10 international centers of implantology were involved in this follow-up trial. The aim of this poster is to present the collected data and the clinical outcome 2 years after implant placement.

MATERIALS AND METHODS:

The documentation and evaluation contain the data of 150 implants and 77 patients. All surgical concepts were used in these investigations (as shown in the first poster publication at AO 2004). 78% of all patients underwent an augmentation treatment prior or simultaneous to the implant placement. The average healing time was 7.8 weeks before the implants were recovered. Subsequently the prosthetic restoration was fabricated and inserted. As prosthetic device different concepts were carried out in order to restore the osseointegrated implants. Depending on the required result solely functional restorations or additionally esthetic superstructures were fabricated. Fixed restorations like single crowns (26%) or bridgework (55% and 2% in combination with natural teeth) displays the majority of the treated cases (83%). Removable dentures (11% bar and 6% ball attachments) were used in only a few cases. In order to check the stability of the achieved initial situation the first recall was carried out after approximately 4 months.

RESULTS:

Besides the 3 non-osseointegrated implants no late failure occurs (98% success). At the first recall the average crestal bone loss was less than 1.5 mm. After 2 years the clinical situation has not changed. No differences in the outcome due to diverse regions of the jaws could be noted.

CONCLUSION:

The results show a high confidence even in more critical indications such as immediate extraction sides, early loading or after implant loss.

DENTSPLY Friadent, Mannheim, Germany.

**Lorenzoni M, Pertl CH, Zhang K, Wegscheider WA:
In-patient comparison of immediately loaded and non-loaded implants
within 6 months.**

Clin Oral Impl Res 2003;14 (3): 273 – 279.

BACKGROUND:

According to the Brånemark protocol, a stress-free healing period is one of the most emphasized requirements for implant integration. Recent studies have encouraged a progressive shortening of the healing period and immediate loading has been proposed for the edentulous mandible.

AIM:

This prospective study evaluated the clinical outcomes of 14 immediately loaded FRIALIT®-2 implants compared with 28 non-loaded controls in an in-patient study. The results were based on clinical stability and on changes of bone level from implant placement to abutment connection 6 months after insertion.

MATERIALS AND METHODS:

In the course of our investigation, seven patients with edentulous mandibles have been treated with 43 implants following an immediate loading protocol. Six FRIALIT®-2 implants were placed in the interforaminal region located at positions 34, 33, 32, 42, 43, 44. Bone level in relation to implant margin was measured and recorded. In order to obtain an in-patient comparison of immediately loaded and non-loaded implants, the ones at 33 and 43 were chosen to be immediately loaded by a Dolder-bar retained overdenture. The implants in position 32, 34, 42 and 44 were covered and left to heal. After a healing period of 6 months, second stage surgery was carried out. The clinical criteria to be checked at this point were survival, Periotest values and marginal bone level at the loaded and non-loaded implants.

RESULTS:

The mean Periotest value was -2.7 for the loaded and -5.6 for the non-loaded implants. The Mann-Whitney U-test showed that the difference was highly significant ($P < 0.001$). The mean bone level changes at prosthetic delivery were 0.9 mm resorption for the loaded implants and 0.3 mm for non-loaded implants. The difference was highly significant ($P < 0.001$). No implant failures were observed up to the prosthetic restoration 6 months post insertion.

CONCLUSIONS:

The results of this investigation allowed for direct comparison of implant survival and clinical results between immediately loaded implants and standard implants. Clinical bone changes at the 6-month evaluation demonstrated significantly higher crestal resorption around loaded implants. This fact was confirmed by higher median Periotest values (-3 vs. -6) of immediately loaded implants. According to the outcome of this study, immediate loading of two interforaminal implants with a Dolder-bar resulted in an intimate bone apposition comparable with implants with submerged healing. Nevertheless, the coronal bone level as well as clinical stability was significantly lower in the case of the immediately loaded implants. Future studies will be necessary to evaluate marginal bone resorption, Periotest values and clinical success rates of mandibular immediately loaded implants in the long-term.

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

**Novaes AB, Papalexidou V, Muglia V, Taba M:
Influence of interimplant distance on gingival papilla formation and
bone resorption. Clinical-radiographic study in dogs.**

Int J Oral Maxillofac Implants 2006; 21 (1): 45 – 51.

PURPOSE:

The purpose of this study was to evaluate in dogs the area between implants after prosthetic restoration within 5 mm distance between the contact point (CP) between crowns and the bone crest (BC).

MATERIALS AND METHODS:

The mandibular premolars of 6 dogs were extracted bilaterally. After 12 weeks of healing, each dog received 8 implants. On each side, 2 implants were separated by 2 mm (group 1) and 2 by 3 mm (group 2). After a healing period (3 months), the implants were restored with temporary acrylic resin prostheses and after 4 more weeks, they were substituted by definitive metallic prostheses. After 8 weeks, the distance between the CP and the papilla (P) was measured. The distance between a line extending from the CP and the gingival height at the distal extension of the prosthesis (DE) was also measured. Digital radiographic images were obtained for evaluation of the CP-BC and BC-P distances and the analysis of bone resorption adjacent to the implant surfaces.

RESULTS:

The median CP-P distances were 1.75 mm and 1.98 mm for groups 1 and 2, respectively; the median CP-DE distances were 2.60 and 2.69, respectively. The mean CP-BC distances were 5.64 mm and 6.45 mm, for groups 1 and 2, respectively; mean BC-P distances were 3.07 mm and 3.55 mm, respectively.

DISCUSSION AND CONCLUSION:

The differences in distances of 2 and 3 mm between implants did not present significant differences in the formation of papillae or in crestal resorption. The CP-BC distances for prostheses should be different from those of natural teeth because in natural teeth, the biologic width is already present, and in the case of implant-supported prostheses, it will develop following second-stage surgery.

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

**Novaes AB, Marcaccini AM, Souza LS, Taba M, Grisi MFM:
Immediate implant placement into periodontally infected sites in dogs:
A histomorphometric study of bone-implant contact.**

Int J Oral Maxillofac Implants 2003; 18 (3): 391 – 398.

PURPOSE:

The placement of implants allows for re-establishment of function and esthetics following tooth loss. Immediate implant placement is a relatively recent procedure and has advantages, such as reduced number of surgical procedures, preservation of alveolar bone, reduction of cost and period of edentulism, and increased patient acceptance. However, there are some specific contraindications for the technique, such as the presence of an infection caused by periodontal disease and periapical lesions.

AIM:

The objective of this study was to evaluate the percentage of bone-implant contact of immediate implants placed in periodontally infected sites.

MATERIALS AND METHODS:

In the first phase, periodontitis was induced with ligatures in the mandibular premolars of 5 mongrel dogs, using the contra lateral teeth as controls (received prophylaxis only). After 3 months, in the second phase of the study, 40 implants were placed in the alveoli of both experimental and control teeth. After a healing period of 12 weeks, the animals were euthanized, and the hemi mandibles were removed, dissected, fixed, and prepared for histomorphometric analysis of percentage of bone-implant contact. The Mann-Whitney test was used for statistical analysis.

RESULTS:

The results of the histomorphometric analysis indicated mean bone-implant contact of 62.4% in the control group and 66.0% in the experimental group, a difference that was not statistically significant.

DISCUSSION:

Histomorphometric results revealed similar bone-implant contact in both groups, with no signs of infection.

CONCLUSION:

It was concluded that periodontally infected sites might not be a contraindication for immediate implantation in this animal model system, if adequate pre- and postoperative care is taken.

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.

F13

**Papalexiou V, Novaes Jr AB, Ribeiro RF, Muglia V, Oliveira RR:
Influence of inter-implant distance on crestal bone resorption and bone density. Submitted to Clin Oral Impl Res in 2004**

Accepted for publication in J Periodontology in 2006.

BACKGROUND:

The position of gingival soft tissues depends on the position and health of the underlying alveolar bone.

The AIM of this study was to evaluate the influence of different inter-implant distances on crestal bone resorption after prosthetic restoration with a 5 mm distance between the contact point and the bone crest.

MATERIALS AND METHODS:

The mandibular bilateral premolars of 6 dogs were extracted and after 12 weeks each dog received 8 implants, totaling 48 implants in the experiment. Two pairs, one each hemi-arch, were separated by 2 mm (group 1) and two by 3 mm (group 2). After 12 weeks, the implants received temporary acrylic prostheses. After 4 more weeks, metallic crowns substituted the temporary prostheses. In 4 weeks more the animals were sacrificed their hemi-mandibles were removed, dissected and processed.

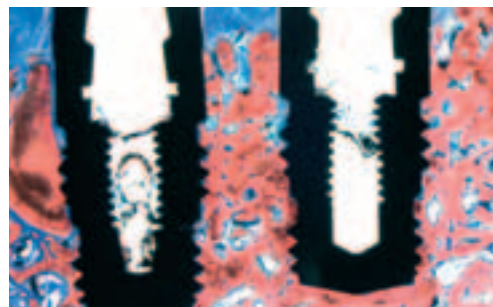
RESULTS:

For groups 1 and 2, respectively, the mean of inter-implant bone resorption (IIBR) analyzed histologically was 2.03 mm and 1.98 mm ($p \geq 0.05$); and the mean of the distal extension bone resorption was 2.04 mm and 1.92 mm for group 1 and 2 respectively ($p \geq 0.05$). The crestal bone resorption between the implants was 0.13 mm ($p \geq 0.05$) for both groups. The mean of inter-implant bone density (IIBD) for groups 1 and 2, respectively, was 79% and 80%. When the IIBD was compared with the distal extension bone density for group 1 (79% and 64%) and group 2 (80% and 62%) statistically significant differences were obtained for both groups ($p \leq 0.05$).

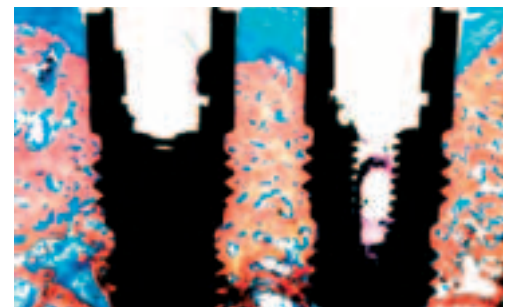
CONCLUSIONS:

In conclusion, the distances of 2 and 3 mm between implants do not result in statistically significant differences in crestal bone resorption around the implant surfaces in dogs. The bone density is enhanced when loading is present at the inter-implant area.

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.



Representative histologic image of the 2 mm inter-implant distance. Note crestal bone resorption around the implants.



Representative histologic image of the 3 mm inter-implant distance. Likewise observe the crestal bone resorption around the implants.

**Wegscheider WA, Lorenzoni M, Pertl C, Zhang K:
Immediate loaded and unloaded tapered screw implants in the edentulous mandible at second stage surgery. An in-patient comparison of 66 implants for nine consecutively treated patients.**

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

INTRODUCTION:

Several studies have demonstrated that in implant dentistry good clinical results may be achieved with one-stage implant procedures. Recent clinical and experimental results have encouraged a progressive shortening of the healing period and immediate loading has been proposed. This method shortens dental rehabilitation time.

PURPOSE:

The purpose of this study was to find out a protocol for immediate loading and give evidence-based recommendations for rehabilitation of the edentulous mandible by comparing reproducible parameters at immediately loaded and unloaded implants at second stage surgery.

MATERIALS AND METHODS:

This prospective study evaluated clinical outcomes of 25 immediately loaded implants compared to 41 unloaded controls in an in-patient comparison in edentulous mandibles. In the course of our investigation 9 patients aged between 50 and 72 have been treated following an immediate loading protocol so far. In all cases, FRIALIT®-2 stepped screws (FRIADENT GmbH, Mannheim, Germany) were inserted.

RESULTS:

The results have to be related to the three quoted parameters such as implant survival, Periotest value (PTV) and clinical bone level change at first stage and second stage surgery. The implant failures were highly related to immediate loaded implants (3 of 4 = 75%) with fixed bridgework as provisional prostheses located in posterior tooth positions. All of them were removed at second stage surgery. No failures have been observed in the group I with the bar-retained overdentures. The median of the PTV was -3 for the loaded and -6 for the unloaded implants. A Mann-Whitney-U-test for non-parametric distributed values was applied to compare these values. PTV of loaded implants was significantly higher compared to those of unloaded implants, but still in the normal range of well osseointegrated implants. The median of bone level changes 6 months post insertion was 1 mm reduction of peri-implant bone height for the loaded implants and 0.5 mm reduction for the unloaded implants. With $p = 0.000$ the difference turned out to be highly significant. Concerning the PTV the implants of the group II did have a significantly higher value than in group I. Engaging the same test the bone level change did not differ significantly between these two groups. Though, the influence of primary stability on the PTV and the survival proved to be highly significant. The highest impact regarding implant survival was proven for the immediately loaded implants with fixed provisional prostheses.

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

F15

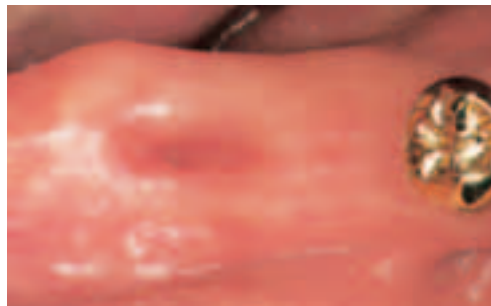
Enomoto H, Nozawa K, Furukawa T, Tsurumaki S, Takano M: Esthetics and hygiene access of implant-supported single tooth crowns in the posterior region with special regard to papilla design.

Quintessenz Zahntechnik 1999, 25 (1): 36 – 52.

The rehabilitation resp. creation of interdental papillae after implant placement is a challenge, especially in case of severe bone loss and thin alveolar mucosa. The present publication describes the fabrication of implant-supported restorations in a cantilever situation in the mandible with special regard to the creation of "pseudo papillae". This procedure allows an esthetic rehabilitation of the oral situation and a sufficient hygiene access for the patient.

Enomoto Dental Clinic, Niigata, Japan.

Clinical example for the creation of a molar:
51 year old male patient with FRIALIT®-2 implants in regio 47 and 46 each.



Situation 6 weeks after extraction of tooth 47. The bone is wide enough for an implant with a larger diameter.



Finished temporary restoration. The shape of the crowns corresponds the dimensions of natural molars.



The finished restoration in situ. The occlusal area stands out for superior esthetics and functionality.



Buccal view 7 months after exposure. The neck is surrounded by thick mucosa and corresponds a natural molar. The thick peri-implant soft tissue between the implants has been formed into a papilla.

Gómez-Román G, Kruppenbacher M, Weber H, Schulte W:
Immediate postextraction implant placement with root-analog stepped
implants: Surgical procedure and statistical outcome after 6 years.
Int J Oral Maxillofac Implants 2001;16 (4): 503 – 513.

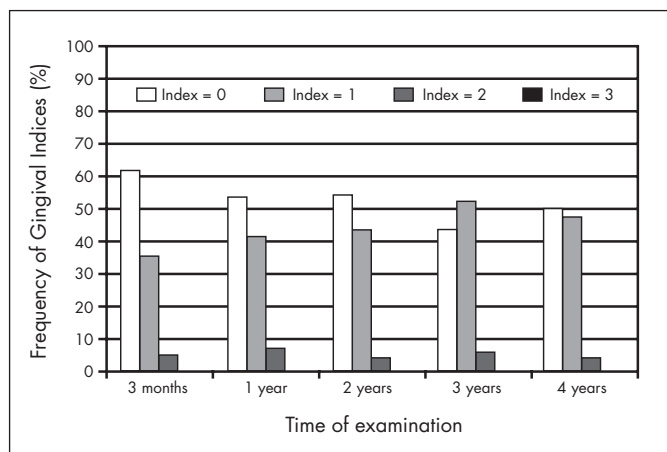
INTRODUCTION:

The present study investigated 124 stepped-screw implants (grit blasted and acid-etched surface) placed in 104 patients immediately after tooth extraction or implant explantation and followed between August 1990 and December 1996. Implants of varying diameters and lengths were used to cover a wide range of indications in both the maxilla and mandible; 68% of the implants supported single tooth replacements. The study parameters included Plaque Index, Gingival Index, probing depth, Periotest values, and peri-implant bone loss.

RESULTS:

Statistical analysis according to Kaplan-Meier revealed a 97% survival rate.

Department of Oral Surgery and Periodontology, University of Tübingen, Germany.



Gingival Index according to Løe and Silness, shown as percentages at various follow-up intervals.

Khoury F, Hoppe A: Soft tissue management in oral implantology:
A review of surgical techniques for shaping an esthetic and functional
peri-implant soft tissue structure.
Quintessenz International 2000; 31 (7): 483 – 499.

Along with osseointegration and restoration of function, the patient's subjective satisfaction with the esthetic result is a touchstone of the success of implant therapy. Although esthetic restoration of natural teeth can be achieved routinely through appropriate tooth preparation and a natural-looking design on the part of the dental laboratory, the road to success is much more complicated with implants, because of atrophy of bone and mucosa. Surgical techniques, paths of incision, and useful instruments for implant therapy are described, from implant placement to exposure. These methods help to provide durable, functional, and esthetic results.

Clinic Schloss Schellenstein, Olsberg, Germany.

F18

**Krennmair G, Schmidinger S, Waldenberger O:
Single tooth replacement with the FRIALIT®-2 system: A retrospective clinical analysis of 146 implants.**

Int J Oral Maxillofac Implants 2002;17 (1): 78 – 85.

PURPOSE:

This study was intended to provide a report of experience and results with FRIALIT®-2 implants used for single tooth replacement.

MATERIALS AND METHODS:

Over a 7-year period (1994 – 2000), 146 single tooth implants (84 maxilla, 62 mandible) were placed in 112 patients (67 females, 45 males). The sites included maxillary anterior teeth (n = 38) as well as the mandibular premolars and molars (n = 57). Ninety-three crowns were cemented and 53 crowns were screw mounted (22 with vertical, 31 with horizontal screws) on standard abutments. The follow-up time varied between 3 and 80 months.

RESULTS:

Two implants (1.4%) were lost, 1 during early loading and the other after 6 years. The most frequent prosthetic complication was isolated crown loosening of cemented crowns requiring re-cementation of 9 crowns (9.9%). Crowns with vertical screws showed no crown and/or screw loosening. Four crowns (2.8%) were replaced because of ceramic fracture.

DISCUSSION:

Peri-implant soft tissue condition, bone resorption, and Periotest values indicated satisfactory results. The cumulative implant survival rate during the follow-up period was 97.3%, and that of the crowns 96.4 % (total cumulative survival rate 93.7%).

CONCLUSIONS:

With the low number of abutment screw loosening (3.5%), the deep internal hexagonal retention compared favorably to external retention methods. The predominant use of long implants allowed a favorable implant-crown ratio with the potential for problem-free, long-term results.

Dental School University of Vienna, and Dental Practice, Wels, Austria.

Peri-implant bone resorption, pocket depth, Periotest value, and soft-tissue conditions of single tooth implants (n = 144)	
Bone resorption (mm)	1.3 +/- 0.8 (0 to 2.5)
Pocket depth (mm)	3.2 +/- 1.4 (1.5 to 4.0)
Periotest values	-4.1 +/- -2.6 (-1 to -7)
Plaque Index	
grade 0	127 (8.2)
grade 1	17 (11.8)
grade 2	0 (0.0)
grade 3	0 (0.0)
Bleeding Index	
grade 0	131 (90.9)
grade 1	13 (9.1)
grade 2	0 (0.0)
grade 3	0 (0.0)

**Schulte W, d'Hoedt B, Axmann D, Gómez-Román G:
15 years of Tübingen implant and its advancement to the
FRIALIT®-2 system.**

Z Zahnärztl Implantol 1992; 9: 77 – 96.

The first concepts for the development of the Tübingen implant system evolved in 1974. Its underlying working hypothesis, the 15 years of continuous data collection, and the consequences this has for the further development of this implantological principle are described. It becomes evident that prognoses for newly developed implant system with relatively short periods of observation are only possible, if data are collected in the long range and with utmost care and if these data can be evaluated with scientifically unobjectionable methods.

The FRIALIT®-2 system is, among others, the result of the evaluation of almost 500.000 data and, after meanwhile 2 years of observation, it is opening up new avenues for the future. Scientific tests of all aspects of the concept established 18 years ago indicate a high probability of success, if multifactor analyses are employed. The use of immediate implants for the preservation of the alveolar process by means of well-timed functional loading as originally laid down in the Tübingen concept has been followed with various implant systems all over the world. The basis principles of the FRIALIT®-2 system, build on this vast experiences, and the first statistical results of 158 implants are presented.

Polyclinic for Dental Surgery and Periodontology, University of Tübingen, Germany.

F20

**Gehrke P, Enomoto H, Neugebauer J, Schnabel TH:
Contribution of interproximal dento-implant architecture on papilla
presence or absence.**

*Scientific Poster, 7th International Symposium on Periodontics &
Restorative Dentistry, June 1 – 4, 2000.*

INTRODUCTION:

The correct mesio-distal and vertical-horizontal position of an implant is ultimately determined by esthetic requirements and anatomical architecture. Implant being placed too close together, unfavorable positions and/or axial disalignment should be avoided. Despite its significance, only little information is available on the interproximal dento-implant anatomy and its influence on the formation of papillae.

PURPOSE:

The purpose of this study was to determine the contribution of the vertical distance between contact point and the crest of bone, the horizontal distance between tooth and implant, and the time of implant placement on the presence or absence of the dento-implant papilla in humans.

MATERIALS AND METHODS:

Within a group of patients treated for single tooth replacement with root-analog implants (FRIALIT®-2, FRIADENT GmbH, Mannheim, Germany), 104 patients with 120 implants were selected for a standardized examination of the mesial and distal interproximal implant-tooth sites. The main interval between implant placement and evaluation of the restored interproximal implant-tooth site was 20 months.

RESULTS:

A vertical distance from the base of the contact point to the crest of bone between 3 to 6 mm is a good prerequisite for a spontaneous interproximal papilla. Vertical distances below 3 mm or above 9 mm reduce predictable papilla regeneration significantly. A horizontal distance between implant and adjacent tooth of 2 mm complies with anatomical data of teeth and favors the re-establishment of interproximal papillae. Horizontal distances below 2 mm and above 3 mm reduce the probability of papilla re-establishment considerably. The study results demonstrate also the importance of the time of implant placement on the predictability of papilla regeneration. When implant placement was performed after complete osseous healing of the extraction site, the papilla was present in less than half of the time. The earliest possible implant placement preserves peri-implant bone and determines the shape of overlying soft tissue contours.

DENTSPLY Friadent, Mannheim, Germany.

F21

**Khoury F:
Esthetic treatment with the FRIALIT-2® system by using all-ceramic
abutments (CeraBase).**

Implantologie 2001; 9 (1): 71 – 81.

In 1996 and 1997, 26 patients were treated with a total of 44 single tooth implants ad modum FRIALIT®-2. All cases required augmentation in order to improve the implant site – also with regard to the esthetic result of the restoration.

The so-called “red esthetics” was enhanced by mucogingival surgery, the soft tissue excess gained herewith was shaped with conditioned temporary crowns based on the ProTect abutment. The implant site was finally restored with all-ceramic crowns fabricated with the CeraBase system. All implants osseointegrated without any complications. The achieved soft tissue formations proved inflammation-free and stable during the relatively short evaluation period. After 18 months, the indices for an evaluation of the peri-implant tissue indicated healthy conditions.

Clinic Schloss Schellenstein, Olsberg, Germany.

Khoury F, Neugebauer J, Pape, F:

The customization of peri-implant soft tissue with an esthetic abutment line.

Scientific Poster, XVI Congresso Internazionale Accademia Italiana di Odontoiatria Protesica, November 7 – 8, 1997.

INTRODUCTION:

An optimal esthetic result of peri-implant soft tissue after augmentation procedures requires more surgical and prosthetic efforts. The use of different flap designs allows the surgeon to mobilize the soft tissue to create new papillae and to achieve a tight adaptation to the implant abutment for long-term success. The good adhesion of soft tissue around the superstructure is ensured due to FRIALIT®-2 CeraBase. By using an aluminum oxide ceramic crown high results in red and white esthetics are achieved.

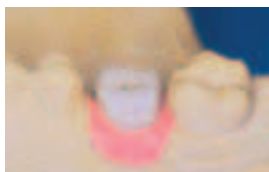
CONCLUSIONS:

The biocompatibility of ceramics in general is well documented in the literature. Schareyka et al. described already in 1984 the characteristics of FRIALIT® ceramics. The results of 25 clinical cases show a healthy soft tissue after a period of maximum 12 months. The treatment with the FRIALIT®-2 CeraBase is an appropriate method for esthetic treatment in the anterior and also posterior region.

Clinic Schloss Schellenstein, Olsberg, Germany.



CeraBase abutment.



The wide CeraBase sleeve shows high flexibility for preparation of an individual ceramic abutment.



Soft tissue situation four weeks after second stage surgery.



Vestibular view of full ceramic restoration with slight infra-occlusion.

F23

**Lorenzoni M, Pertl Ch, Jakse N, Wegscheider W:
Implant-supported restorations: A comparison of different prosthetic
concepts for the posterior maxilla.**

*Scientific Poster, 9th Annual Congress European Association for
Osseointegration, September 14 – 16, 2000.*

INTRODUCTION:

Insufficient bone volume resulting from alveolar resorption and the pneumatizing behavior of the sinus creates a difficult restorative problem for rehabilitation of the posterior maxilla. Brånemark and co-workers introduced the concept of anterior implants and a cantilevered superstructure as a solution, other authors recommended the use of wide/short or immediate implants. Since the introduction of sinus augmentation the method of reconstructing an adequate bone volume seemed to be the preferred method for implant insertion in the maxillary molar region.

AIM:

The aim of the present study was to investigate clinical and radiographic data of edentulous and partially edentulous patients treated with different prosthetic concepts in the maxilla.

MATERIALS AND METHODS:

67 patients received a total of 344 maxillary FRIALIT®-2 implants. Our study's main purpose was to evaluate various techniques for prosthetic rehabilitation of the posterior maxilla. A preliminary assessment of the crestal bone level of implants after sinus augmentation (group 4, n = 98) was compared to anterior implants with distal extensions (1, region 13 – 23, cantilever superstructure, n = 97), anterior implants without extensions (2, n = 70) and posterior implants without sinus augmentation (3, regio 14 – 17, 24 – 27, n = 79). Kaplan-Meier survival rates were calculated for groups 1, 2, 3, and 4 for basic implant survival statistics (implant in situ or loss). In order to obtain a more realistic evaluation, clinical and radiographic parameters had to be included.

RESULTS:

Survival Analyses: The overall survival rate was 95.6% after 60 months. Using the success criteria proposed by the authors, assessment of our data produced a total success rate of 94.5% after 60 months. Evaluation according to region showed comparable success rates of 95.2% for the anterior and 94.3% for the posterior region. Corresponding analyses carried out in groups 1, 2, 3, and 4 showed a cumulative success rate of 94.4%, 97%, 96.2%, and 92.7% after 60 months. Statistical comparison showed no significant differences between the four groups. Radiographic Evaluation: Mean coronal bone defect (CBO) for all implants (n = 344), was 0.86 mm after 6 months. 6 months following restoration, the CBO averaged 1.17 mm. After 36 months, the radiographic bone loss was at 1.61 mm, after 48 months it measured 1.71 mm and after 60 months it was 2.12 mm below the upper rim of the implant. In group 4 (implants + sinus augmentation) the CBO increased from 0.54 mm at reentry at above 0.83 mm, 1.23 mm, 1.29 mm, to 1.22 mm after 48 months.

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

Pape F, Khoury F:

Ceramic abutments for esthetic implant restorations.

Scientific Poster, 9th Annual Congress European Association for Osseointegration, September 14 – 16, 2000.

INTRODUCTION:

The single tooth implant prosthesis in the maxillary anterior region is one of the most challenging prosthetic restorations. Main objective of both surgical and prosthetic procedures is the creation of an emergence profile, which means the creation of a natural mucosa comparable to the gingival margin of the adjacent teeth, so that the restoration cannot be identified as an implant-supported crown. Commonly used titanium abutments may cause discoloration of the adjacent soft tissue. On the contrary, the full-ceramic FRIALIT®-1 Tübingen implant (FRIADENT GmbH, Mannheim, Germany) showed excellent esthetic results but, unfortunately, suffered from fractures in several cases. The FRIALIT®-2 implant (FRIADENT GmbH, Mannheim, Germany) has proved its applicability in several clinical studies. Meanwhile, the ceramic abutment system CeraBase has been developed to achieve esthetic results on this titanium implant, even in difficult cases.

AIM:

The aim of this prospective study was the clinical evaluation of the esthetic advantages of ceramic abutments on FRIALIT®-2 implants in combination with two well known and widespread full-ceramic crown systems.

MATERIALS AND METHODS:

Between 1997 and 1998 19 women and 11 men were treated with 30 FRIALIT®-2 single tooth implants in the upper front. Bone augmentation techniques were necessary at every implant site. Gingival conditions were improved by muco-gingival surgery utilizing connective tissue grafts. After a healing period of six months the peri-implant soft tissue was shaped by properly formed provisional crowns made of acrylic resin and based on the ProTect® abutment (FRIADENT GmbH, Mannheim, Germany). After conditioning the peri-implant soft tissue to an emergence profile the final restoration was to be done by full-ceramic crowns utilizing the CeraBase abutment.

RESULTS AND CONCLUSION:

All implants integrated without any complication. No gingival inflammation or recession could be found, and soft tissue conditions were found to be stable over time. With respect to esthetics no discoloration or revealing metal margins of the titanium core were observed within up to 2-years. Periodontal indices taken after 18 months indicated healthy conditions at the implant sites.

Clinic Schloss Schellenstein, Olsberg, Germany.



CeraBase abutment in the upper canine region with healthy conditions of the soft tissue.



The situation three years later shows similar conditions of the soft tissue and esthetics comparable to the adjacent teeth.

F25

Aires I, Berger J:

Immediate implant placement in extraction sites followed by immediate loading: A pilot study and case presentation.

Implant Dentistry 2002; 11 (1): 87 – 93.

PURPOSE:

The purpose of the study was to compare the results of implants immediately loaded in edentulous sites with implants loaded immediately in extraction sites.

MATERIALS AND METHODS:

Since December 1998, we selected a small group of patients for immediate or early loading. Seventy-five implants were placed in nine jaws of seven patients. Two of the patients received implants in both the maxilla and mandible. Of the 75 implants placed, 29 were placed in immediate extraction sites. Twenty-six of the 29 that were placed in immediate extraction sites were loaded in less than 3 weeks.

RESULTS:

Of the 75 implants placed, 62 were loaded early (less than 3 weeks). Two implants have been lost. The remaining 13 implants were buried and allowed to heal in the customary manner. None of the buried implants failed. One of the implants lost was in an extraction site and one was in a non-extraction site. Of the 33 implants that were placed in edentulous areas and immediately loaded, one was lost. This is compared with the 29 implants placed in extraction sites that were immediately loaded.

CONCLUSION:

We conclude that the success rates for implants immediately loaded in extraction sites and edentulous sites are comparable.

Dental Practice, La Jolla, California, USA.

F26

Degidi M, Pieri F, Marchetti C, Piattelli A:

**Immediate loading of dental implants placed in distracted bone:
A case report.**

Int J Oral Maxillofac Implants 2004; 19 (3): 448 – 454.

INTRODUCTION:

A 40-year-old female patient presented for rehabilitation of an edentulous mandible with endosseous implants. Radiologic examination showed evidence of moderate atrophy in the intraforaminal area and an even more pronounced level of bone resorption in the posterior mandible. The patient desired a fixed rehabilitation with re-establishment of the posterior occlusal plane. From an esthetic standpoint, it was necessary to provide a restoration with crowns the same height as the original teeth while avoiding an unfavorable biomechanical situation. Vertical distraction of the complete mandible was performed using a Martin distractor according to the Hoffmeister technique. At the end of the period of activation and consolidation, the distractor was removed and 8 FRIALIT®-2 Synchro implants were placed in predetermined sites and immediately loaded with a cemented transitional prosthesis. Ten months later the definitive restoration was delivered.

RESULTS:

The absence of any pathologic symptoms or negative radiologic findings 12 months after the surgery suggests a satisfactory result in the short term.

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

Dörtbudak O, Haas, R, Mailath-Pokorny G:

Effect of low-power laser irradiation on bony implant sites.

Clin Oral Impl Res 2002;13 (3): 288 – 292.

AIM:

This study was designed to examine the effect of low-energy laser irradiation on osteocytes and bone resorption at bony implant sites.

MATERIALS AND METHODS:

Five male baboons with a mean age of 6.5 years were used in the study. Four holes for accommodating implants were drilled in each iliac crest. Sites on the left side were irradiated with a 100 mW low-energy laser (690 nm) for 1 min (6 Joule) immediately after drilling and insertion of four sandblasted and etched (FRIALIT®-2 Synchro) implants. Five days later, the bone was removed en bloc and was evaluated histomorphometrically.

RESULTS:

The mean osteocyte count per unit area was 109.8 cells in the irradiated group vs. 94.8 cells in the control group. As intra-individual cell counts varied substantially, osteocyte viability was used for evaluation. In the irradiated group, viable osteocytes were found in 41.7% of the lacuna vs. 34.4% in the non-irradiated group. This difference was statistically significant at $P < 0.027$. The total resorption area, eroded surface, was found to be 24.9% in the control group vs. 24.6% in the irradiated group. This difference was not statistically significant.

CONCLUSIONS:

This study showed that osteocyte viability was significantly higher in the samples that were subjected to laser irradiation immediately after implant site drilling and implant insertion, in comparison to control sites. This may have positive effects on the integration of implants. The bone resorption rate, in contrast, was not affected by laser irradiation.

Department of Oral Surgery, Dental School, University of Vienna, Austria.

F28

Fürst U, Klug D, Neugebauer J: Sinus Floor Elevation with FRIALIT®-2 BoneCondensers to enhance maxillary implant placement.

ZWR 1999;108 (9): 506 – 510.

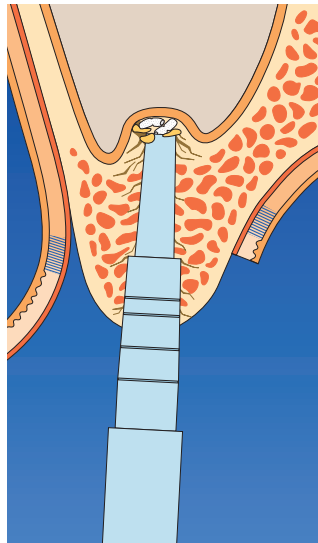
BACKGROUND:

In cases with reduced bone height in the posterior maxilla, the site for implant placement can be improved by sinus floor elevation and bone grafting.

MATERIALS AND METHODS:

The sinus lift technique with special atraumatic instruments (FRIALIT®-2 BoneCondenser) presented below, ensures an improved quality of spongy bone through apical and lateral condensing. In addition, the procedure is less invasive due to the minimized flap incision and the access from the alveolar ridge (so-called internal sinus lift). The technique will be described on the basis of clinical cases and evaluated compared to conventional sinus floor elevation, augmentation and ERE-techniques.

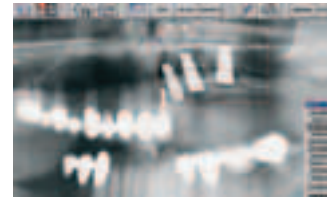
Dental Practice, Wiesloch, Germany.



FRIALIT®-2 BoneCondenser: Illustration of the preparation with the D2 pilot instrument.



Internal sinus lift: Final posterior preparation with angled D 5,5 L13 instruments, residual tooth.



Status after internal sinus lift with placement of a D 5.5, L13 implant. The height of the available bone (from the crestal edge to the red marking) is 8 mm.

**Garber DA, Salama MA, Salama H:
Immediate total tooth replacement in the external root resorption case.**

World Dentistry 1(1), www.worlddent.com.

BACKGROUND:

The quest for a “true” immediate tooth replacement in dentistry has long plagued the clinician in everyday practice. In cases with an uncompromised osseous topography and when using the correctly shaped implant with the correct surface, immediate tooth replacement has at least become a true everyday clinical reality.

AIM:

The authors present an incisionless approach that makes it possible to go from tooth removal with implant placement and temporization at one visit to insertion of the final restoration some six to eight weeks later, even in the problematic case of external root resorption.

CONCLUSION:

In selected cases with the uncompromised osseous topography and when using the correctly shaped implant with the correct surface, immediate tooth replacement for the root undergoing external root resorption has at last become a true everyday clinical reality. It requires different tapered armamentarium as opposed to a cylindrical form implant (FRIALIT®-2 implant, FRIADENT GmbH, Mannheim, Germany), which allows the clinician to obliterate the top of the extraction socket negating the need for a membrane and primary closure of the site. The stepped decreased diameter in the apical region precludes perforating the subnasal concavity of the labial surface. The concept of incisionless implant placement allows the clinician to maintain the key inherent forms of the restorative gingival interface - maximizing esthetics. In addition, it allows the critical preservation of the labial facial bone by not stripping the periostium and maintaining the crucial vascular supply. If the length of the implant fixture is optimized utilizing the primary native bone beyond the apex of the root towards the base of the nose, primary stability can be obtained and healing with full osseointegration, no soft tissue seam, and immediate provisional restoration is viable. This approach expedites the process exponentially making it possible to go from tooth removal with implant placement and temporization at one visit to insertion of the final restoration some six to eight weeks later, even in the problematic case of external root resorption.

Dental Practice, Atlanta, USA.



Radiograph reveals that the adjacent right central incisor is showing signs of external root resorption with the potential to fracture during function.



An appropriately sized scREW type implant is inserted and torqued down into position.



Radiograph at the end of treatment.

F30

Hartmann, HJ, Gross M:

Non functional immediate progressive loading of root-analog implants:

A case report.

ZWR 1999;108 (9): 506 – 510.

INTRODUCTION:

Immediate loading has become one of the most interesting challenges in implant dentistry. Clinical experiences showed that the most decisive factor for esthetic results is the natural bony support of soft tissue. Nowadays the high level of predictability in dental implants has been well demonstrated and this lead to the development of some surgical treatment protocols for immediate implant placement to increase the success rate of esthetic single tooth restorations. The standard protocol for immediate implant placement describes a two-stage surgery with primary closure immediately after extraction and re-opening after a healing period of about 4 to 6 months. At second stage surgery, after primary closure, the natural gingival contour has to be reconstructed. In order to simplify this procedure the protocol has been varied and impression taking was performed at the time of placement to fabricate the crown by preserving the original gingival contours. A further step in variation of the protocol resulted in one-stage immediate implant placement with transgingival healing and gingival shaping. In addition, a protocol for immediate restoration with or without functional loading was established.

AIM:

The aim of this poster is to present a clinical case following the protocol of non-functional immediate progressive loading without flap incision.

MATERIALS AND METHODS:

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 is presented step by step and shows the excellent tissue reaction and adaptation if atraumatic surgical procedures are applied.

DISCUSSION:

This clinical case shows a favorable result with excellent natural esthetics under the circumstances of a flapless immediate implantation with non-functional immediate progressive loading. In the post-op periapical x-ray the implant seems to be successfully integrated and no significant bone loss or formation of fibrous connective tissue rather than bone at the bone-implant-interface can be observed.

Dental Practice, Tutzing, Germany.



Clinical situation before extraction; hopeless tooth 21.



The final crown; perfect natural esthetics.

Khoury F:

Augmentation of the sinus floor with mandibular bone block and simultaneous implantation: A 6-year clinical investigation.

Int J Oral Maxillofac Implants 1999;14 (4): 557 – 564.

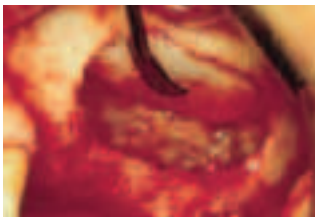
INTRODUCTION:

Between 1991 and 1995, 216 sinus-lift procedures were accomplished as part of a clinical study. The study involved placing 467 implants in the atrophic posterior maxillae of 142 female and 74 male patients. The initial bone height at the implant site was between 1 and 5 mm. The implants were supported subantrally with bone block grafts harvested from the retromolar or symphysis areas of the mandible.

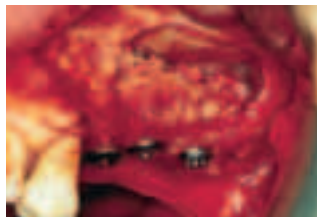
RESULTS:

Perforations of the maxillary sinus membrane were observed in 51 patients; these were repaired with fibrin adhesive. The spaces remaining above the bone graft were filled with various materials. A total of 28 implants failed. All the remaining implants were deemed successfully osseointegrated, based on radiographic and clinical (including periodontal health) criteria. No patients experienced maxillary sinus complications. Clinically and radiographically, the best bone regeneration was observed in those patients in whom the surgically created space was completely grafted with autogenous bone that included a high percentage of resorption-resistant cortical bone. In those patients having bone grafts harvested from the mandibular symphysis, none of their facial profiles were adversely affected; however, some patients experienced neurosensory deficits involving the mandibular anterior incisors and adjacent alveolar mucosa. Occasionally, these symptoms persisted for up to 1 year following the procedure.

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



The bony lid is rotated toward the maxillary sinus without injuring the maxillary sinus membrane.



Stabilization of the bone block graft with 3 FRIALIT®-2 implants. Wide cover screws are used to achieve initial stability of the bone graft/implant structure on the alveolar ridge.



Radiographic situation 6 years post-operatively.

F32

Lorenzoni M, Pertl Ch, Zhang K, Wimmer G, Wegscheider W: Immediate loading of single tooth implants in the anterior maxilla.

Preliminary results after one year.

Clin Oral Impl Res 2003; 14 (2); 180 – 187.

INTRODUCTION:

According to the standard protocol, a load-free healing period is one of the most emphasized requirements for implant integration. Recent studies have encouraged a progressive shortening of the healing period for single tooth implants and immediate loading has been proposed for the aesthetic zone in the maxilla.

AIM:

The present study evaluated clinical outcomes of immediately loaded FRIALIT®-2 Synchro implants 12 months after placement in the maxillary incisal region.

MATERIALS AND METHODS:

In the course of our investigation, nine patients have been treated following an immediate loading protocol. The stepped-screw type implants were inserted with an increasing torque up to 45 Ncm, thus measuring the primary stability of the implants. All implants were immediately restored with unsplinted acrylic resin provisional crowns and the patients provided with occlusal splints. Regular controls were performed at monthly intervals, intraoral radiographs were taken directly after implant placement, 6 and 12 months post insertion. The survival rate, clinical stability (Periotest) and radiographic coronal bone defects (CBD) were evaluated at delivery of the definitive superstructures (CBD 6) and 6 months later (CBD 12). Twelve FRIALIT®-2 Synchro stepped screws of 3.8, 4.5 and 5.5 mm diameter and 13 and 15 mm length were placed in the incisal maxillary region.

RESULTS:

The median Periotest value 6 months post insertion was -2 with a minimum of -5 and a maximum of +2. The mean coronal bone level changes (CBD) at 6 and 12 months were 0.45 and 0.75 mm. No implant failed up to 12 months after insertion, resulting in a 100% survival rate.

CONCLUSIONS:

The presented results showed promising data for immediately loaded single tooth implants in the anterior maxilla. Periotest values were within the range published for submerged implants. The radiographic coronal bone resorption after 6 and 12 months was even less than evaluated for implants placed in a standard two-stage procedure. It is evident that successful immediate loading protocols require a careful and strict patient selection aimed at achieving the best primary stability and avoiding any excessive functional or non-functional loading. Additional research needs to be done to provide data in situations where problems of poor bone quality, multiple implants or augmentation procedures must be overcome.

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

Lorenzoni M, Pertl CH, Wegscheider WA, Keil C, Penker K, Polansky R, Bratschko RO:

Retrospective analysis of FRIALIT®-2 implants in the augmented sinus.

Int J Periodontics Restorative Dent 2000; 20 (3): 251 – 263.

AIM of the present study was to investigate clinical and radiographic data of patients treated with implants in the posterior maxilla in combination with sinus augmentation.

MATERIALS AND METHODS:

Study parameters included Periotest values, radiographic analysis, and survival/success rates up to 5 years.

RESULTS:

Clinical and radiographic criteria resulted in a success rate of 92.7% for sinus implants. Radiographically, the sinus implants showed a mean coronal bone loss of 0.5 mm at 6 months and 1.2 mm at 48 months. The results showed stable peri-implant parameters for sinus implants during the observation period of 5 years. The success rates showed no significant differences regarding different implant-supported treatment options for the posterior maxillary region.

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

F34

Lorenzoni M, Pertl Ch, Wegscheider W: Clinical and histological results of sinus augmentation with bovine filling materials.

*Scientific Poster, 82nd Annual Meeting AAOMS,
September 20 – 23, 2000.*

INTRODUCTION:

In the posterior maxilla, the process of ridge resorption is bi-directional. The result is a rapid loss of bone volume and height of the alveolar ridge. Reconstructive surgery is required to recreate bone volume and height for the placement of long end osseous dental implants to support a dental prosthesis. The technique known as sinus augmentation is the least invasive and a variety of techniques and materials is documented. Data regarding implant success in grafted sinuses is relatively limited.

AIM:

The present retrospective study of FRIALIT®-2 maxillary implants aimed at a clinical and radiographic analysis of sinus augmentation procedures including histological results. Moreover, it intended to assess survival and success rates for implants following sinus grafting and compare them to conventional implants for the restorative treatment of the posterior maxilla.

MATERIALS AND METHODS:

Our investigation included 344 FRIALIT®-2 stepped screws (FRIADENT GmbH Mannheim, Germany) which had been placed at the Department of Prosthodontics, University Dental Clinic, Graz, into edentulous maxilla (n = 169) or free-end cases (n = 175). 98 implants were placed in combination with sinus augmentation. Seventy-three of them in a simultaneous approach. Bio-Oss® (Geistlich AG, Switzerland) was used exclusively as filling material for 89 implants, while in two cases a combination of Bio-Oss® and autogenous bone was utilized.

RESULTS:

Radiographic Evaluation: Median coronal bone defect (CBD) for all implants (n = 344), was 0.86 mm after six months. Six months following restoration, the CBD averaged 1.17 mm. After 36 months, the radiographic bone loss was at 1.61 mm, after 48 months it measured 1.71 mm and after 60 months it was 2.12 mm below the upper edge of the implant. In group 4 (implants + sinus augmentation) the CBD increased from 0.54 mm at reentry at above 0.83 mm, 1.23 mm, 1.29 mm, to 1.22 mm after 48 months.

Success Analyses: Using the success criteria proposed by the authors, assessment of our data produced a total success rate of 95.2% after 60 months for anterior implants and 94.3% for implants in the posterior maxilla. In the sinus group, a cumulative success rate of 92.7% after 60 months was achieved. The success rate for groups 1, 2 and 3 were 94.4%, 97% and 96.2%. Statistical comparison showed no significant differences between the 4 groups after 60 months.

Histological Results: The bone immediately adjacent to the Bio-Oss®; granules turned out to be mostly lamellar, showing a slightly irregular structure. In the available histological specimen extracted six months after clinically successful sinus augmentation, the bovine filling material appeared as a matrix, taking on the function of an osseoconductive scaffold serving new bone formation.

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

**Marcaccini AM, Novaes AB, Souza LS, Taba M, Grisi MFM:
Immediate implant placement into periodontally infected sites in dogs:
A fluorescence microscopy study.**

Int J Oral Maxillofac Implants 2003; 18 (6): 812 – 819.

PURPOSE:

Polychromatic sequence labeling of bone was used to study the effect of periodontal infection on the immediate placement of FRIALIT®-2 implants.

MATERIALS AND METHODS:

In the surgical first phase, periodontitis was induced with ligatures involving the mandibular premolars of 5 mongrel dogs, and the contralateral teeth were used as controls (received only prophylaxis). After 3 months, the second phase was initiated and 40 implants were placed in the alveoli of both experimental and control teeth. During the healing period, fluorescent bone markers were injected to study bone formation around the implants. The dyes were injected in the following sequence: oxytetracycline hydrochloride at 3 days after implant placement, calcein green 4 weeks after implant placement, oxytetracycline 8 weeks after implant placement, and alizarin red S 3 days before sacrifice. Following a healing period of 12 weeks, the animals were euthanized and the hemi mandibles were removed, dissected, fixed, and prepared for histomorphometric analysis of the percentage of each bone marker present.

RESULTS:

Fluorescence microscopy showed a similar sequence of bone remodeling (Mann-Whitney test) for both groups: experimental group, 9% bone formation at 3 days, 29% at 4 weeks, 21.6% at 8 weeks, and 52% at 12 weeks; control group, 14% at 3 days, 35.2% at 4 weeks, 32.3% at 8 weeks, and 45.8% at 12 weeks.

DISCUSSION:

Remodeling in both groups had similar characteristics in the degree of bone formation.

CONCLUSION:

It was concluded that periodontal disease does not affect bone remodeling around immediate implants. Although the healing in periodontally infected sites was slower initially, it reached the levels of the non-diseased sites after 12 weeks.

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.

F36

**Schulte W, d'Hoedt B, Axmann D, Gómez-Róman G:
15 years of Tübingen implant and its advancement to the
FRIALIT®-2 system.**

Z Zahnärztl Implantol 1992; 9: 77 – 96.

The first concepts for the development of the Tübingen implant system evolved in 1974. Its underlying working hypothesis, the 15 years of continuous data collection, and the consequences this has for the further development of this implantological principle are described. It becomes evident that prognoses for newly developed implant system with relatively short periods of observation are only possible, if data are collected in the long range and with utmost care and if these data can be evaluated with scientifically unobjectionable methods.

The FRIALIT®-2 system is, among others, the result of the evaluation of almost 500.000 data and, after meanwhile 2 years of observation, it is opening up new avenues for the future. Scientific tests of all aspects of the concept established 18 years ago indicate a high probability of success, if multifactor analyses are employed. The use of immediate implants for the preservation of the alveolar process by means of well-timed functional loading as originally laid down in the Tübingen concept has been followed with various implant systems all over the world. The basis principles of the FRIALIT®-2 system, build on this vast experiences, and the first statistical results of 158 implants are presented.

Polyclinic for Dental Surgery and Periodontology, University of Tübingen, Germany.

F37

**Strietzel FP, Nowak M:
Extension of the alveolar crest with the FRIALIT®-2 BoneCondenser.**

Z Zahnärztl Implantol 1998; 14: 85 – 90.

The placement of implants in the mandible is often aggravated by unfavorable anatomic preconditions like a strong vestibular inclination or a pronounced atrophy of the alveolar ridge in the buccal-palatal extension. Under these conditions the width of the ridge does not allow the preparation of the implant site without a preliminary optimization in order to guarantee a sufficient primary stability of the implant. The present publication presents instruments for an extension of the alveolar crest, especially for the implantation of stepped screw implants or stepped cylinder implants of the FRIALIT®-2 implant system which do not only condense the spongy bone in the implant bed but also create an implant-congruent implant site.

Department of Oral Surgery and Dental Radiology, University Clinic Charité, University of Berlin, Germany.

Valentin H, Rinck Th:
(Delayed) immediate implant placement –
A method for optimum functional and esthetic results in implantology.
Dent Implantol 1997; 1 (1): 28 – 36.

BACKGROUND:

Improved surgical procedures and optimized implant systems have revolutionized the range of indications for dental implants. In recent decades the main focus was set on the stabilization of removable dentures. The idea of a fixed full-mouth restoration for edentulous patients developed only slowly and under an increasing pressure from the patients. Today the esthetic result of a treatment becomes more and more decisive for the acceptance of an implantological treatment by the patient (Valentin 1995). However, this implies a close conceptual cooperation between the dentist and the dental technician in order to achieve an optimum result in accordance with the patient's wishes (Schilli 1995).

MATERIALS AND METHODS:

The methodical procedure from the surgical treatment to the individual shaping and coloring of the prosthetic restoration is representatively demonstrated for different age groups by different clinical cases from a pool of 100 patients.

RESULT:

A statistical evaluation shows that the grafting techniques become less important in older patients due to immediate implantation per se – and also due to placing an increased number of shorter implants and implants with smaller diameters.

Dental Practice, Mannheim, Germany.

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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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