Immediate loading of single-tooth implants in the anterior maxilla. Preliminary results after one year

Key words: anterior maxilla; immediate implant; immediate loading; radiographic bone level; single tooth implant

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

The high levels of predictability in implant therapy have encouraged re-evaluation of several aspects of the traditional Bränemark implant protocol (Adell et al. 1981; Albrektsson et al. 1981; Branemark 1983; Szumukler-Moncler et al. 2000). Several authors demonstrated successful immediate loading in edentulous mandibles by means of fixed superstructures (Salama et al. 1995; Schnitman et al. 1997; Tarnow et al. 1997; Randow et al. 1999) or bar-retained overdentures (Ledermann 1979, 1983; Babbsch et al. 1986; Graber & Besimo 1991; Chiapasco et al. 1997) thereby preventing any movement or non-axial loading by rigidly splinted implants. At present, it appears that premature loading per se does not lead to fibrous tissue encapsulation. Rather, it is due to an excessive amount of micromotion at the bone-implant interface, during the healing phase (Szumukler-Moncler et al. 2000). Bone remodelling probably does not occur all at once over the entire implant. Otherwise, mobility would have occurred during the osseous remodelling process. It appears that remodelling is probably variable, with balanced osteoclastic and osteoblastic activity, so that a stable implant is always maintained during osseointegration [Schnitman et al. 1997].

Recent experimental [Piattelli et al. 1998; Corso et al. 1999] and clinical [Wöhrle 1998; Ericsson et al. 2000; Garber et al. 2000; Chaushu et al. 2001; Cooper et al. 2001] studies have concentrated on a progressive shortening of the healing period for single-tooth implants with immediate loading in the aesthetic zone of the anterior maxilla. Wöhrle (1998) demonstrated the use of an immediate placement procedure for restoring single teeth in the aesthetic zone, focusing on hard and soft tissue management. Fourteen implants were placed immediately following tooth extraction and were subsequently restored. Life-table analysis indicated that all implants maintained their primary stability throughout the conventional 6-month healing phase and were considered to have osseointegrated based on pre- and post-operative radiographs. In recent clinical studies Ericsson et al. (2000) and Chaushu et al. (2001) found a 86–100% survival rate of single-tooth replacements installed according to a one-stage surgical procedure and immediate loading.

The hypothesis of this clinical study was that the clinical outcome of immediately loaded unsplit FRIALIT-2 Synchro stepped screw implants in the maxillary incisal region could be a predictable treatment approach, clinically comparably successful to submerged maxillary anterior single-tooth implants placed according to a standard protocol. The outcome measures were based on clinical stability and on changes of radiographic coronal bone level from implant placement to an average of 12 months after insertion.

Material and methods

In the course of our investigation, nine patients were treated following an immediate loading protocol. The treatment course included permanent wear of an occlusal splint for 8 weeks, alternatives as well as risks were explained to, and informed consent was obtained from, all patients. Oral examination focused on stable occlusion, soft tissue conditions, buccolingual and mesiodistal width and maxillomandibular relationship. The patients were selected to be non-smokers, non-bruxers and prepared to comply to the follow-up and maintenance programme. Tomograms [Dental CT, Sirona Dental Systems, Bensheim, Germany] as well as periapical (Sidexis Intraoral, Sirona Dental Systems) and panoramic radiographs [Orthophos plus DS, Sirona Dental Systems] were evaluated for mesiodistal width [anteroposterior distance], volume and direction of the residual bone beyond the apex, socket width, buccal bone plate and root angulation.

Indications for tooth extraction and immediate implant placement included trauma resulting in tooth avulsion [1] or root fractures [2], periodontal attachment loss [3], endodontic failures [2] or non-restorable crowns [2]. In one patient, four periodontally involved incisors were extracted and four implants placed in a delayed immediate approach 8 weeks post extraction. In one patient, periodontal disease and subsequent attachment loss of a central incisor adjacent to an implant have been treated for several years. Finally, tooth extraction and immediate implant placement following an immediate loading protocol were performed. Careful root planing, systemic and localized antibiotic treatment (Actisite, Solco Basel AG, Switzerland) preceded tooth extraction and immediate implant placement in this patient.

On the basis of the existing crown, a special drilling abutment [Select abutment, Friadent AG, Mannheim, Germany] was polymerized in a thermo-forming foil [Erko- dur, Erkodent, Kopp, Pfalzgrafenweiler, Germany] with acrylic resin [Palapress, Heraeus Kulzer GmbH, Wehrheim, Germany] thereby facilitating the selection of position and direction of the initial drilling procedure. Implant placement immediately after tooth extraction and debridement were carried out in eight patients. Following careful luxation of the root with a periodote, six teeth could be removed easily. In two cases, implant site preparation was performed with the intra-alveolar part of the root in situ. After final drilling with a 5.5-mm twist drill, thereby expanding the internal root canal, remaining root structures were elevated with a periote. Installation of the stepped-screw type grit-blasted, acid-etched FRILALIT-2 Synchro implants was achieved according to the instructions of the manufacturer with an increasing torque up to 45 Ncm [Torque-Controller, Nobel-Biocare, Gothenburg, Sweden] thus measuring mechanical bone quality and primary stability of the implants [TC]. Final implant position was achieved utilising a torque driver turning special attention to the position of the internal hexagon to optimise chair-side restoration with the help of angled [MH 6] abutments. Finally, MH 6 or EsthetiCap abutments [Friadent AG] were screwed to the implant and the wound closed with single mattress sutures. In three sites, implant placement was performed through the socket opening without any incision. In these cases, the implants were placed with their top 3–4 mm above the gingival level. Post-operatively, patients received oral antibiotics for 8 days, starting one day prior to surgery, as well as non-steroidal analgetics and instructions for oral hygiene with chlorhexidine [0.12%]. In the immediate implants placed without incision, remaining incongruencies between the screw and the surrounding bone were left untreated, in two cases with flap elevation and peri-implant gaps Bio-Oss [Geistlich AG, Wolhusen, Switzerland] granules were applied and exact adaptation of the soft-tissue margins ensured.

All implants were immediately restored with temporary cemented [Temp Bond,
Fig. 1. (a) Clinical situation of the lateral incisor preoperatively. (b) Preparation of the implant bed with root in situ (modified extraction). (c) Insertion of a 4.5×15 mm implant (FRIALIT-2 Synchro) without raising a mucoperiosteal flap. (d) Cemented provisional restoration with bite guard immediately after implant insertion. (e) Clinical situation 8 weeks post insertion demonstrating stable peri-implant conditions. (f) Root analogue diameter of acrylic abutment (EsthetiCap) supports alveolar contour (10 weeks post operatively). (g) Final restoration (all ceramic crown, Procera) 20 weeks post implant insertion. (h) Final restoration 12 months post insertion demonstrating optimal maintenance of soft tissues. (i) Intraoral radiographs immediately after implant insertion. Note imperfect fit of provisional acrylic abutment. (j) Intraoral radiographs 6 months after delivery of final restoration (= 12 months post insertion).
Kerr, GmbH, Karlsruhe, Germany) provisional crowns, manufactured with the help of single shell crowns, or clear vacuum-formed templates, and adjusted to the abutment and the gingival margin with acrylic resin (Pro Temp, Espe, Seefeld, Germany). Special care was taken to prevent any centric and eccentric contacts on the provisional crowns. Finishing of the acrylic resin restorations was performed on abutment analogues in the laboratory to avoid removal of the abutment screwed to the implant. Finally, all patients were provided with occlusal splints. Regular controls were performed at 2-week intervals with special attention to occlusion and hygiene. Intraoral radiographs (Sidexis-Intraoral, Sirona Dental Systems) with digital sensor positioning system (XCP-DS, Sirona Dental Systems) in right angle technique were taken monthly. Any manipulation except re-cementation of crown and hygiene. Intraoral radiographs at the time of implant insertion, intraoral radiographs were taken and compared with the corresponding radiographs at the time of implant insertion and 6 months post insertion. No further clinical data were evaluated at this point in time (Fig. 1).

Results

Healing was, in general, uneventful with little pain and swelling for the patients. Complications were restricted to loosening of the provisional crowns or final restorations. In one patient presenting with periodontal attachment loss in the adjacent teeth, a mucosal inflammation was diagnosed 6 weeks post insertion. Treatment involved removal and polishing of the provisional, rinsing with chlorhexidine and hygiene instructions resulting in uneventful healing during the observation period. In this patient, a slight buccal recession was noticed after delivery of the final all-ceramic crown. All other sites maintained excellent papillae and peri-implant soft-tissue conditions.

Table 1 presents an overview of clinical data of patients and implants included in this study. Follow-up ranged from 12 to 14 months, with a mean of 13 (± 1) months for the evaluated implants (calculated from the day of implantation). All implants were inserted with a final torque ≥32 Ncm. Three implants were placed in male and nine implants in female patients, the mean age of the patients being 51.8 years (±9.5), minimum 19 years, maximum 71 years.

For a total of 12 FRIALIT-2 Synchro stepped screws placed in the incisal maxillary region, diameters of 4.5 and 5.5 mm and 13 and 15 mm length were inserted in regions 12, 11, 21 and 22. Eight implants were placed as immediate implants, four as delayed immediate implants. The median Periotest value 6 months post insertion was −2 with a minimum of −5 and a maximum of +02 for the immediately loaded implants (Fig. 2). Maximum bone resorption 6 and 12 months after implant placement amounted to 2 mm. During the course of our study the mean crestal bone loss was 0.46 (CBD 6; ±0.66) and 0.75 mm (CBD 12; ±0.5). The corresponding median was 0 and 0.5 (Fig. 3). No implant failed up to 12 months after insertion, resulting in a 100% survival rate.

### Table 1 Overview of clinical data of patients and implants included in this study

| Pat Sex Tooth Reason Implant Incision Torque Abutment Final abutment Restoration Observation period Mean CBD 6 PTV 6 Mean CBD 12 |
|---|---|---|---|---|---|---|---|---|---|---|
| H.M. F 12 Fracture 4.5/15 + >45 Ncm MH 6 Cerabase Procera 14 0.5 −2 0.5 |
| M.M. M 12 Avulsion 4.5/15 − >45 Ncm MH 6 MH 6 Procera 14 1 −1 1 |
| W.F. M 12 Fracture 4.5/13 − >45 Ncm Estheticap MH 6 MH 6 Procera 12 0 −1 1 |
| R.S. F 21 Perio 5.5/13 − >32 Ncm MH 6 Cerabase Procera 12 1 −2 1 |
| U.S. F 22 Fracture 4.5/15 + >32 Ncm MH 6 MH 6 Procera 12 0 −3 0.5 |
| U.G. F 12 Perio 3.8/15 + >32 Ncm MH 6 MH 6 Ceramometal 14 2 +1 2 |
| U.G. F 11 Perio 3.8/15 + >32 Ncm MH 6 MH 6 Ceramometal 14 1 +2 1 |
| U.G. F 21 Perio 3.8/15 + >32 Ncm MH 6 MH 6 Ceramometal 14 0 −3 0.5 |
| U.G. F 22 Perio 3.8/15 + >32 Ncm MH 6 MH 6 Ceramometal 14 0 −1 0.5 |
| W.L. F 22 Fracture 3.8/15 + >45 Ncm MH 6 MH 6 Ceramometal 12 0 −4 0 |
| W.E F 11 Endo 5.5/15 + >32 Ncm MH 6 Cerabase Procera 12 0 −5 0.5 |
| K.H. M 21 Endo 5.5/13 + >45 Ncm MH 6 MH 6 Ceramometal 12 0 −4 0.5 |
| Mean 13 0.46 −2 0.75 1.0 0.66 0.5 |

Procera, all-ceramic crown; Ceramometal, porcelain-fused-to-metal crown; CBD 6, radiographic coronal bone defect 6 months post insertion; CBD 12, radiographic coronal bone defect 12 months post insertion; PTV 6, Periotest-value 6 months post insertion.
Discussion

This investigation involved a method of placing implants into immediate function at first-stage surgery and restoring the patient with an implant-retained provisional prosthesis. The advantages of this one-stage procedure are obvious and include immediate function and aesthetics. There is no need for a temporary denture. Second-stage surgery is eliminated and adjacent papillae are well preserved, contributing to the final aesthetic result [Chaushu et al. 2001].

The results presented showed promising data for immediately loaded single-tooth implants in the anterior maxilla. Periotest-values were in the range of implants placed according to standard protocols. In accordance with other authors [Wöhrle 1998], we suggest immediate provisionalization only in case of optimal primary stability (> 32 Ncm). In this patient population, the potential for micromovement was minimized by avoiding any centric and eccentric contacts and providing occlusal splints for a minimum of 8 weeks. The provisional restorations have not been removed during the healing period, to prevent any manipulation possibly jeopardizing osseointegration. In a recently published study Chaushu et al. [2001] concluded that immediate loading of single-tooth implants placed in healed sites was a possible treatment alternative. In another pilot study, 14 fixtures for single crown restorations, were installed according to a one-stage surgical protocol and loaded via a temporary crown within 24 h. Out of the 14 fixtures, two were lost (14%) after being up to 5 months in function, and were subsequently removed. All remaining implants were stable [Ericsson et al. 2000]. The authors stated that the reasons for these two fixture losses could only be speculated upon. In an investigation of early failures, Tarnow and co-workers stated that rigid splinting and minimal lateral force application were critical factors for success. They suspected that their early failures were the result of the removal of early provisionals for Periotest mobility measurement for each individual implant [Tarnow et al. 1997]. The preliminary results of our clinical investigation showed a 100% survival rate. Besides strict inclusion criteria (non-smokers, non-bruxers, stable occlusion, high primary stability) one possible reason might be the fact that patients were carrying removable occlusal splints for 6–8 weeks both day and night. The rationale for such splints was not only to protect the provisionals against centric or eccentric occlusal loading, but also to avoid any pressure exerted by the tongue [Schulte 1973].

Ericsson et al. reported that the marginal bone loss during the observation period between 6 and 18 months post insertion was, on average, found to be 0.14 mm in the experimental group [Ericsson et al. 2000]. In the present study, we found lower initial bone resorption (0.45 mm, 0.75 mm) 6 and 12 months post implant insertion compared with our previously published data on submerged Frialit-2 implants [Lorenzoni et al. 1999]. A possible explanation might be the well-known fact that the exposure of the marginal bone during second-stage surgery is suspected to result in some bone loss in standard submerged implant procedures. Weber et al. demonstrated that in one-stage implants a large percentage of initial bone loss occurred during the first months, whereas, in two-stage implants, 40% of initial bone resorption was found after re-entry. The authors explained their findings with bacterial colonisation of one-stage implants on the one hand and the additional surgical trauma in two-stage protocols on the other [Weber et al. 1996]. Hermann et al. [2000] concluded that the presence of an interface on two-part implant/abutment systems appeared to correlate with crestal bone loss independent of submerged or non-submerged implant placement. In agreement with those experimental [Weber et al. 1996] and clinical [Hermann et al. 2000] data we expect comparable radiographic assessments between the immediate loading procedure and the conventional two-stage protocol in the course of our ongoing evaluation.

Cooper et al. [2001] reported on a bone adaptation following provisional crown placement 3 weeks after implant placement limited to approximately 0.6 mm within the first 6 months of the evaluation. Additional bone adaptation was not observed at 12 months [Cooper et al. 2001]. In another paper, the authors stated that the 6-month radiographic marginal bone loss did not extend beyond the implant-abutment junction [Chaushu et al. 2001]. In accordance with Cooper et al. [2001] we suggest that the presently measured favourable cortical bone response could be responsible for the support of the peri-implant mucosa. Consequently, the excellent papilla form observed in these cases can be related to the bone maintenance observed [Cooper et al. 2001].

In the above mentioned study, Chaushu and co-workers evaluated that immediate loading of single-tooth implants placed in fresh extraction sites carried a failure risk of approximately 20% in their patient population. Implant placement immediately following tooth extraction did not increase the risk of implant failure in our patients and is therefore recommended in order to prevent horizontal bone atrophy following tooth extraction. Certainly all prerequisites, limitations and selection criteria of immediate implant insertion [Lazzara 1989, Schulte et al. 1992] must be met.
Salama and associates suggested guidelines for one-stage surgery and immediate loading. These included bone quality, macro- and microstructure of the implant, initial stability of the implant and the occlusal loading situation (Salama et al. 1995). In the present study we utilised grit-blasted, acid-etched stepped screw type implants with a minimum of 13 mm length and 3.8 mm diameter. A key issue for future studies will be to define a threshold value for the primary stability as well as general prerequisites [minimal length, diameter, bone quality, implant surface] for immediate loading of unplanted implants. Another important objective will be to find out the most advantageous components for immediate provisionalization as far as material, ease of adaptation, stability, individualisation, manipulation, use as definitive abutment and economic considerations are concerned. The use of a new threaded implant designed for immediate loading procedures with a pre-mounted temporary abutment (XIVE, Friadent) might be a step towards improved clinical management of immediate loading procedures in single-tooth cases.

Patients appeared to benefit from immediately loaded implant restorations in several tangible ways. First, they resumed function quickly following surgery and provisional restoration placement without second-stage surgery. Moreover the need for removable dentures can often inadvertently apply excessive forces, whether or not the implants are submerged below the flaps (Ganeles et al. 2001). In accordance with Wöhrl [1998] the main advantage, in our opinion, seems to be the optimal maintenance of the existing hard and soft tissues resulting in very favourable aesthetic results without the necessity of hard or soft tissue augmentation. The high predictability of implants shown in this series and others seems to indicate that the use of a fixed provisional restoration can help control the occlusal forces that are applied to the healing bone-to-implant interface within a physiologic range [Ganeles et al. 2001]. In spite of the many reports about successful immediate implant loading, we still have to accept the fact that, at present, only non-loading protocols are fully evidenced. According to the outcome of this study, users can treat their patients in a highly predictable way if patients are selected carefully and treatment protocols aimed to achieve the best primary stability are strictly followed.

Further studies are needed to determine the long-term success of immediately loaded implants. Furthermore, additional data are needed to determine the minimal bone quality, quantity, minimal insertion torque and maximal occlusal loading for predictable immediate loading protocols.

**Conclusion**

Within the limits of the present study the preliminary data indicate that immediate loading of single-tooth implants in the anterior maxilla can result in successful implant integration and stable peri-implant conditions up to one year. Future studies will have to evaluate long-term data of immediate restorations on implants and possible applications of this technique in situations where problems of poor bone quality, multiple implants or augmentation procedures must be overcome.

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**Résumé**

Selon le protocole standard, une période de guérison sans mise en charge est une des conditions requises pour l'intégration implantaire. Des études récentes ont encouragé un temps de guérison progressivement plus court pour les implants solitaires et la mise en charge immédiate a été proposée dans les zones esthétiques du maxillaire. L'étude présente a évalué les conséquences cliniques d'implants FRIALIT-S Synchro chargés immédiatement, douze mois après leur placement dans la région antéro-supérieure. Neuf patients ont été traités suivant un protocole de mise en charge immédiate. Les implants de type vis ont été insérés avec une force de vissage pouvant atteindre 45 Ncm mesurant ainsi la stabilité primaire de ces implants. Ces derniers ont été restaurés par des couronnes provisoires en résine immédiatement après le placement des implants et les patients ont reçu une attelle occlusale. Des contrôles réguliers ont été effectués tous les mois, des radiographies ont été prises immédiatement après le placement des implants ainsi que six et douze mois après. Le taux de survie, la stabilité clinique résulante par le Periotest et les lésions osseuses coronaires radiographiques (CBD) ont été évalués lors du placement des couronnes définitives (CBD) 6 et six mois après CBD 12. Douze implants FRIALIT-S Synchro en vis de 3.8, 4.5 et 5.5 mm de diamètre et de 13 et 15 mm de longueur ont été placés dans la région maxillaire antérieure. La valeur Periotest moyenne six mois après l'insertion était de –3, avec un minimum de –5 et un maximum de +0. Les variations du niveau osseux coronaires moyens (CBD) à six et douze mois étaient respectivement de 0,45 et 0,75 mm. Aucun implant n’a été perdu douze mois après l’insertion résultant en un taux de survie de 100%. Ces résultats apportent des données très positives en ce qui concerne la charge immédiate des implants solitaires dans la région maxillaire antérieure. Les valeurs Periotest étaient dans les limites publiées pour les implants enfoncés. La résorption osseuse coronaire évaluée par radiographie après six et douze mois étaient même inférieure à celle évaluée pour des implants placés de manière standard en deux étapes. Il est évident que le succès de cette méthode requiert une sélection stricte des patients permettant une stabilité primaire parfaite et évitant une charge non fonctionnelle ou fonctionnelle excessive. Davantage de recherche s’avère nécessaire afin d’apporter des données dans les situations de mauvaise qualité osseuse, d’implants multiples ou d’épaisseur osseux. Selon le protocole standard, une période de guérison sans mise en charge est une des conditions requises pour l’intégration implantaire. Des études récentes ont encouragé un temps de guérison progressivement plus court pour les implants solitaires et la mise en charge immédiate a été proposée dans les zones esthétiques du maxillaire. L'étude présente a évalué les conséquences cliniques d'implants FRIALIT-S Synchro chargés immédiatement, douze mois après leur placement dans la région antéro-supérieure. Neuf patients ont été traités suivant un protocole de mise en charge immédiate. Les implants de type vis ont été insérés avec une force de vissage pouvant atteindre 45 Ncm mesurant ainsi la stabilité primaire de ces implants. Ces derniers ont été restaurés par des couronnes provisoires en résine immédiatement après le placement des implants et les patients ont reçu une attelle occlusale. Des contrôles réguliers ont été effectués tous les mois, des radiographies ont été prises immédiatement après le placement des implants ainsi que six et douze mois après. Le taux de survie, la stabilité clinique résulante par le Periotest et les lésions osseuses coronaires radiographiques (CBD) ont été évalués lors du placement des couronnes définitives (CBD) 6 et six mois après CBD 12. Douze implants FRIALIT-S Synchro en vis de 3.8, 4.5 et 5.5 mm de diamètre et de 13 et 15 mm de longueur ont été placés dans la région maxillaire antérieure. La valeur Periotest moyenne six mois après l’insertion était de –3, avec un minimum de –5 et un maximum de +0. Les variations du niveau osseux coronaires moyens (CBD) à six et douze mois étaient respectivement de 0,45 et 0,75 mm. Aucun implant n’a été perdu douze mois après l’insertion résultant en un taux de survie de 100%. Ces résultats apportent des données très positives en ce qui concerne la charge immédiate des implants solitaires dans la région maxillaire antérieure. Les valeurs Periotest étaient dans les limites publiées pour les implants enfoncés. La résorption osseuse coronaire évaluée par radiographie après six et douze mois étaient même inférieure à celle évaluée pour des implants placés de manière standard en deux étapes. Il est évident que le succès de cette méthode requiert une sélection stricte des patients permettant une stabilité primaire parfaite et évitant une charge non fonctionnelle ou fonctionnelle excessive. Davantage de recherche s’avère nécessaire afin d’apporter des données dans les situations de mauvaise qualité osseuse, d’implants multiples ou d’épaisseur osseux.

**Zusammenfassung**

Gemäß der Standard-Protokolle stellt die belastungsfreie Einheielperiode eine der am häufigsten gestellten Forde-
Andersson, B., Ödman, P., Lindvall, A.-M. & Lithner, B.

Albrektsson, T., Branemark, P.-I., Hansson, H.A. &

(CBD) nach

sorption nach

kieferfrontzahnbereich. Die Periotestwerte lagen in ei-

achtungszeit von

0

13

und Längen von

5

45

mm. Keines der Implante ging während der Beob-

achtung von

12

6

Monaten nach Plazierung in der Regi-

öse coronales radiografisch (CBD). Sei-

colocaron 12 implantes FRIALIT-2 Syncro autorroca-

dos de 3.8, 4.5 y 5.5 mm de diámetro y 13.7 a 15 mm de

longitud en la región incisal maxilar. El valor medio de

Periotest a los 6 meses tras la inserción fue de 3-5 y un máximo de 12-2. Los cambios medios de

del nivel óseo coronal (CBD) a los 6 y 12 meses fue de 0.45 y 0.73 mm. Ningún implante fracasó hasta los 12

meses tras la inserción resultando en un 100% de índice de

supervivencia. Los resultados presentados mostraron datos promedios para implantes unitarios cargados inmediatamente en el maxilar anterior. Los valores de Periotest se encontraron dentro del rango publicado para implantes superiores. La reabsorción ósea coronal radiográfica tras 6 y 12 meses fue incluso menor que la evaluada para implantes colocados con un procedimiento estándar de dos fases. Es evo-
dente que los protocolos exitosos de carga inmediata exi-
guen una selección estricta de los pacientes con la inten-
tión de lograr la mejor estabilidad primaria y evitar cualquier caga funcional o no funcional. Se precisa llevar a cabo investigaciones adicionales para proporcionar datos en situaciones en las que hay que superar problemas de baja calidad ósea, implantes múltiples o procedimien-
tos de aumento óseo.

Resumen

De acuerdo con el protocolo estándar, un período de cica-

trización libre de carga en uno de los requisitos más emfa-
sados para la integración del implante. Estudios recien-
tes han fomentado un progresivo acortamiento del perió-
do de cicatrización para implantes unitarios y se ha

propuesto carga inmediata para la zona estética del max-

ilar. El presente estudio evaluó los resultados clínicos de

implantes FRIALIT-2 Syncro cargados inmediatamente

tras 12 meses de su colocación en la zona incisal del ma-

xilar. En el transcurso de nuestra investigación se trataron

9 pacientes siguiendo un protocolo de carga inmeditada. Los implantes autorrascados se insertaron con un torque creciente de hasta 45 Ncm midiendo de este modo la estabilidad primaria de los implantes. Todos los implante-
tes se restauraron inmediatamente con coronas provisio-

nales no felurizadas de resina acrílica y se proporcionó a

los pacientes férmulas oclusales. Se llevaron a cabo controles

regulares en intervalos mensuales, se tomaron radiográ-

fias intraorales directamente tras la colocación del

plante, a los 6 y 12 meses tras la inserción. En el momen-
to de la colocación de las estructuras definitivas (CBD)

6 y 6 meses más tarde (CBD2) se evaluó el índice de supervivencia, la estabilidad clínica (Periotest) y defectos óseos coronales radiográficos (CBD).

Los cambios medios de

del nivel óseo coronal (CBD) a los 6 y 12 meses fue de 0.45 y 0.73 mm. Ningún implante fracasó hasta los 12

meses tras la inserción resultando en un 100% de índice de

supervivencia. Los resultados presentados mostraron datos promedios para implantes unitarios cargados inmediatamente en el maxilar anterior. Los valores de Periotest se encontraron dentro del rango publicado para implantes superiores. La reabsorción ósea coronal radiográfica tras 6 y 12 meses fue incluso menor que la evaluada para implantes colocados con un procedimiento estándar de dos fases. Es evidente que los protocolos exitosos de carga inmediata exigen una selección estricta de los pacientes con la intención de lograr la mejor estabilidad primaria y evitar cualquier caga funcional o no funcional. Se precisa llevar a cabo investigaciones adicionales para proporcionar datos en situaciones en las que hay que superar problemas de baja calidad ósea, implantes múltiples o procedimientos de aumento óseo.

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