

I Do Biotech Dental Implants: Prospective Multicentric Study after 5 Years of Functional Loading

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Abstract

Introduction: I Do Biotech's implants were developed starting in 2014. Since then, they obtained GMP and KFDA licenses for distribution in 2015. The main objective of this paper is to determine the survival rate of I Do Biotech implants five years after the first surgery. **Material and Methods:** 1000 implants were used on 480 prostheses across 10 clinics on 320 healthy, non-smoker and non-diabetic patients, chosen at random, of which 160 are male and 160 female, all in the age range of 30 to 50 years old. The failure rate was studied related to the patient's gender, the length and diameter of the implant, anatomical location, the percentage of peri-implantitis, prosthodontic failures and the patient's quality of life. **Discussion:** The results obtained are similar to those of Van Steenberghe D. Dieter-Busenlechner, E. Serrano Catauria and far superior to those of Sáenz Guzmán. Failure rates vary greatly from study to study due to the heterogeneity of the samples in the other research papers. **Conclusion:** The overall implant failure rate at 5 years is 1.7%. The factors affecting significantly the survival rate are: the implant diameter, its length and the anatomic area. Failure ratios increase significantly when the diameter or the length of the implant decreases, and when they are placed in the posterior maxilla (up to 4.3%). The rate of peri-implantitis is 5.1%. The prosthodontic failure rate is 2.91%. The improvement in quality of life and satisfaction increases with the years.

Keywords

Dental Implants, Titanium, Morse Taper, SLA Surface, Multicentric Study, Peri-Implantitis, Prosthodontic Failures, Study after 5 Years of Loading, Quality of Life

1. Introduction

Modern oral implantology began with Professor P.I. Brånemark (1969) [1], who in 1952 was working on the microscopic mechanisms of bone healing and discovered that the titanium cylinder had fused with the bone. He called this phenomenon “osseointegration”.

It was not until the Harvard Consensus Conference in 1978 when success criteria were agreed, Schnitman P.A., Shulman L.B. (1979) [2], which have since evolved over time: Albrektsson T., Zarb G. (1986) [3]; Isidor F., Albrektsson T. (1996) [4], Wennerberg A., Albrektsson T. (2010) [5].

In 1977, Professor Brånemark published his first paper on implantology and in 1982 presented his studies at the Toronto Conference Zarb G.A. (1990) [6]. Since then, the design of the implant, its prosthetic connection and the treatment of its surface have evolved, all with a view to increasing the success rate and reducing treatment times.

The I Do Biotech implant is a conical trunk implant, with an 11-degree prosthetic Morse taper and a bioactive surface according to the procedures specific to the SLA technique (Figure 1).

The study was designed by distributing 1000 implants among ten implant clinics with more than seven years of experience and without any commercial relationship with the I Do Company. Each prosthesis was accompanied by a form to be filled out by the clinic and the patient together (Table 1).

Table 1. Form to be filled for each prosthesis during the 5 years’ study.

Implant type	Lengths		Diameters			
	Maxilla		Mandibula			
Position	Anterior	Posterior	Anterior	Posterior		
Prosthesis	Unitary	Bridge 2 implants	Hybrid 6 implants			
Check Up Year	Implant failure?	Prosthesis failure?				
		Porcelain	Screw	Bridge		
1						
2						
3						
4						
5						
Patient’s quality of life assessment						
Functional limitation	0	1	2	3	4	5
Physical pain	0	1	2	3	4	5
Psychological distress	0	1	2	3	4	5
Physical disability	0	1	2	3	4	5
Psychological disability	0	1	2	3	4	5
Phonetic disability	0	1	2	3	4	5
Patient’s degree of satisfaction						
Dissatisfied (1) Without Changes (2) Little satisfied (3) Satisfied (4) Completely Satisfied (5)						

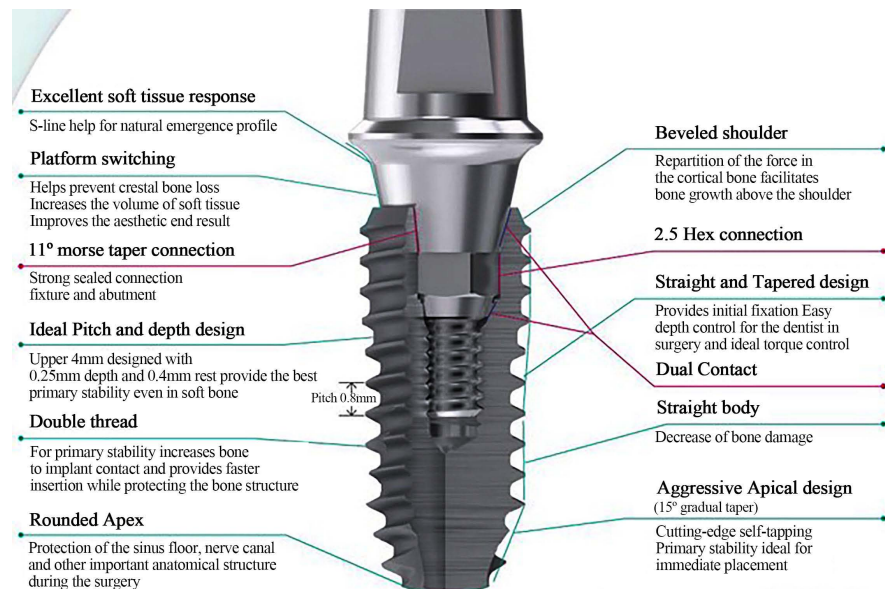


Figure 1. Characteristics of I Do Implant.

This paper refers to the results of the multicentric study after 5 years of functional loading. The date of surgery was not taken into consideration, but each of the 1000 implants had completed 5 years of loading.

The implants had to be inserted in bone without any type of GTR. No patient could be a smoker or diabetic and all of them were loaded three months after the first surgery.

The main objective of this paper is to assess the survival of I Do Biotech implants after 5 years of functional loading, while the secondary objectives are: 1) Distribution of failures by gender, anatomical location, implant length and diameter; 2) Peri-implantitis rate; 3) Assessment of prosthodontic problems: screw breakage, porcelain breakage, implant breakage, and finally, 4) Assessment of the quality of life.

2. Materials and Methods

2.1. Description of the I Do Biotech Implant and Its Surgical Insertion Technique

The I Do Biotech implant is made of CP titanium grade 4 F67 from the American company Carpenter, the use of which as a biomaterial is possible thanks to the formation of a TiO₂ layer 5 - 20 µm thick.

Its macro-model is conical trunk, with threads of the coronal part 4 mm from the apex, 0.25 mm deep, 0.45 mm wide and separated by 0.8 mm. In the final 4 mm, the depth of the thread is 0.40 mm, its width is 0.35 mm and there is a gap between threads of 0.8 mm.

The prosthetic connection is a Morse taper with 11° degrees of conicity and 3 mm depth, followed by a 2.5 mm hexagon, to end with a second Morse taper, which decreases tact.

The surface treatment is SLA, giving a moderately rough surface (Ra 2.065 µm), homogeneous throughout its length, and does not feature a polished neck.

It is sold with 7 types of diameters (3.8, 4.0, 4.5, 5.0, 5.5, 6.0 and 7.0) and 6 types of lengths (7, 8.5, 10, 11.5, 13 and 15). It is presented in a double package sterilized with Gamma rays.

Regarding the surgical technique, it is a regulated, ergonomic, and simple procedure. All necessary surgical equipment is orderly presented in a surgical kit. It consists of 3 burs. The first is the Lindemann bur with which we approach the cortical; with the second tapered twist drill, we reach the desired working length; and with the third and final one we use a tapered bur, which reproduces the morphology of the implant with 0.45 mm more length and 0.8 mm less diameter (**Figure 2**).

The implant is inserted at 35 Ncm and positioned 0.5 mm under the crest.

In this study, all implants were 7 and 10 mm long, and 3.8, 4 and 5 mm in diameter, loaded at 3 months, with 5 years of functional loading.

2.2. Design of the Multicentric Study

2.2.1. Selection of Implantologists

Only implantologists with a minimum of seven years of clinical experience and without any commercial relationship with the company I Do were invited. Ten surgeons were selected (**Table 2**) and one hundred implants were provided to each one, indicating to them their assigned anatomical areas and the form that they had to fill in each year for the five years of the study.

Table 2. Information on the implantologists taking part in the study.

Doctor's name	Table Column Head			
	City	Social Class of the patient	Career years of the surgeon	Av. No. of implants placed monthly in the clinic
Kim Jong Yeon	Seoul	Upper middle	19	240
Song Jae Hyun	Beijing	Upper middle	13	60
Anaraki Mohaammad	Contanza	Upper middle	12	120
Varun Goel	New Delhi	Middle	18	70
Shaker Tarawneh	Kiev	High	22	40
Yang Ming De	Taipei	Upper middle	25	150
Tsang Century	Hong Kong	High	14	70
Hansel A. Serrano	Mexico city	Middle	16	70
Chanchai Thonpresertvej	Bangkok	High	25	130
Jose F. Ballester Ferrandis	Madrid	Upper Middle	45	60

Bone Level Protocol

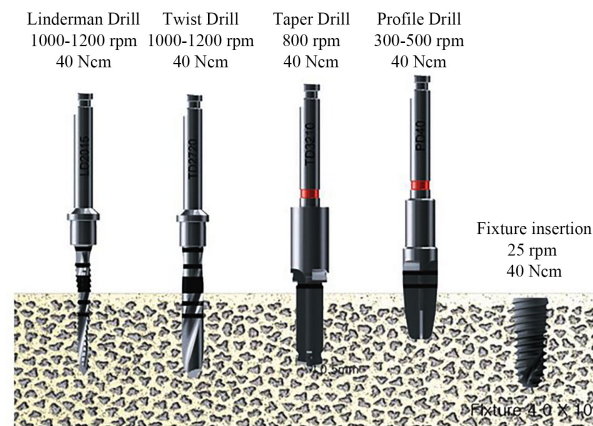


Figure 2. I Do Implant: Surgical protocol.

2.2.2. Selection of Patients

This study was carried out on 320 patients, 50% female and 50% male, chosen at random within the population of the doctor's patients taking part in the study that matched the inclusion criteria. They had agreed to attend the check-up appointment once a year; and had signed the informed consent form.

The inclusion criteria were: generally healthy, non-smoker, non-diabetic patients between 30 and 50 years old. They did not require any GTR technique at the time of the first surgery; and had a bone height greater than 10 mm and a minimum width of 8 mm. They didn't have any history of severe periodontal disease either. These criteria were chosen to remove factors that impacted failure rates.

2.2.3. Selection of the Implants

There were five hundred implants of 10 mm in length and another five hundred of 7 mm in length. The diameters were four hundred units of 3.8 mm diameter, four hundred units of 4 mm diameter and two hundred units of 5 mm diameter.

2.2.4. Anatomical Location of the Implant

The implants were divided into four groups.

- 1) Anterior superior (premaxilla).
- 2) Posterior superior.
- 3) Anterior inferior (mandibular symphysis).
- 4) Posterior inferior.

Fifty units of each diameter and length were used in each location, except for the 5 mm diameter implants, which were only used in the posterior areas (**Table 3**).

2.3. Study Variables

2.3.1. Related to the Implant: Diameter and Length

In each of these subgroups, the failure and complication rates were measured: bleeding, suppuration, gingival hyperplasia, bone loss (measured in intraoral

X-rays with Kodak RVG 5100, measuring mesial, distal and total loss (mesial + distal/2).

2.3.2. Related to the Prosthesis

Single-tooth prosthesis, fixed prosthesis with more than one implant, hybrid and their antagonist. Each subgroup measured screw fracture, porcelain fracture and prosthetic fracture.

As it was a prospective study, each of the dentists was allocated a number of implants, indicating where it had to be placed and what type of prosthesis should be performed, which resulted in a homogeneous sample (Table 4). In total, 480 prostheses were placed.

2.3.3. Related to the Type of Edentation

Superior, inferior, anterior and posterior.

2.3.4. Related to the Patient

On each yearly check-up, three factors were taken into account in order to assess the patients:

- Proper hygiene maintenance and impact on the oral health profile (bad taste in the mouth, smell, inability to lead a normal life, difficulty with speech, aesthetic impact).
- Evolution of the patients' quality of life over these five years, according to the OHIP-14 protocol, with all patients filling out a form.
- Satisfaction of the patient with the treatment, on a scale of 0 (Not satisfied) to 5 (completely satisfied). They were matched against other patient's results that the same doctors treated using removable prosthesis.

Table 3. Implants distribution for length, diameter, and anatomic place.

Implant (D × L)	Maxilla		Lower Jaw	
	Anterior	Posterior	Anterior	Posterior
3.8 × 7	50	50	50	50
3.8 × 10	50	50	50	50
4 × 7	50	50	50	50
4 × 10	50	50	50	50
5 × 7	0	50	0	50
5 × 10	0	50	0	50

Table 4. Number of prosthesis, type, and place for each participant implantologist.

Prosthesis	Anatomical area			
	Maxilla		Mandible	
	Anterior	Posterior	Anterior	Posterior
Unitary	7	7	7	7
Bridge over 2 implants	3	3	3	3
Hybrid over 6 implants		4		4

2.4. Statistical Processing

This is a cohort study design.

The data obtained by the doctors and sorted in Excel was entered into the SPSS software package (v 12.0).

2.4.1. Descriptive Statistics

The percentages of each of the variables were studied.

2.4.2. Inferential Statistics

The null hypothesis (there is a relationship of independence) must be rejected (*i.e.* the relationship between variables is dependency) when the minimum probability of rejection (p-value) does not exceed 0.05.

Once the variables were determined to be homogeneous, Pearson's chi-squared test was used to study the associations between continuous quantitative variables, thereby establishing hypothesis contrasts.

In the correlation between various variables multinomial logistic regression RR (risk ratio) was used (implant length and diameter for implant failure, and bone loss great than 2 mm for peri-implantitis) and the risk factors were age, gender, oral hygiene, and anatomical location, calculating 95% confidence intervals (Pv.0.05). This allows us to express the likelihood of implant failure.

3. Results

3.1. Related to the Implant

3.1.1. Implant Failure

When comparing the homogeneity of the implant diameters and lengths with respect to their topographic location, it was verified that all samples were homogeneous with respect to age (Pv 0.0388), gender (Pv 0.0178) and oral hygiene (Pv 0.0405).

In the descriptive statistical analysis, we studied the failure rate of the sample and the failure rate of each variable. For the exploratory analysis of association of variables, Pearson's chi-squared test and multinomial logistic regression were used. The significance level was set at 0.05.

The failure rate over all implants is shown in **Table 5**.

In **Table 6**, we can see the failure rate according to anatomical location.

The failure rate which links implant length with diameter is shown in **Table 7**.

For Pv = 0.05 value, implants with 7 mm length for 3.8 diameter and 10 mm length for 3.8 diameter have a difference statistically significant. The chi-squared test showed that if the H⁰ (null hypothesis) is "No length influence in failure", the chi squared calculated was 6 and the chi square table 3.84. That means that the null hypothesis is rejected and the rate of failure is limited to the length and diameter of the implant with a Pv = 0.010, with the difference being statistically very significant. As for gender, the chi-squared was Pv = 0.720 and no relationship was found between failure and gender.

Table 5. Failure rate of all implants.

Failure	1.7%	17
Success	98.3%	983
Total	100%	1000

Table 6. Failure rate according to anatomical location.

Prosthesis	Anatomical area			
	Maxilla		Mandible	
	Anterior	Posterior	Anterior	Posterior
Failure	3	9	1	4
	1.5%	3%	0.5%	1.3%
Success	197	291	199	296
	98.5%	97%	99.5%	98.7%

Table 7. Failure rate in implant by length and diameter.

Implant (D × L)	Total No.	Failure No.	Failure %
3.8 × 7	200	10	5
3.8 × 10	200	2	1
4 × 7	200	3	1.5
4 × 10	200	1	0.5
5 × 7	100	1	1
5 × 10	100	0	0

Of the 1000 implants, 17 failed, accounting for 1.7%. Of these failed implants, 88.7% were due to osseointegration failure, with peri-implantitis being the cause of failure in 11.3% of cases (7% percussion pain and 93% peri-implant fibrosis with implant mobility).

The association between narrow diameter and short implant in posterior areas presented a RR (risk ratio) of 5 with a confidence interval between 1, 7 and 6, 5, for $P_v = 0.001$.

3.1.2. Peri-Implantitis

The peri-implantitis rate of the total implant sample was 5.1% after five years of loading. Of this 5.1%, 100% showed bleeding upon examination, 2.67% exceedance, 13% gingival hyperplasia, and 3.17% bone loss of more than 2 mm (**Figure 3**).

The multinomial regression study indicated that age, gender, and alcohol do not have an influence, while oral hygiene do have an influence on the presence of peri-implantitis (**Table 8**).

Bone lysis was measured annually, obtaining the following values (**Figure 4**). The percentage of periimplantitis increases over time from 0% to 5.1% at five years of function.

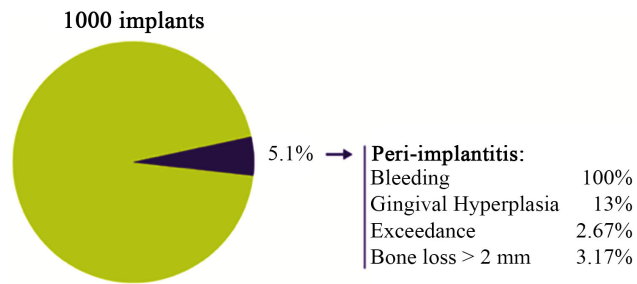


Figure 3. Symptoms of periimplantitis in the sample.

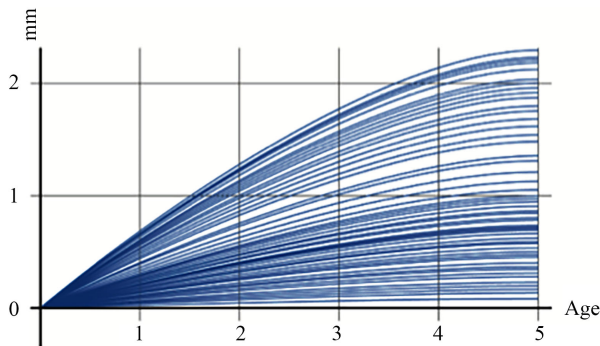


Figure 4. Bone lysis over five years.

Table 8. Factors influencing the development of peri-implantitis.

Variable	RR	Internal	Pv
Age	0.94	0.71 - 1.25	0.767
Gender	1.01	0.71 - 1.33	0.948
Alcohol	1.32	0.85 - 2.05	0.209
Oral Hygiene	3.31	1.31 - 8.31	0.041

3.2. Related to the Prosthesis

Regarding the prosthesis, the implant failures were related to the type of prosthesis and its antagonist.

3.2.1. Type of Prosthesis

The total survival figure of the prosthesis was 468 (2.91% failure). Out of this failure rate, 57.1% corresponds to single-tooth prostheses, 35.7% to fixed prosthesis of more than one implant, and 7.1% to hybrids (**Table 9**).

3.2.2. Antagonist

The failed implant antagonist was a natural tooth in 70.5%, fixed prosthesis on teeth in 17.6%, fixed prosthesis on implants in 5.8%, and removable prosthesis in 5.8%.

3.2.3. Screw Fractures

There were no reported screw fractures.

3.3. Evolution of the Quality of Life and Satisfaction

On comparing the quality of life among patients wearing I Do Biotech implants with the same patients wearing a skeletal or fully removable prosthesis, a significant improvement was observed.

On a scale of 0 to 5, where 0 is absence of disability and 5 is maximum disability, the results shown in **Table 10** were obtained.

The degree of satisfaction of patients with I Do Biotech implants compared to others with removable prostheses was quantified by measuring the level of satisfaction in each of the 320 patients (**Table 11**).

4. Discussion

This paper is a prospective clinical study based on a group of selected patients, Derks J. (2016) [7], carried out by a group of expert surgeons like Berglundh T. (2013) [8] and, although the methodology was questioned due to involving patients under optimal conditions, it provides results attributable to the quality of the implant, eliminating failure factors due to the patient, the surgeon or the surgical technique.

Table 9. Failure rate in prostheses.

Total Prostheses – 480 No./Success 468 No./Failures 14 No.			
Prosthese type	No.	Failure %	Over the total %
Unitary	8	57.1%	1.67%
Bridge over 2 implants	5	35.7%	1.04%
Hybrid over 6 implants	1	7.1%	0.20%
Total failures	14	100%	2.91%

Table 10. Patient’s quality of life.

Condition experienced	Using I Do Biotech implants	Using removable prosthesis	Pv
Functional limitation	0.23 ± 1.10	4.1 ± 1.01	0.0120
Physical pain	0.15 ± 0.80	2.83 ± 2.86	0.0100
Psychological distress	0.51 ± 1.07	3.12 ± 1.23	0.0233
Physical disability	0.16 ± 0.97	2.31 ± 1.17	0.0258
Psychological disability	0.43 ± 1.03	2.39 ± 1.18	0.0190
Phonetic disability	0.51 ± 1.40	2.45 ± 1.07	0.0210

Table 11. Degree of patient satisfaction.

Degree of satisfaction	I Do Biotech implants (%)	Removable prosthesis (%)
Completely satisfied	13.33	0.44
Satisfied	69.71	1.39
Little satisfied	12.28	13.11
Without changes	2.92	21.31
Dissatisfied	1.76	63.75

The understanding of osseointegration as a continuous biological process over time and not as a one-off result makes it necessary to perform a continuous evaluation of the implant, Esposito (1998) [9].

Albrektsson and Zarb (1993) [10] defined four conditions for osseointegration of the implant: implant design, surgical technique, host bed and loading conditions. This paper only studied length, diameter of the implant and its anatomical bed, the percentage of peri-implantitis, prosthodontic problems and quality of life, as all participants used the same implant, the same technique and the same loading conditions.

Over the years, various authors have proposed different success criteria: Karthik K. (2013) [11], Brugegenkate CM. (1990) [12], Buser D. (1997) [13], Smith LP (2009) [14]. The ones used today are: implant immobility; crest loss no greater than 1.5 mm with annual loss no greater than 0.22; and no infection or pain. We could add phonetic and aesthetic problems to this. In our study, failed implant means mobile or painful implant, removed from its bone bed, with the other concepts being considered as complications, but not as failures. The concept of elapsed time should be added to this failure. For example, the Melbourne hospital considers a success rate of 95% for the first year and 92.8% after five years acceptable (5% failure first year and 7.2% after 5 years). Our study quantified the five-year failure at 1.7% (it means a 98.3% of success rate at five years of functional load).

The paper studies the evolution of I Do Biotech implants over five years of loading in a controlled study. This was conducted according to four parameters: the implant; the topographic location of the implant; the type of prosthesis; and the patient's quality of life.

The overall percentage of implant failure was 1.7% after 5 years, much lower than in the study by Peñarrocha M. (2002) [15], who analysed 441 ITI implants and recorded a 3.8% failure rate. Both studies coincide in attributing a greater percentage of failures to shorter implants located in the posterior areas of the maxilla.

Of the 1.7% failure rate, 88.7% was due to a lack of osseointegration according to the criteria of Albrektsson T. (2014) [16] and 11.3% was a late loss related to peri-implantitis; Berglundh, 2002 [17]; Quirynen (2002) [18]; Van der Weijden (2005) [19]; Roos J. (1997) [20].

The study by Curto A.A. (2012) [21] shows a 10.7% failure rate for implants smaller than 7 mm and 5.9% for implants greater than or equal to 10 mm. In our study the failure rate for 7 mm and 3.8 mm diameter was 5%.

Sáenz Guzmán M. (2013) [22] states that the failure rate after 5 years is 15% and 20% after 10 years. In contrast, the University of Gothenburg, Adel. R. (1990) [23] proposes a 5% failure rate after 5 years and 8% after 15 years. In his study, Chee W. (2007) [24] obtained a failure rate of 7.2%, of which 4% in the maxilla and 3.2% in the jaw. For Busenlechner D. (2014) [25] the failure rate after 8 years was 3%; Smith L.P. (2009) [14] reports 6% at the end of first year, and

7.2% after 5 years; Kohavi D. (2004) [26] 4%; Hutter J.W. (2001) [27] 0.7% after 36 months; and Donati M. (2015) [28] 2.5% before loading and 5% after 5 years. This variability in the success-failure rates is due to the variability of the samples: type of implant (surface, length, diameter); bone bed quality; dentist's experience; patient smoker, bruxist, history of severe periodontitis, quality of hygiene, etc.

The study by Santamaría J. (1996) [29], with a two-year follow-up, on Brånemark surface implants obtained a failure rate of 2.2%, in line with our results.

The paper by Papaspyridakos P. (2018) [30] reporting a 13.3% failure of short implants and 5% of long ones. In his study, the risk ratio (RR) for short implants was 1.29 (Pv 0.045), showing that the risk of failure in short implants is 29% higher than that of long implants. In our study, the risk ratio for 7 mm implants was 5 with Pv 0.001. Bain C.A. (1993) [31] set the failure rate of short implants after 6 years at 5.92%. For Salonen M.A. (1993) [32], the failure rate is 4.89% and 6.27% in the maxilla; Ibáñez J.C. (2005) [33] quotes it at 5.6% after 6 years; Ivanoff C.J. (1999) [34] sets it at 18% after 5 years; and Ravidà A. (2019) [35], with 6 mm implants, reports 21.4%. Atieh M.A. (2012) [36] found a 24.2% failure rate for short implants, 8.3% for standard implants and 6.5% for long implants. Of the 14.4% in the maxilla, 10.3% in the anterior maxilla, 4.5% in the posterior jaw and 2.3% in the anterior jaw. As for the type of prosthesis, 17.5% in single-tooth implants, 7.9% in hybrid denture and 5.8% in fixed prosthesis of more than one implant. In our study we had 9 failures over 480 prosthesis 55% in single-tooth implants, 33% in fixed prosthesis with two implants and 11% in hybrid denture.

Our study coincides with that of Fartash B. (1997) [37], finding no differences regarding gender.

The highest failure rate is found in the conjunction of poor bone quality, short implant and small diameter.

The overall peri-implantitis rate was 5.1%. At the 1994 European Workshop, Isidor F., Albrektsson P. (1994) [4], the reversible inflammatory reaction in the gum surrounding a functioning implant was defined as "mucositis", indicating that it occurs in 80% of the implants and increases over the years, Roos-Jansåker A.M. (2006) [38]; Zitzmann N.U. (2008) [39]. The same authors defined peri-implantitis as marginal bone loss, reporting its presence between 28% and 56% of implants, Fransson Ch. (2009) [40].

Its causes include: poor oral hygiene, Ferreira S.D. (2006) [41]; history of aggressive periodontitis, Heitz-Mayfield L.J. (2010) [42]; smoking, alcohol and diabetes, Lindhe J. (2008) [43]; and rough surface greater than 2 microns, Becker W. (1997) [44].

The best peri-implantitis results obtained in our study, 5.1% at five years, may be due to the fact that since this was a prospective study, we did not include smokers, patients with a history of aggressive peri-implantitis or diabetics. In addition, we only choose cases where no GTR techniques were performed and loading was deferred at three months, while we also subjected patients to strict

hygiene controls and used an intermediate rough surface implant (**Figure 5**).

Increasing the Ra value favours the proliferation of osteoblasts, but also of bacteria and, consequently, the rate of peri-implantitis. Bone-implant contact increases with surface roughness from value 1.1 Albreksson T. (2004) [45] to 1.4 Ra, Dheda S.S. (2013) [46] and even 2.0 Ra, Dohan D.M. (2010) [47]. Greater roughness favors microbial contamination, Quirynen M. (2007) [48]. I Do implant has 2.0 Ra.

Tan W.Ch. (2011) [49] obtained a peri-implantitis rate of 5.9% after one year of follow-up, comparable to those in our study. For Mombelli A. (2012) [50], peri-implantitis is a slowly progressing disease, affecting 10% of implants after 5 years, which is double our rate.

The peri-implantitis rate varies greatly from one study to another. Daubert D.M. (2015) [51] finds it in 16% of implants and 26% of patients, while Dvorak G. (2011) [52] records 13% of implants and 24% of patients., Derks J. (2015) [53] finds it in 22%, Mir-Mari J. (2012) [54] in 40%, and Serino G. (2011) [55] in 47%.

To assess the quality of life, the OHIP-14 questionnaire, Lindeboom A.J. (2010) [56]; was used, showing a level of quality of life far superior to patients rehabilitated with removable prostheses. Yunus N. (2015) [57] obtains results comparable to ours by comparing hybrid prostheses with removables on two implants. The extension of the prosthesis does not influence patient satisfaction, but it does affect chewing ability and confidence.

Lee D.J. (2015) [58] compared overdentures and single-tooth implants, reporting a similar level of satisfaction. In our study, we compared patients with and without implants, with the result being very satisfactory in all aspects studied, showing also how satisfaction increased over the years (**Figure 6**), which is the same result obtained by Amnibalis S. (2009) [59].

Numerous studies have shown that the removable prosthesis is associated with a reduction in the quality of life Blomberg S. (1983) [60]; Locker D. (1994) [61]; Gerritsen A.E. (2010) [62].

The positive impact was demonstrated when comparing a fully removable with a hybrid denture, Sung-Hee O. (2014) [63]; Kaptein M.L. (1998) [64], Wismeijer D. (1997) [65], all showing a high level of satisfaction.

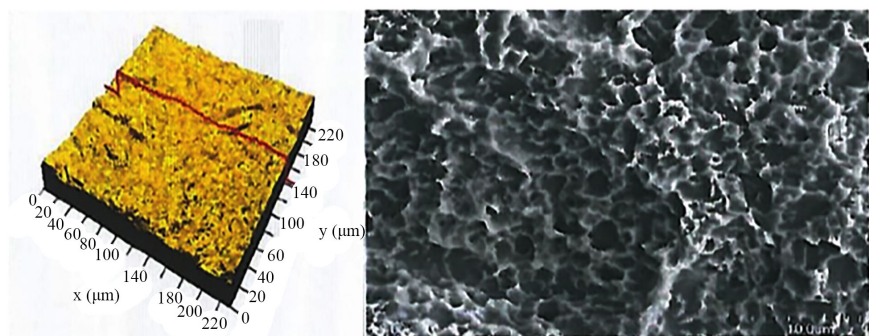


Figure 5. Rough surface implants.

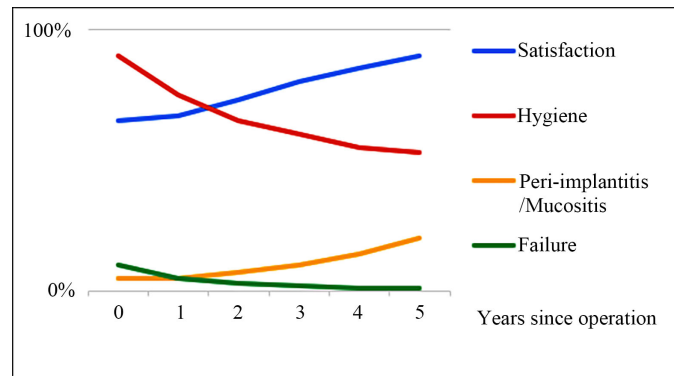


Figure 6. Illustrative trends of the evolution of the parameters studied over 5 years.

The level of dissatisfaction was related to failures and complications, Alsaadi (2007) [66].

Our study found no differences between men and women, while Lee did find some in terms of pronunciation, taste and discomfort.

5. Conclusions

The failure rate of the I Do Biotech implant after 5 years was 1.7%. It increases up to 4.3% when the length of the implant or its diameter decreases, and when it is placed in posterior areas.

The failure rate of the prosthesis after 5 years was 2.91%.

The rate of peri-implantitis after 5 years was 5.1%.

No significant differences were found between both genders, so it can be said that gender does not influence failure rates.

With a statistically significant difference, the highest failure rates were seen with short implants, smaller diameter, and located in the posterior areas of the maxilla.

The quality of hygiene decreases over the years and the rate of peri-implantitis increases.

The roughness of the I Do Biotech implant is ideal for increasing the rate of osseointegration without increasing the rate of peri-implantitis.

The conical form of the I Do Biotech implant connection guarantees the stability of the prosthesis.

The perception of improved quality of life and patient satisfaction grows over the years.

As this was a prospective study with highly selected patients and dentists, it is not possible to transfer this data to the general population, as it is limited to the I Do Biotech implant used in optimal conditions.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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