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A 7-year life table analysis from a prospective study on ITI implants with special emphasis on the use of short implants

Results from a private practice

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ABSTRACT

This paper reports on a 7-year life table analysis on ITI titanium plasma-sprayed (TPS) and sandblasted and etched (SLA) implants placed in a private practice and loaded for at least 1 year. In 236 patients, 528 (264 TPS and 264 SLA) implants were placed, 351 (66.5%) implants rehabilitated the posterior region and 71.1% implants were ≤11 mm. In the posterior mandible and maxilla, the mean implant length was 9.90 and 9.74 mm respectively. Implant length was determined through standard radiographs only. Increase of the number of implants or reduction of the width or the length of the rehabilitations was not specifically sought for the shorter implants. One hundred and twenty-two SLA implants were loaded within 63 days. All early loaded SLA implants resisted the applied 35 N cm without rotation or pain. Three implants failed, one early and two late failures, all were SLA implants placed in the mandible. Shorter implants did not fail more than longer ones. The cumulative success rate was 99.40%. The predictable use of short implants supporting single crowns and small fixed partial dentures of 2-4 units supported by two to three implants permitted (1) restricting the need for sophisticated and expensive presurgical procedures aimed to determine precisely the available bone height by computerized radiographic methods, (2) the placement of prosthetically driven restoration instead of surgically driven ones, (3) reducing the indications span for complex invasive procedures like sinus lift and bone grafting procedures, (4) facilitating the surgery, without attempting to place the longest implant and (5) avoiding the occurrence of sensation disturbance. The safe use of short implants in a private practice should make implant therapy simpler and accessible to a higher number of patients and practitioners.

The ITI Dental Implant system (Straumann AG, Waldenburg, CH, Switzerland) is one of the most documented implant systems (Eckert et al. 1997). A Medline literature search on this implant system showed that all clinical studies published in the English language, except for one (Brocard et al. 2000), have been conducted in university or hospital centers (Astrand et al. 1996; Buser et al. 1997; Moberg et al. 2001; Cochran et al. 2002; Ferrigno et al. 2002), involving often predefined patient selection (Buser et al. 1990, 1991, 1997; Cochran et al. 2002). However, most implants are placed in a private practice environment. Implant therapy showed to improve the quality of life in terms of comfort, function, speech, esthetics and self-image (Sugerman & Barber 2002). Therefore, the private practitioner wishes to rehabilitate every patient who qualifies prosthetically for implant therapy, without applying predefined patient selection criteria. The implant treatment must be cost-effective, short in duration, simple in procedure and highly predictable. Particularly, the private practitioner wants to rehabilitate most patients without implementing advanced surgical techniques, like alveolar augmentation or sinus grafting, because they require special surgical training, they increase the treatment duration and the costs. Bernard et al. (1995) in a 3-year study, reported that short ≤10 mm titanium plasma-sprayed (TPS) ITI implants were highly predictable when placed in the posterior region, whereas short machined implants have been traditionally linked with a higher propensity to fail when compared to longer ones (Quirynen et al. 1992; Saadoun & LeGall 1992; Henry et al. 1993; Lazzara et al. 1996; Bahat 2000; van Steenberghe et al. 2000). In our private practice, we took advantage of the possibility to use short textured ITI implants on a routine basis in combination with broad patient inclusion criteria. The aim of this prospective study is to report on a 7-year life table analysis on the use of ITI implants in a private practice environment.

MATERIAL AND METHODS

Surgical and prosthetic procedures

Between January 1995 and July 2002, 467 patients have been treated with 1030 ITI implants placed by two surgeons (RN and MB) in a private practice environment, under clean but not sterile conditions as defined by Scharf & Tarnow (1993). The present report evaluates all implants placed by 31 December 2000. There were 528 nonsubmerged implants inserted in 236 consecutive patients; all implants passed the 1-year control. The patient population consisted of 145 females (61.4%) and 91 males (38.6%). Age at implant placement ranged between 18 and 89 years; patients younger than 50 years received 176 (33.3%) implants, patients between 50 and 70 years received 278 (52.6%) implants, while 74 (14.0%) implants were placed in the elder patients. After 1 June 1999, 264 (50.0%) sandblasted and etched (SLA) implants have been inserted; TPS implants were also 264 (50.0%). Implants were mostly full-body screws (S) of ∅4.8 mm (6.6%), ∅ 4.1 mm (82.4%) and ∅3.3 mm (5.5%); hollow screws (HS) and hollow cylinders (HC) were respectively 5.1% and 0.4% as shown in Table 1. Quadrant distribution is given in Table 2 where the posterior region included the premolar and molar areas, 42.8% rehabilitated the posterior mandible and 23.7% the posterior maxilla. Implant length was distributed into 6 mm (1.1%) long implants, 8 mm (18.4%),

9 mm (Esthetic Plus 8 mm, 1.5%), 10 mm (36.7%), 11 mm (Esthetic Plus 10 mm, 13.4%), 12 mm (25.8%) and 13 mm (Esthetic Plus 12 mm, 3.0%) as shown in Table 3. The mean implant length in the posterior mandible and maxilla was respectively 9.90 and 9.74 mm, while in the anterior region it was respectively 11.28 and 11.21 mm. The mean available bone height was recorded for each implant length (Table 3). During surgery, implant sites were categorized into dense bone (18.6%), normal bone (66.8%) and soft bone (14.6%), following the classification of Trisi & Rao (1999). The vestibular and buccal bone lamellae were also measured: 369 (69.9%) sites had both lamellae $\geq$1 mm, 116 (22.0%) had one of them<1 mm and 43 (8.2%) had both lamellae <1 mm. Sinus perforation occurred at 82 (15.6%) sites.

The mean healing time for the TPS implants was 3.9 months in the mandible and 4.5 months in the maxilla. For the SLA implants, it was respectively 2.3 and 2.5 months in the mandible and in the maxilla. Out of the 264 SLA implants, 122 (46.2%) implants placed in 38 patients were loaded within 63 days as proposed by Cochran et al. (2002). Eighty-two implants rehabilitated the mandible, 26 were inserted in the posterior mandible and 26 in the posterior maxilla. The mean implant length in the posterior mandible and maxilla was 9.38 and 9.92 mm respectively.

The prosthesis distribution is detailed in Table 4a. Implants supported single crowns (SCs: 32.4%), fixed partial dentures (FPDs: 38.6%), fixed full arches (FFAs: 1.1%) andoverdentures (ODs: 27.5%); two FPDs with one implant each were implant-tooth supported. The mean number of implants per FPD was 2.27 in the mandible and 2.07 in the maxilla. Details of the FPDs are given in Table 4b. The majority of the bridges (90.3%) were supported by two implants, 25.8% of them consisted of twosplinted implants, the other FDPs had either one (49.5%) or two (3.3%) pontic units, a cantilever unit (16.1%) or both (3.3%) as shown in Table 4b. Clinical crown height and restoration length were measured with an electronic caliper and are detailed in Table 5a and b. The crown/implant ratio at prosthetic restoration time was calculated, taking into account the clinical crown height in addition to the implant neck (1.8 mm for the Esthetic Plus implants or 2.8 mm for the standard implants) above the bone level. These data have been split according to implant length (Table 5a) and according to the posterior jaws (Table 5b); when a prosthesis was supported by implants of various lengths, the rehabilitation length was entered in each length group.

Inclusion/exclusion criteria and implant length determination

Before implantation, evaluation of the general health and local examination were performed without complementary biologic tests. When required, implant treatment was decided after a benefit/risk analysis with the patient. In this patient pool were included bruxing patients (72 implants, 13.6%), smokers (106 implants, 20.1%) and medical risk patients (77 implants, 14.6%) like HIV+, controlled diabetes, malignant pathology other than in the cervico-facial area, heart disease or patients with coagulation deficiency, as shown in Table 6. Light or heavy smokers were included without distinction, smoking cessation was not requested either before or after surgery. Bruxers received one implant per rehabilitated unit without, however, any further extra-attention like night-guards. A specific oral hygiene control was not introduced for the medical risk patients. A specific delay between tooth extraction

and implant placement was not introduced: 12 (2.3%) implants were placed consecutively to tooth extraction, 184 (34.9%) after 3-6 months, 84 (15.9%) after 6-12 months and 248 (47.0%) after 1 year or more.

Implant length was chosen according to the available bone and adjacent anatomical structures as suggested by Bernard et al. (1995). Implant length was determined by the mean of periapical radiographs or orthopantomographs. In the mandible, it was assessed considering a 2-mm security margin above the mandibular canal; therefore, standard insertion was performed when 10 mm of bone was available. In the maxilla, sinus perforation was not avoided, penetration of 1-2 mm was tolerated and standard insertion was performed when 5 mm of bone height was available. Esthetic plus implants (providing one additional millimeter for bone anchorage) were used when the esthetic situation required a deeper placement of the implant-crown junction in the sulcus (Buser & von Arx 2000), but not in order to enhance the anchoring length. Implant tilting to place a longer implant was not considered, 6-mm long implants were used only in conjunction with longer implants. Implant length, whether 8, 10 or 12 mm, was not taken into consideration to determine the number of implants, the type of prosthetic rehabilitation or its dimensions.

Success criteria

The success criteria proposed by Buser et al. (1991, 1997) and Cochran et al. (2002) were followed at each recall. They included: (1) absence of clinically detectable implant mobility, (2) absence of pain or any subjective sensation, (3) absence of recurrent peri-implant infection and (4) absence of continuous radiolucency around the implant. Patients who did not attend the last recall were considered as drop-outs.

Statistical analysis

Life table analysis with cumulative success rates and success rates at 1-3 years were calculated.

RESULTS

All patients who qualified prosthetically for implant therapy, but four (1.7%), could be treated in our private practice. The latter patients needed vertical bone augmentation procedures, bilateral sinus lifts (two patients) and illiac crest bone grafting (two patients); they were referred to a maxillo-facial surgeon. Tomography was performed for four (1.7%) patients and 24 (4.5%) implants to determine the horizontal ridge dimension but not the vertical available bone. One patient (0.4%) with one implant (0.2%) in the anterior maxilla necessitated preimplant surgery, 36 (15.2%) patients with 57 (10.8%) implants required simultaneous lateral augmentations with Bio-Oss® and Biogide® (Geistlich AG, Wolhusen, CH, Switzerland) (Table 7). Slight mobility at placement was noticed for 14 implants (2.7%) but all integrated. Transient sensation alteration occurred in one patient (0.4%) for two implants (0.4%) that abated after 8 weeks; no definitive sensory

disturbance was recorded. All but two implants (for financial reasons) were loaded. Twenty-one patients (8.9%) with 31 implants (5.9%) were lost to follow-up: two patients with five implants passed away; two patients with four implants were severely ill; three patients with four implants moved out of the country; five patients with nine implants did not attend because of an unpaid treatment; and nine other patients with nine implants refused to attend a control because they were satisfied with the treatment.

Three failures in two patients were recorded, all SLA implants and all placed in the mandible; no failure occurred in the maxilla. The failures were divided into one early failure (0.2%) before loading and two late failures (0.4%) after loading, as described in Table 8. Peri-implantitis was observed at six implants (1.1%) in four patients (1.7%), five occurred in the mandible and four occurred in the posterior area. The implants supported an FPD (sites 44, 45, 46), two ODs (sites 21, 43) and an SC (site 37). These adverse events occurred chronologically 24, 8, 2 and 12 months after implantation; various degrees of bone resorption were recorded, from the first spire level down to the third. The sites were locally treated with 3% H_2O_2, 0.12% chlorhexidine digluconate and antibiotic therapy with Amoxibasan® (Schönenberger Pharma, Schönenwerd, CH, Switzerland) and Flagyl® (Rhône-Poulenc-Rorer, Thalwil, CH, Switzerland). In all cases, the peri-implantitis was under control (no bleeding upon probing, no suppuration and no progressive bone loss), strict hygiene recommendations were given and the patients were put on a tighter recall (every 4 months instead of the annual recall). Bone defect filling was not undertaken when bone loss was stabilized. The treated implants have been followed up for 2 - 6 years without recurrent peri-implantitis. It is noteworthy the bone defect that reached the third spire regressed spontaneously to the second spire level after 2 years. All the 122 SLA implants loaded within 63 days resisted the applied 35 N cm recommended by the manufacturer without rotation or pain; however, the three failures belonged to this group.

The 7-year cumulative success rate (CSR) for all pooled implants was 99.40% (Table 9a). The 7-year CSR for the TPS implants was 100%; the 3-year CSR for the 122 early-loaded SLA implants was 97.44% (Table 9b). The CSR for the 8-9, 10-11 and 12-13 mm long implants was respectively 100%, 99.60% and 98.66%. For TPS implants, the 3-year success rate based on 145 implants was 100%; for early-loaded SLA implants, the 2-year success rate based on 115 implants was 97.39%. The 1-year success rate based on 500 pooled implants was 99.60%.

DISCUSSION

In this prospective study, TPS and SLA implants were used. The advantage of a shortened healing period <63 days for the SLA implants was taken for only 122 (46.2%) implants, because it did not meet the patient and practitioner convenience. A longer delay than the one requested for implant healing is often introduced by the patient and the prosthodontist, for practical and financial reasons. Nevertheless, the mean healing time was reduced, from 4.2 months with the TPS implants to 2.4 months with the SLA implants.

The TPS and SLA implants were pooled because Roccuzzo et al. (2001) documented an equal predictability for both implant surfaces even when the SLA implants were loaded within 6 weeks. One SLA implant failed (0.2%) after 11 weeks, during the healing phase, which shows that early failure is a rare event for the TPS and SLA implants. This low early failure rate is consistent with other studies on TPS (Mericske-Stern et al. 1994; Bernard et al. 1995; Buser et al. 1997, 1999; Behneke et al. 2000; Brocard et al. 2001) and SLA implants (Roccuzzo et al. 2001; Cochran et al. 2002). In the present survey, 71.1% implants were ≤11 mm and 66.5% were placed in the posterior region. The mean implant length in the posterior mandible and in the maxilla was respectively 9.90 and 9.74 mm. Reduction of the crown height, the crown length or the rehabilitation length was not specifically sought for the shorter implants placed in the posterior region where high mechanical stresses are exerted. This makes the present study particularly suitable for the evaluation of short implants placed in the posterior region. Shorter implants did not show a propensity to fail more than longer ones because no 8 mm long (out of 97) implant failed but only one 10 mm (out of 194) and two 12 mm long (out of 136) implants. This finding is in line with other reports, issued either by university centers (Wedgwood et al. 1992; Bernard et al. 1995; Buser et al. 1997; Roccuzzo et al. 2001; Cochran et al. 2002) or by private practitioners (Brocard et al. 2000). Clinical data from other implant systems with a textured surface also support the safe use of short implants (Deporter et al. 2000; Testori et al. 2001, 2002). This contrasts with the higher failure tendency reported for short smooth-threaded implants (Quyrinen et al. 1992; Henry et al. 1993; Lazzara et al. 1996; Bahat 2000; van Steenberghe et al. 2000). Several authors (Friberg et al. 1991; Quirynen et al. 1992; Henry et al. 1993) suggested that it is the combination of short implants and low bone density that is responsible for the higher failure tendency of short implants rather than implant length per se. In the present survey, 55 implants with a mean length of 9.2 mm combined poor bone density and reduced implant length (≤ 11 mm); nevertheless, no implant failed. Similarly, Bernard et al. (2001) reported a cumulative survival rate of 95.9% for a 10-year life table analysis based on 445 implants placed in type IV bone. They suggested that placement of short implants in soft bone was not a specific risk for TPS-coated ITI implants even when inserted in the posterior region.

Some authors (Schwarz-Arad & Dolev 2000) recommended a minimum bone height of 10 mm in the posterior maxilla to place implants without an augmentation procedure. Application of this rule would have discarded 42 (17.8%) patients having received 62 (11.9%) implants from treatment in our practice. The predictable use of the 8-mm implant expanded the number of patients who could be rehabilitated through standard surgery. The predictability of the 8-mm implant in the posterior maxilla should be stressed since the average crown height was higher in the maxilla than in the mandible (Table 5b). Traditionally, the higher failure rates frequently observed in the maxilla have been attributed to a poorer bone support capacity (Testori et al. 2002). It might be possible, however, that longer crowns in the maxilla than in the mandible contribute also to this phenomenon as an additional load factor risk (Rangert et al. 1997).

One transient sensation alteration was recorded that abated after 8 weeks, without further definitive disturbance. Other authors having placed machined fixtures in the mandible reported that sensation alteration was a rather frequent surgical

complication (Kiyak et al. 1990; van Steenberghe et al. 1990; Henry et al. 1993; Lekholm et al. 1994; Higuchi et al. 1995; Lazzara et al. 1996), reaching up to 30% of the patients (Ellies 1992). Since an 8-mm ITI implant was regarded as safe as alonger one, the security distance of ca. 2 mm above the mandibular canal was easily kept, preventing the occurrence of sensation disturbance, a liable body damage (Givol et al. 2002). Bernard et al. (1996) reported similar observations because two implants (0.3%) out of 577 implants placed in the mandible resulted in a temporary paraesthesia.

In order to avoid a load factor risk, determination of an ideal number of implants was suggested by Rangert et al. (1997). They proposed that the number of implants should be equal to the number of replaced roots, the so-called support value (SV), where a premolar has an SV of 1 and a molar an SV of 2. This recommendation was not followed, since 72% out of the 93 FDPs had a lower SV number for the implant-supported prosthesis and incorporated a pontic or a cantilever unit. After at least 1 year of loading, and despite this load factor risk, only one single crown failed, without displaying the signs of crestal bone loss due to overloading (Isidor 1997).

Concerning the issue of peri-implantitis, Esposito et al. (1998) suggested that implants with a TPS-coated surface are more prone to peri-implantitis than implants with a machined surface. In this up to 7-year survey of TPS-coated implants, this adverse event occurred in a limited number of implants (six implants or 1.1%); it appeared rather during the first year of function and did not seem to increase with implantation time. In longer follow-ups, the issue of a possible relationship between the occurrence of peri-implantitis and implantation time remains to be addressed.

A specific strategy has been proposed by other authors when placement of short implants cannot be avoided: it includes implant tilting to insert longer implants (Krekmanov et al. 2000), use of multiple standard short implants (Lazzara et al. 1996; Martinez et al. 1999) or use of wide implants (Martinez et al. 1999). In our practice, the possibility to use short roughened ITI implants in a predictable way permitted (1) restricting the need for sophisticated and expensive presurgical procedures aimed to determine precisely the available bone height by computerized radiographic methods, (2) the placement of prosthetically driven restoration instead of surgically driven ones, (3) reducing the indications span for complex invasive procedures like sinus lift and bone grafting procedures, (4) facilitating surgery, without attempting to place the longest implant and (5) avoiding the occurrence of sensation disturbance.

In conclusion, this study showed that a high success rate can be achieved for short ITI implants supporting single crowns and small 2-4 unit FPDs supported by two to three implants. The safe and predictable use of short implants in a private practice environment should make implant therapy accessible to a higher number of patients and practitioners. It suits the aim of a simpler implantology involving simple rehabilitation schemes in modern and routine dental medicine.

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Résumé

Ce manuscrit rapporte une analyse sur sept ans d'implants ITI® TPS et SLA placés dans un cabinet privé et chargés pendant au moins une année. Chez 236 patients, 528 implants (264 TPS et 264 SLA) ont été placés, 351 (66,5%) d'entre eux pour reconstruire la région postérieure et 71,1 étaient ≤11 mm. Dans les parties postérieures de la mandibule et du maxillaire la longueur implantaire moyenne était respectivement de 9,90 et 9,74 mm. La longueur de l'implant était déterminée à partir uniquement de radiographies standards. L'augmentation du nombre d'implants ou la réduction de la largeur ou la longueur des reconstructions n'étaient pas spécifiquement recherchées pour les implants les plus courts. Cent vingt-deux implants SLA ont été mis en charge avant 63 jours. Tous les implants SLA avec mise en charge précoce ont résisté à la force de 35 Ncm appliquée sans rotation ni douleur. Trois implants ont échoué: 1) de manière précoce et 2) plus tard, tous étaient des implants SLA placés dans la mandibule. Les implants les plus courts n'avaient pas davantage d'échec que les plus longs. Le taux de succès cumulatif était de 99,40%. L'utilisation prévisible des implants courts portant des couronnes uniques et des petites prothèses fixées de deux à quatre unités supportées par deux à trois implants permettait 1) de réduire la nécessité de processus préchirurgicaux sophistiqué et cher visant à déterminer précisément la hauteur osseuse disponible par des méthodes radiographiques avec ordinateur, 2) le placement de restaurations axées sur la prothèse plutôt que sur la chirurgie, 3) de diminuer la portée des indications des processus invasifs complexes comme l'épaississement du plancher buccal et les processus de greffe osseuse, 4) de faciliter la chirurgie sans essayer de placer l'implant le plus long, 5) d'éviter l'apparition de troubles de sensation. L'utilisation sûre d’implants courts dans une pratique privée pourrait rendre la thérapie plus simple et accessible à un plus grand nombre de patients et de praticiens.

Zusammenfassung

Eine Life Table Analyse einer prospektiven Studie an ITI Implantaten über 7 Jahre mit speziellem Schwergewicht bezüglich der Verwendung von kurzen Implantaten. Resultate aus einer Privatpraxis.

Diese Arbeit berichtet über eine 7 Jahre Life Time Analyse von ITI TPS und SLA Implantaten, welche in einer Privatpraxis gesetzt wurden und für mindestens 1 Jahr unter Belastung standen. Bei 236 Patienten wurden 528 Implantate (264 TPS und 264 SLA) eingesetzt, 351 Implantate (66.5%) dienten der Wiederherstellung der posterioren Region und 71.1% der Implantate waren 11 mm lang. In der posterioren Mandibula bzw. Maxilla betrug die mittlere Implantatlänge 9.9 bzw. 9.74 mm. Die Implantatlänge wurde nur auf Standardröntgenbildern bestimmt. Bei Rekonstruktionen mit kurzen Implantaten wurden nicht speziell mehr Implantate verwendet oder die Breite oder die Länge der Rekonstruktionen reduziert. 122 SLA Implantate wurden innerhalb von 63 Tagen belastet. Alle frühbelasteten SLA Implantate widerstanden den applizierten 35Ncm ohne Rotation oder Schmerzen. 3 Implantate zeigten Misserfolge, einen Früh- und 2 Spätmisserfolge. Es handelte sich dabei ausschliesslich um SLA Implantate, welche im Unterkiefer eingesetzt worden waren. Kurze Implantate zeigten nicht mehr Misserfolge als lange. Die kumulative

Erfolgsrate betrug 99.4%. Die Verwendung von kurzen Implantaten, welche Einzelkronen und kleine festsitzende Brücken mit 2-4 Einheiten auf 2-3 Implantanten trugen, erlaubte, 1) die Notwendigkeit von komplizierten und teuren prächirurgischen Abklärungen zur genauen Bestimmung der zur Verfügung stehenden Knochenhöhe durch computerisierte radiologische Methoden zu beschränken, 2) die Platzierung von prothetisch diktierten Rekonstruktionen anstelle von chirurgisch diktierten Rekonstruktionen, 3) eine Reduktion der Indikationsbreite von komplexen invasiven Prozeduren wie Sinuslift und Knochentransplantationen, 4) eine Erleichterung der Chirurgie indem nicht ein möglichst langes Implantat gesetzt werden musste, 5) das Auftreten von Sensibilitätsstörungen zu vermeiden. Die sichere Verwendung von kurzen Implantaten in einer Privatpraxis sollte die Implantattherapie einfacher machen. Dadurch sollte die Behandlung mit Implantaten einer grösseren Anzahl Patienten und Praktikern zugänglich werden.

Resumen

Este estudio informa sobre un análisis de un cuadro de vida de implantes ITI TPS y SLA colocados en una consulta privada y cargados durante al menos un año. Se colocaron 528 implantes (264 TPS y 264 SLA) en 236 pacientes, 351 implantes (66.5%) rehabilitaron el maxilar posterior y el 71.1% de los implantes fueron ≤11 mm. La longitud media de los implantes en la mandíbula posterior y el maxilar fue de 9,90 y 9.74 mm respectivamente. La longitud del implante se determinó solamente a través de radiografías. No se buscaron específicamente incrementos en el número de implantes o reducción en la anchura o longitud de las rehabilitaciones para los implantes cortos. Se cargaron 122 implantes dentro de los 63 días. Todos los implantes SLA cargados tempranamente resistieron la fuerza de 35 Ncm aplicada sin rotación ni dolor. 3 implantes fracasaron, uno tempranamente y 2 tardíos, todos fueron implantes SLA colocados en la mandíbula. Los implantes mas cortos no fracasaron más que los implantes largos. El índice acumulativo de éxito fue del 99.4%. El uso predecible de implantes cortos soportando coronas unitarias y pequeñas prótesis fijas parciales de 2-4 unidades soportadas por 2-3 implantes permitieron, 1) restringir la necesidad de procedimientos quirúrgicos sofisticados y costosos con la intención de determinar con precisión la altura de hueso disponible por medio de métodos de radiografías computarizadas, 2) la colocación de restauraciones orientadas prosteticamente en vez de quirúrgicamente, 3) reducir el abanico de indicaciones para procedimientos complejos invasivos tales como procedimientos de elevación del seno e injertos, 4) facilitar la cirugía, sin intentar colocar el implante mas largo, 5) evitar la aparición de sensación de molestia. El uso seguro de implantes cortos en una consulta privada debería hacer el tratamiento de implantes mas simple y accesible para un mayor número de pacientes y profesionales.

要約
本稿は個人開業医院で埋入し、少なくとも１年間荷重してきたITIのTPSとSLAインプラントに関する７年生命表分析について報告する。患者２３６名において５２８本のインプラント（TPS２６４本、SLA２６４本）を埋入した。３５１本（６６．５％)のインプラントは臼歯部に埋入された。７１．１％のインプラントは、長さ１１ｍｍ以下であった。上下顎臼歯部においてインプラントの平均長は各々９．９０と９．７４ｍｍであった。インプラント長は標準レントゲン像のみで測定した。より短いインプラントについては、インプラントの本数増加、口径の減少、補綴物の長さは、特に調べなかった。１２２本のSLAインプラントは６３日以内に荷重した。全ての早期荷重のSLAインプラントは回転や痛みを伴わず、３５Ncmの力に抵抗した。3本のインプラントが失われたが、１本は早期、２本は晩期の喪失で、全て下顎にいれたSLAインプラントであった。より短いインプラントの方が長いものより失敗数が多いということはなかった。累積成功率は９９．４０％であった。短いインプラントで単冠や２－４ユニットの短い固定式部分義歯を支持するという予知性の高い方法を採用することによって、１）コンピュータ化したレントゲン法によって局所の骨高径を正確に測定するための、複雑で高価な術前処置の必要性を限定することができ、２）外科主導ではなく補綴優先のインプラント埋入が可能となり、3）上顎洞挙上や骨移植のような、複雑で侵襲度の高い処置の適応範囲を狭めることができ、４）最長のインプラントを入れずにすむため、外科処置が行ない易くなり、５）知覚障害の発症を防ぐことが可能になる。個人開業医院における短いインプラントの安全な使用は、インプラント療法を簡潔化し、より多くの患者と開業医が使用できるようにするものである。