Scientific article

Early and late implant loss in a university-based periodontal setting: A retrospective analysis on 1'821 patients and 2'639 implants over a period of 18 years

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Early and late implant loss in a university-based periodontal setting: A retrospective analysis on 1'821 patients and 2'639 implants over a period of 18 years

Abstract

The aim of this study was to retrospectively analyze the implant failure rate, not due to peri-implantitis, in periodontally compromised patients rehabilitated with at least one dental implant placed in a specialist university setting over the last 18 years. Records of patients receiving dental implants at the Department of Periodontology, University of Bern, Switzerland, between 2005 and 2022 were analyzed. Data on 1'821 patients with 2'639 implants were retrieved. Fifty-nine patients experienced implant loss (rate at patient level: 3.2%) out of which 2.1% were early and 1.1% late implant losses, respectively. The majority of the 59 patients were males (68%) and 27.1% were smokers. Eight mm implants were lost with the highest rate (42.4%) followed by 10 mm implants (31.8%). The rate of lost maxillary implants was more than twice as high compared with that of mandibular implants (69.7 vs. 30.3%). Within the study limitations, the implant failure rate in this cohort of patients enrolled in regular supportive periodontal and peri-implant care, was low.

Introduction

Over the past four decades titanium implants have conquered the world of dentistry. Today more than 12 million dental implants are placed each year (1, 2). Their high predictability and reliability, as well as also the increasing longevity of the population, have contributed to the widespread use (3, 4). While in the early days implants were placed to support removable dentures, particularly in the mandible, and the focus was on function, in the last two decades implants have become the first choice for replacement of missing single teeth and the focus shifted to peri-implant hard and soft tissue conditions, prosthetic parameters and patient-related outcomes, all of which together define implant success (5). Nevertheless, implant survival remains the major outcome measure reported in clinical studies with, at the time being, very high rates (>95%) (6).

Implant loss encompasses two main categories in relation to its temporal occurrence. Loss prior to loading is traditionally considered as "early loss" (EL) whereas implants lost after prosthetic loading are classified as "late failures" (LF). Biologically, the first scenario is characterized by the failure to establish osseointegration, whereas the second is characterized by the loss of osseointegration. However, the thresholds between early and late failure are not biologically defined, and studies of early failure tend to extend the time frame to the first few months or even up to one year after implant installation (7, 8). In this regard, recent evidence reported early implant loss rates ranging from 0% to 6% (2). Data from a representative Swedish population sample of 2'765 individuals indicated that 4.4% of subjects experienced early loss, corresponding to a loss rate of 1.4% at implant level (9). From a clinical perspective, while early implant loss may show signs of inflammation (10), other signs such as implant mobility may be diagnosed without inflammation (11). Furthermore, pain associated with early loss appears to be rare. Data on the etiology of early implant loss are still scarce and inconclusive.

Rates of late implant loss, when reported at the implant level, vary from 1% to 10%. At the patient level the numbers are even higher. According to Swedish cohort studies 1.7%, 4.6%, and 4.2% of all patients experienced late implant loss at 4-13, 9-14, and 9 years, respectively (9, 12, 13). Regarding the etiology of late implant loss, peri-implantitis (14, 15) is the most commonly reported cause (16-18), followed by implant fracture (19) and overload (10).

Several putative risk indicators for both early and late implant loss have been described such as smoking (9, 20-22) history of periodontal disease (18, 23, 24), implant macro- and micro-characteristics and treatment-related factors (20, 25, 26). Patient adherence to supportive care has been shown to play a critical role in late implant loss (15, 27-29)

Currently, most studies evaluating implant loss in patients with a history of periodontal disease have included data from heterogeneous groups with different case-definitions and patient characteristics (2). Hence, the aim of this retrospective study was to analyze the implant failure rate in patients treated for periodontal disease and subsequently rehabilitated with at least one dental implant in a periodontal university setting over a period of 18 years.

Material and Methods

This study is based on all available archived non-digital (i.e. paper-based) records of patients who received at least one dental implant at the Department of Periodontology of the University of Bern between 2005 and 2022. Due to the retrospective nature of the study

design, ethical committee approval was sought but not required according to the local legislator authority (ID: 2022-01729).

Case Definitions

Implant failure was defined as the ultimate event leading to implant removal from the oral cavity. More specifically, the following 2 definitions were applied (2):

1. Early Implant Loss (EIL): any loss occurring during the healing phase and prior to connection of the suprastructure not due to peri-implant diseases;

2. Late Implant Loss (LIL): any loss occurring following connection of the suprastructure not due to peri-implant diseases.

The dental records of all patients diagnosed with generalized/localized chronic periodontitis (30) who received dental implants at the Department of Periodontology were considered. More specifically, in order to minimize missing data, a substantial effort was undertaken by two of the authors (R. B and E.P) to screen the list of all patients undergoing periodontal therapy and who were consequently rehabilitated with at least one dental implant between January 2005 and December 2022.

From the retrieved patient's records the following data were extracted:

1)	Patient demographic data: age and gender

2)	Smoking status: non-smoker, smoker (≥ 5 cigarettes/day) and former smoker (smoking cessation ≥ 5 years) (Ramseier et al. 2019)

3)	Presence/absence of the following systemic diseases: cardiovascular diseases and diabetes mellitus

4)	Continuous medication: antihypertensive/anticoagulant, insuline, bisphosphonates and antidepressant

5)	Implant location by means of tooth number

6)	Implant-related factors: brand (e.g. Straumann, Camlog, and Neoss) length, diameter, surface and type (SLA, SLAacitve, tissue level or bone level)

7)	Surgical-related factors: Classification of implant placement without simultaneous guided bone regeneration (GBR), implant placement with GBR (simultaneous or staged) or implant placement with Sinus Floor Elevation (SFE) (simultaneous or staged).

8)	Type of implant-supported reconstruction: single-unit crown (SUC), or fixed-dental prosthesis (FDP). The presence of a cantilever extension was also recorded.

9)	Type of supportive periodontal care (SPC) according to the Periodontal Risk Assessment (PRA) (31) at the Department of Periodontology.

Data analysis

Due to the retrospective nature of the study design, the sample were analyzed through a descriptive approach. Categorical variables were described using absolute and relative frequencies. Quantitative variables were described reporting means, standard deviations, range, medians and interquartile ranges (IQs) for the total sample.

All statistical analyses were performed using IBM SPSS Statistics for Windows, version 26.0 (IBM). Data are reported according to the STROBE checklist.

Results

Overall patients' and implants characteristics

This study included a total of 1821 patients who received 2639 implants over a period of 18 years (range: 2005 - 2022). Of these patients, 986 (54.1%) identified as female and 835 (45.9%) as male. Most implants were placed in the maxilla (1542 implants; 58.5%), while 960 (36.3%) were placed in the mandible. No information on the implant site was available for 137 (5.2%) implants (Table 1).

Characteristics of the patients who experienced implant loss

Fifty-nine patients experienced implant loss resulting in a patient-based failure rate of 3.2%. The majority of the 59 patients were male subjects (40). The mean age of the patients at the time of implant loss was 62.7 ± 10.8 years. Of the 59 patients, 27.1% were smokers (16), 66.1% were non-smokers (39), and 6.8% were former smokers (4) at the time of implant loss. Thirty-seven patients (62.7%) were systemically healthy, 11 patients (18.6%) had cardiovascular disease, 1 patient (1.7%) had diabetes, and 5 patients (8.5%) had both diseases. In 69.7% of cases of loss, the implant had been placed in the maxilla (46 implants) and in 30.3% of cases in the mandible (20 implants).
All patients were enrolled in regular SPC (i.e. 3-6 months interval).

Early / late implant loss

The reason for implant loss was in all cases, aseptic loosening. Out of the 59 patients, 39 patients (66.1%) experienced EIL during the healing period and prior to prosthetic loading. At the implant level, 47 of 66 implants (71.2%) were lost prior to loading. LIL occurred in 20 patients (33.9%) corresponding to 19 of 66 (28.8%) at implant level.
The mean survival time of all lost implants was 17.7 months, with a range from 2 weeks to 130 months. In the EIL group the mean time to implant loss was 2.9 months, while in the LIL group, the mean time to loss was 45.5 months.

Characteristics of the lost implants

Sixty-six implants were lost over the 18-year period, resulting in an overall failure rate of 2.5% at implant level. In the maxilla, 45.7% (21 lost implants) were in the molar region, 28.3% (13 lost implants) in the premolar region and 26% (12 lost implants) in the anterior region. In the mandible, 40% (8 implants) were placed in the molar region, 25% (5 lost implants) in the premolar region, and 35% (7 implants) in the anterior region.
One brand (Straumann) accounted for 98.4% of all implants placed. Two other brands were used to a small extent (1.6%) between 2014 to 2022 (Camlog Biotechnologies GmbH and Neoss GmbH). The majority of Straumann implants placed were tissue-level implants (87.8%), while bone-level implants were placed in 10.6% of cases. 18.5% of placed Straumann implants had an SLA surface (12 lost implants), while 81.5% of the cases used a surface modification with SLActive (53 lost implants). The most common diameter used was 4.1 mm in 44% (29 lost

implants), followed by 4.8 mm in 31.8% (21 lost implants) and 3.3 mm in 21.2% (14 lost implants). One implant (1.5%) had a diameter of 4.2 mm and 2.9 mm.

The most common length used was 8 mm (42.4%) in 28 lost implants, followed by 10 mm (31.8%) in 21 lost implants and 12 mm (15.2%) in 10 lost implants. The 6 mm length was used in 7.6% of cases with 5 lost implants. The 4 mm and 12.5 mm lengths were used once each (1.5%).

Surgical interventions related to the lost implants

Of the 66 lost implants, 36 (54.5%) did not require guided bone regeneration and were placed using a standard protocol. Guided bone regeneration (GBR) was required for 30 implants (45.5%). Of these, 11 implants (16.7%) required sinus floor elevation and simultaneous implant placement with a transcrestal osteotome technique, 4 implants (6.1%) required no biomaterial, 6 implants (9.1%) required a staged lateral window approach, 8 implants (12.1%) required lateral GBR, and 1 implant required two-stage bone augmentation with titanium mesh. Among the 59 patients with implant loss, 17 patients (28.8%) were prescribed concomitant systemic antibiotics after implant placement, while 42 patients (71.2%) did not receive any antibiotics.

Characteristics of the reconstructions supported by the lost implants

Of the 22 implants lost after reconstruction, 15 implants (68.2%) were SUC restorations, 6 implants (27.3%) were lost as FDP abutments, and 1 implant (4.5%) was lost as an SUC with cantilever extension. All restored implants supported screw-retained reconstructions. The characteristics of all patients and lost implants are summarized in Table 2.

Discussion

The aim of this study was to document the reasons for implant loss not due to peri-implant diseases in a large cohort of patients treated for periodontal disease and subsequently rehabilitated with implant-supported fixed dental prostheses. Based on the obtained results, 59 (3.2%) patients with a total of 66 implants experienced implant loss. Of these, 39 patients (66.1%) experienced early implant loss and 20 patients (33.9%) suffered from late implant loss (Figure 1). Focusing at implant level, a total of 2'639 implants were placed, of which 66 (2.5%) were lost. When comparing our results with those available in the literature, it has to be remarked that a lower implant loss was reported by Ducommun and co-workers (i.e., 0.6% (n = 13) over a 3-year observation period (32) as well as by Bornstein (11) and Brügger and co-workers (33) this rate being lower than in the present study (below 1 %). One possible explanation for this difference might be the differences in case selection process as well as different patients' characteristics (i.e., with and without a history of periodontal disease).

Implant brand and characteristics (i.e., length and diameter) have been advocated to have an impact on implant loss (Derks et al. 2015). In all of the aforementioned studies, Straumann implants, with either an SLA or an SLActive surface, were used almost exclusively. Our results are consistent with previous data indicating that 58 of the lost implants were tissue-level implants (87.9%) and 8 were bone-level counterparts (12.1%). The maxillary premolar and molar areas were the most affected by implant loss (46 implants, 69.7%). A potential

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explanation linked to implant loss in the posterior maxilla might be related to the quality of the bone which has been widely described to be softer and more cortical. With respect to implant length and diameter, the majority of the implants lost in the present study were non-reduced in diameter (i.e. > 3.3 mm) and with a length of 6mm (i.e., 8.62%) such as in the aforementioned publications. These findings are corroborated by a recent 10-year randomized clinical study reporting an increased risk for implant loss for short implants (i.e. 6 mm) when compared to longer ones (i.e. 10 mm) (28).

The fact that the mean age of the Swiss population is increasing, is reflected in the findings of the present study. Indeed, the mean age of our cohort was 62.7 years, considerably higher than in the above studies (53.6-57.6 years). Although age per se cannot be considered a risk factor for early implant loss, the ability of older patients to heal and host osseointegration may be compromised.

Smoking and the presence of a grafting material have been described as potential risk factors for early implant loss (34, 35). With respect to these variables, our results are consistent with previous publications pointing out the importance of smoking cessation prior to implant placement (36, 37) as well as providing patients with adequate information on the efficacy of bone augmentation procedures as well as on a slight increased risk for early implant loss (35, 38). The patients enrolled in the present retrospective study reflect a pre-selected cohort treated in a specialized periodontal university clinic. On the other hand, the retrospective analysis by Derks et al. 2016 shows an early loss rate of 1.4% and a late loss rate of 2.0% in 2765 randomly selected Swedish patients and 11,311 placed implants, corresponding to a rate of 4.4% and 4.2% of patients, respectively. Overall, 8.6% of patients experienced implant loss. The authors found an increased risk of early implant loss in the presence of periodontitis, in smokers and in implants less than 10 mm in length (Derks et al. 2016). Again, most implants placed in this study were Straumann implants, which had the lowest early and late loss rates compared to other implant brands (9). In the present study, 34 of the 66 lost implants were 8 mm or shorter and 44 implants were 4.1 mm or smaller in diameter, suggesting that the longer the implant, the lower the risk of early implant loss. In a study by Alsaadi and co-workers (2007), the early loss rate was 3.6% and was also associated with nicotine use and an implant length of less than 10 mm (39).

In the present study, the median time to restoration was 4 years and the longest time to implant loss was almost 11 years. In a systematic review by Pjetursson and co-workers (2012) (40), higher rates of implant loss were reported after 5 (i.e. 5.1%) and 10 years (i.e. 6.9%), respectively. Albrektsson and co-workers (2012) showed an implant survival rate of approximately 95% at 10 years (41). In addition, the data obtained cover a long period of time by several clinicians with different procedures and clinical experience.

This study presents several major limitations such as the retrospective design, and the lack of proper assessment of several confounding/modifying factors such as full-mouth oral hygiene levels and bleeding scores. However, it should be noted that all implants were placed only at the completion of the active periodontal therapy, under strict and standardized surgical and prosthetic protocols and in patients enrolled in regular supportive care.

The main demographic patterns show that men and people aged between 45 and 65 are more likely to experience implant loss. However, it was not possible to determine in this cohort whether gender itself is a potential risk factor for implant loss or whether this is influenced by gender-specific characteristics (i.e., oral hygiene and smoking habits) or socioeconomic

factors. In a study by Lin and co-workers, male gender, age > 41 years and mandibular anterior region were found to be risk factors for early implant loss in a retrospective study of 30'959 implants and 18'199 patients (25). Another aspect that should be recall is that the majority of the placed implants did belong to one company only and therefore, the external validity of these results might be low.

Conclusions

Within its limitations, the outcomes of this retrospective study based on 1821 patients treated with a total of 2639 implants indicated a patient-based early implant failure rate of 2.1% and a late implant failure rate of 1.1% not due to peri-implantitis over an 18-year period.

Zusammenfassung

Einleitung

Ziel dieser retrospektiven Studie war es, die Implantat-Misserfolgsrate in parodontal sanierten Patienten zu untersuchen, welche mit mindestens einem Implantat über die letzten 18 Jahre an einer universitären Klinik für Parodontologie rehabilitiert wurden. Der Implantatverlust lässt sich in Bezug auf sein zeitliches Auftreten in zwei Hauptkategorien einteilen. Der Verlust vor der Belastung wird traditionell als „early failure" betrachtet, wohingegen Implantate, die nach der prothetischen Belastung verloren gehen, als „late failure" klassifiziert werden. Während Studien eine hohe Implantatüberlebensrate von über 95% aufzeigen (6), beträgt die Frühverlustrate von Implantaten zwischen 0-6% (2) und die Spätverlustrate zwischen 1-10% (9, 12, 13).

Material und Methoden

Diese Studie basiert auf allen verfügbaren archivierten, nicht-digitalen (d. h. papierbasierten) Krankengeschichten von Patienten mit der Diagnose einer generalisierten oder lokalisierten chronischen Parodontitis, die nach der Therapie der Grunderkrankung zwischen 2005 und 2022 an der Klinik für Parodontologie der Universität Bern mindestens ein Zahnimplantat erhalten haben. Dabei wurden patienten-, implantat- und therapiebezogene Parameter wie Alter, Geschlecht, Raucherstatus, kardiovaskuläre Erkrankung, Diabetes mellitus, Dauermedikation (Antihypertensiva, Antikoagulantien, Insulin, Bisphosphonate, Antidepressiva), Implantatlokalisiation, Charakteristika des Implantates, Art des chirurgischen Eingriffes (Standardimplantation, Implantation mit einzeitigem oder zweizeitigem Knochenaufbau/Kieferhöhlenelevation), Art der implantat-getragenen Rekonstruktion (Einzelkrone, Rekonstruktion mit Extension, Brückenversorgung), Art der kontinuierlichen parodontalen Betreuung (SPC) erfasst und ausgewertet.

Resultate

Insgesamt wurden die Krankengeschichten von 1821 Patienten untersucht, die über einen Zeitraum von 18 Jahren (2005 – 2022) 2639 Implantate erhielten. Bei 59 Patienten kam es zu einem Implantatverlust (Rate auf Patientenebene: 3.2%), wobei es sich bei 2.1% um einen frühen und bei 1.1% um einen späten Implantatverlust handelte. Total waren 66 Implantate davon betroffen (Rate auf Implantatebene: 2.5%). Die Mehrheit der 59 Patienten waren Männer (68%) und 27.1% waren Raucher. Implantate mit der Länge von 8mm wiesen die

höchste Verlustrate auf (42.4 %), gefolgt von 10mm-Implantaten (31.8 %). Die Verlustrate von Oberkiefer-Implantaten war mehr als doppelt so hoch wie die von Unterkiefer-Implantaten (69.7 vs. 30.3%).

Diskussion

Die Implantatverlustrate in dieser Patientenkohorte, die regelmäßig unterstützende parodontale und periimplantäre Behandlung erhielt, war niedrig. Die hier gezeigten Beobachtungen deuten darauf hin, dass Parodontitis in der Vorgeschichte, Rauchen, medizinische Kompromittierung, der Gebrauch von kurzen Implantaten und Knochenersatzmaterialien im posterioren Oberkiefer das Risiko für einen Implantatverlust erhöhen.

Résumé

Introduction

L'objectif de cette étude rétrospective était d'examiner le taux d'échec des implants chez les patients ayant subi une réhabilitation parodontale et ayant reçu au moins un implant au cours des 18 dernières années dans une clinique universitaire de parodontologie. La perte d'un implant peut être divisée en deux catégories principales en fonction du moment où elle se produit. La perte avant la mise en charge est traditionnellement considérée comme une "défaillance précoce", tandis que les implants perdus après la mise en charge prothétique sont classés dans la catégorie des "défaillances tardives". Alors que les études montrent un taux de survie élevé des implants, supérieur à 95% (6), le taux de perte précoce des implants se situe entre 0-6% (2) et le taux de perte tardive entre 1-10% (9, 12, 13).

Matériel et méthodes

Cette étude se base sur tous les dossiers médicaux non numériques (c'est-à-dire sur papier) disponibles de patients diagnostiqués avec une parodontite chronique généralisée ou localisée, qui ont reçu au moins un implant dentaire après le traitement de la maladie de base entre 2005 et 2022 à la Clinique de parodontologie de l'Université de Berne. Les paramètres liés au patient, à l'implant et au traitement tels que l'âge, le sexe, le statut tabagique, la maladie cardiovasculaire, le diabète sucré, la médication permanente (antihypertenseurs, anticoagulants, insuline, bisphophonates, antidépresseurs), la localisation de l'implant, les caractéristiques de l'implant ont été pris en compte, Le type d'intervention chirurgicale (implantation standard, implantation avec augmentation osseuse en un ou deux temps/élévation du sinus maxillaire), le type de reconstruction implanto-portée (couronne unitaire, reconstruction avec extension, restauration par bridge), le type de soins parodontaux continus (SPC) ont été saisis et évalués.

Résultats

Au total, les dossiers médicaux de 1821 patients ont été examinés, qui ont reçu 2639 implants sur une période de 18 ans (2005 - 2022). Cinquante-neuf patients ont subi une perte d'implant (taux au niveau du patient : 3,2%), 2,1% d'entre eux ayant subi une perte d'implant précoce et 1,1% une perte d'implant tardive. Au total, 66 implants ont été touchés (taux au niveau des implants : 2,5%). La majorité des 59 patients étaient des hommes (68%) et 27,1% étaient fumeurs. Les implants de 8 mm de long présentaient le taux de perte le plus élevé (42,4 %),

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suivis des implants de 10 mm (31,8 %). Le taux de perte des implants maxillaires était plus de deux fois plus élevé que celui des implants mandibulaires (69,7 vs 30,3%).

Discussion

Le taux de perte d'implants dans cette cohorte de patients recevant régulièrement un traitement parodontal et péri-implantaire de soutien était faible. Les observations présentées ici suggèrent que les antécédents de parodontite, le tabagisme, la compromission médicale, l'utilisation d'implants courts et de matériaux de substitution osseuse dans le maxillaire postérieur augmentent le risque de perte d'implants.

Acknowledgements

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Early and late implant loss in a university-based periodontal setting: A retrospective analysis on 1'821 patients and 2'639 implants over a period of 18 years

Table 1. Overview of the entire patient's and implants characteristics

NUMBER OF PATIENTS	1821
GENDER	
MEN	54.1% (*N* = 986)
WOMEN	45.9% (*N* = 835)
NUMBER OF IMPLANTS	**2639**
LOCATION OF IMPLANT AMONG JAW	
MAXILLA	58.5% (*N* = 1542)
MANDIBLE	36.3% (*N* = 960)
NO INFORMATION	5.2% (*N* = 137)
BRAND OF IMPLANT	
STRAUMANN	98.4% (*N* = 2597)
OTHERS (CAMLOG, NEOSS)	1.6% (*N* = 42)
TYPE OF STRAUMANN IMPLANT	
TISSUE-LEVEL	87.8% (*N* = 2317)
BONE-LEVEL	10.6% (*N* = 280)
SURFACE OF STRAUMANN IMPLANT	
SLA	38.4% (*N* = 1011)
SLAactive	61.7% (*N* = 1628)
DIAMETER OF IMPLANT	
4.1mm	54.9% (*N* = 1449)
4.8mm	23.6% (*N* = 623)
3.3mm	19.4% (*N* = 512)
Others	2.1% (*N* = 55)
LENGTH OF IMPLANT	
10mm	52.8% (*N* = 1394)
8mm	27.6% (*N* = 728)
12mm	14.9% (*N* = 393)
6mm	2.2% (*N* = 58)
Others	2.5% (*N* = 66)

Table 2. Characteristics of patients with implant loss and characteristics of the lost implants

NUMBER OF PATIENTS	59 (3.24% of overall patients)
EARLY	39 (2.1% of overall patients)
LATE	20 (1.1% of overall patients)
NUMBER OF IMPLANTS	66 (2.5% of overall implants)
EARLY	47 (1.8% of overall implants)
LATE	19 (0.7% of overall implants)
GENDER	
MEN	68% ($N = 40$)
WOMEN	32% ($N = 19$)
MEAN PATIENTS AGE	62.7 years
LOCATION OF LOST IMPLANT	
MAXILLA	69.7% ($N = 46$)
MOLAR	45.65% ($N = 21$)
PREMOLAR	28.25% ($N = 13$)
FRONT	26% ($N = 12$)
MANDIBLE	30.3% ($N = 20$)
MOLAR	40% ($N = 8$)
PREMOLAR	25% ($N = 5$)
FRONT	35% ($N = 7$)
BRAND OF LOST IMPLANT	
STRAUMANN	98.5% ($N = 65$)
	(2.5% of overall placed Straumann implants)
OTHER (CAMLOG)	1.5% ($N = 1$)
TYPE OF IMPLANT	
TISSUE-LEVEL	87.9% ($N = 58$)
BONE-LEVEL	12.1% ($N = 8$)
SURFACE OF LOST STRAUMANN IMPLANTS	
SLA	18.5% ($N = 12$)
SLAactive	81.5% ($N = 23$)
DIAMETER OF IMPLANT	
4.1mm	44% ($N = 29$)
4.8mm	31.8% ($N = 21$)

|	
3.3mm	21.2% (*N* = 14)
Others	3% (*N* =2)
LENGTH OF IMPLANT	
8mm	42.4% (*N* = 28)
10mm	31.8% (*N* =21)
12mm	15.2% (*N* = 10)
6mm	7.6% (*N* = 5)
Others	3% (*N* = 2)
SMOKER	27.1% (*N* = 16)
FORMER SMOKER	6.8% (*N* = 4)
NON-SMOKER	66.1% (*N* = 39)
PATIENTS WITH SYSTEMATIC DISEASE	
DIABETES	1.7% (*N* = 1)
CARDIO-VASCULAR DISEASE	18.6% (*N* = 11)
DIABETES AND CVD	8.5% (*N* = 5)
OHTERS	8.5% (*N* = 5)
PATIENTS WITHOUT SYSTEMATIC DISEASE	62.7% (*N* = 37)
SURGICAL PROCEDURE	
STANDARD IMPLANT PLACEMENT	54.5% (*N* = 36)
IMPLANT PLACEMENT WITH GBR	
SIMULTANEOUS	12% (*N* = 8)
STAGED	1.5% (*N* = 1)
IMPLANT PLACEMENT WITH SFE	
SIMULTANEOUS OSTEOTOME TECHNIQUE	23% (*N* = 15)
STAGED LATERAL WINDOW	9% (*N* =6)
CONCOMITANT ANTIBIOTICS	28.8% (17 of 59 patients)
NO ANTIBIOTICS	71.2% (42 of 59 patients)
RETENTION OF SUPRACONSTRUCTION	
SCREW RETAINED	100% (*N* = 19)
DESIGN OF SUPRACONSTRUCTION	
SINGLE CROWN	68.2% (*N* = 13)
SINGLE CROWN WITH CANTILEVER	4.5% (*N* = 1)
IMPLANT BRIDGE ABUTMENT	27.3% (*N* = 5)
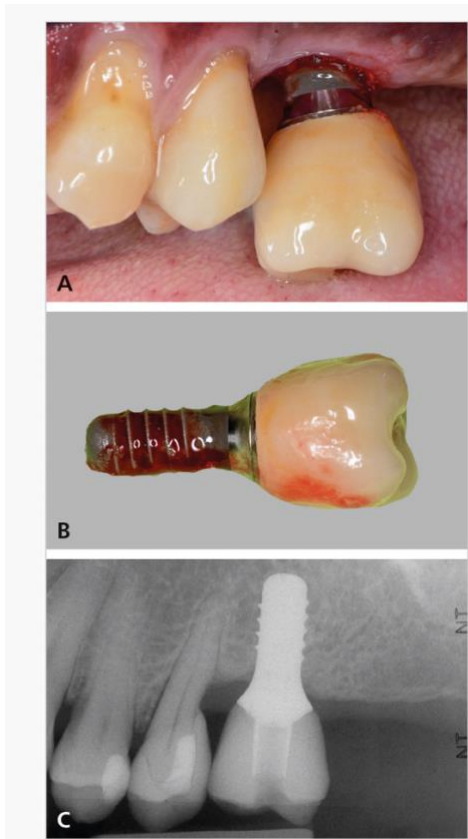
Figure 1a, b and c. Clinical and radiographic representative scenario of LIL of an implant placed in regio 26.