



## Article 1

# Long-Term dental Implant Survival In Fully Edentulous Patients: A 30-66 Month Follow-Up

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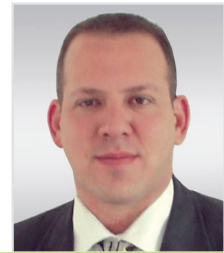
DMD

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## Abstract

**Purpose:** This single center, retrospective cohort study presents long-term dental implant survival results for a small patient cohort from a general practitioner's private practice records.

**Materials and Methods:** Between the years 2008-2011, 123 titanium implants were implanted in 9 fully edentulous patients with 59 implants placed following extraction and 91 immediately loaded. Metal/ceramic fixed partial dentures (FPD) were built on implants 3-4 months post-implantation.

**Results:** Follow-up was 30-66 months with a cumulative implant survival rate of 97.56% and average bone loss of 0.9 mm on the mesial aspect and 1.1 mm on the distal aspect.

**Conclusion:** Over a 30-66 month period 9 fully edentulous patients showed minimal bone loss and high long-term implant survival rate.

# Introduction

A great number of studies have analyzed dental implant survival, with the majority providing data for up to 5 years. Although modern implants have been placed for almost 50 years (Ratner 2004), few studies have provided long-term follow up data.

The dental implant survival prior to loading is generally accepted as very high. An initial loss of 2–3% in all implants is followed by another 2–3% loss over an observation period of 5 years for implants supporting FPDs. 10 year to 16 results have been reported in a few studies (Buser et al 2012, Siminois et al. 2010, Pjetursson et al. 2007). When fixed prosthesis longevity was addressed, systematic reviews showed a survival rate of 96.5% after 5 years for single tooth replacement; 95.4% for implant fixed bridgework and 90.1% for implant tooth reconstruction (Lang et al. 2004, Pjetursson et al 2004, Brägger et al. 2005, Jung et al. 2008).

Nevertheless, the ideas of survival and success often are used in a confusing manner, although precise definitions are available (Albrektsson et al. 1986, Smith & Zarb 1989). In these studies, survival was defined as implant and fixed prosthesis present in the mouth independent of biological and/or technical complications. Success was defined as being free of all these complications over the entire observation period. Reliable parameters to assess both biological and prosthetic complications are largely absent from the literature. Biological complications include mucositis and peri-implantitis. Some studies suggest that patients susceptible to periodontitis could be at higher risk for developing peri-implantitis (Hardt et al. 2002, Karoussis et al. 2003, Schou et al. 2006). In the present single center, retrospective cohort study outcomes of implant therapy in a fully edentulous patient group over 30–66 months were evaluated.

# Materials and Methods

This is a non-randomized retrospective, single center study. Data was collected from patient records in a general practitioner's private office. Between the years 2008–2011, 123 titanium implants were surgically placed in 9 fully edentulous patients. Metal/ceramic FPDs were built on implants 3–6 months post-implantation.

## Study Inclusion Criteria

Study candidates were patients who were treated with full arch implant-supported prosthetic restorations. Patients included in the study were at least 18 years of age, dentally healthy, demonstrated an ability to maintain oral hygiene with willingness and ability to commit to follow-up.

## Study Exclusion Criteria

Patients who were not available for annual follow-up and did not complete initial therapy with the dental hygienist were excluded. Patient records with incomplete surgical or restorative data or non-diagnostic x-rays also were excluded.

## Patient Evaluation

Patients had a preliminary evaluation that included careful review of their medical and dental histories,

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detailed clinical and radiographic examination including panoramic and computed tomography (CT) radiographs, evaluations of oral hygiene and assessment of their ability to commit to at least one annual hygiene prophylaxis and clinical monitoring.

A clinical examination was performed in which the following parameters were evaluated for all implants: probing pocket depth (PPD) in millimeters, distance between the implant shoulder and the mucosal margin (DIM) in millimeters. The distance from the implant shoulder to the first visible apical bone-to-implant contact was measured by the same periodontist examiner in millimeters in the mesial and distal aspects of the implants.

All measurements were performed manually at six aspects of each implant (mesio-buccal, buccal, disto-buccal, mesio-lingual, lingual and disto-lingual) using a HuFriedy PCPUNC 15 probe (HuFriedy, Chicago, IL, USA). Distances were measured to the nearest millimeter. Peri-implantitis was defined as suggested by Ong et al. (2008): PPD  $\geq 5$  mm with BOP/suppuration and radiographic bone loss  $\geq 2.5$  mm or bone loss extending  $\geq 3$  threads for a follow-up of at least 10 years.

The treatment plan was discussed with patients and signed informed consent was obtained from each patient prior to implant placement.

Before implant placement, patients were treated periodontally if necessary to achieve periodontal health.

## **Procedure:**

123 implants were solid screw spiral implants (SPI Alpha-Bio Tec) with 71 implants inserted in the maxilla (30 in the anterior maxilla and 41 in the posterior maxilla) and 52 in the mandible (25 in the anterior mandible and 27 in the posterior mandible). 4 were 8 mm in length, 2 were 10 mm in length, 24 were 11.5 mm in length and 93 were 13 mm length. (Table 1) One periodontist performed all of the surgeries, with another performing all of the implant procedures.

59 implants were placed immediately with 64 placed using the delayed approach. 91 were immediately loaded and 32 were submerged. Bovine bone and bond appetite were used as necessary.

## **Annual Hygiene Prophylaxis and Monitoring:**

To monitor hygiene prophylaxis and implant health, patients were recalled for annual examination for at least 3 years. Assessment metrics included: age, gender, smoking habits, and reasons for tooth loss. Implant details included: type, number, length and distribution. Any implant loss also was recorded.

Biological (peri-implantitis) and mechanical complications (fracture of implant, fracture of abutment, fracture of screw, porcelain fracture) were assessed and recorded. Implant-related problems were treated. Patients were subsequently treated for any failed implants.

## **Data Collection**

All patient records in the practice were examined to identify subjects who met the inclusion criteria. Data from each patient including records were entered into spreadsheets (Microsoft Excel, Microsoft Corporation, Redmond, WA) on a personal computer (Windows XP operating system, Microsoft Corporation).

## Results

This study of 9 fully edentulous patients showed a cumulative implant survival rate of 97.56%. Out of 123 dental implants placed, only 3 implants in 3 patients were lost over a 30-66 month period. Two implants were lost during the osseointegration phase and 1 implant had to be removed due to pain. Immediate implants had a 100% success rate and immediate loaded implants 98.90% success rate.

There was minimal bone loss. On radiographic evaluation, the average marginal bone loss after 30-66 months was 0.9 mm on the mesial aspect and 1.1 mm on the distal aspect.

## Discussion

This single center, retrospective cohort study presents long-term dental implant survival results for 9 fully edentulous patients from a general practitioner's private practice records. In the years 2008-2011, 123 titanium implants were implanted with 59 implants placed following extraction and 91 immediately loaded. Metal/Ceramic FPDs were built on implants 3-6 months post-implantation.

Cumulative implant survival rate of 97.56% and based on radiological evaluation, average bone loss of 0.9 mm on the mesial aspect and 1.1 mm on the distal aspect. Over a 30-66 month period, 9 fully edentulous patients had minimal bone loss and high long-term implant survival rate.

## Conclusion

Within the limitations of this study, full arch SPI dental implant placement with FPDs showed very high survival and success rates over a 30-66 month period.

### Abbreviations

CT computed tomography

DIM distance between the implant shoulder and the mucosal margin

FPD fixed partial denture

PPD probing pocket depth

SPI spiral implants

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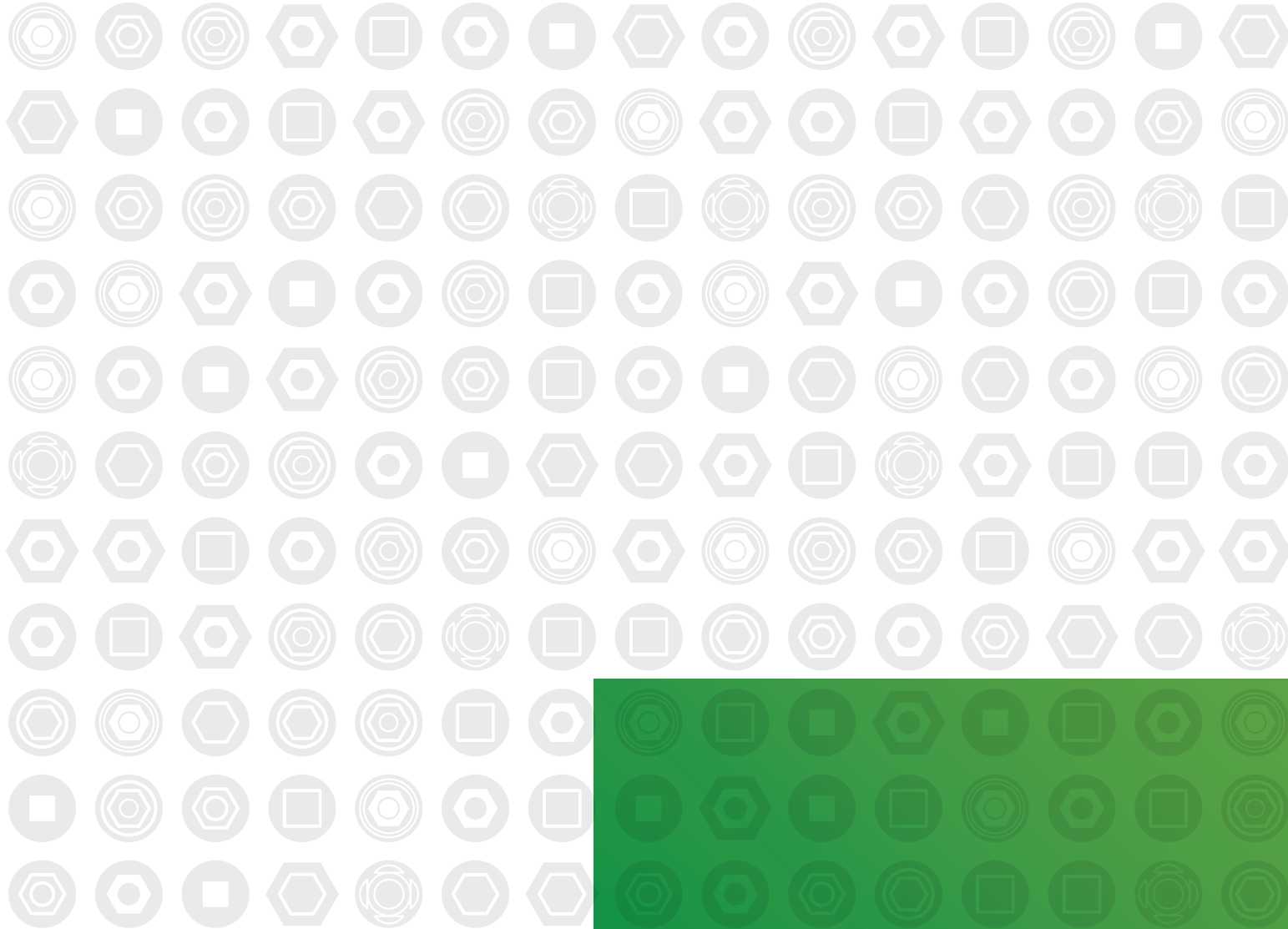
**Table 1.**  
Distribution of placed implants (n=123) according to the position in the jaws and length of implants

	Implant length (mm)	Anterior			Posterior				Total	%
		1	2	3	4	5	6	7		
Maxilla		1.8ii*	3.6ii*	2.10ii*	11.4ii*	13.2ii*	10	1	71/49§/30ii*	
	8	0	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0	0
	11.5	2	2		5	6	2	1	18	
	13	7	7	12	12	9	5	1	53	
Mandible		0	5.9ii* (14)	3.8ii* (11)	5.8ii* (13)	3.4ii* (7)	(6)	(1)	52/42§/29ii*	
	8					1	2	1	4	
	10	0	0	0	0	2	0	0	2	
	11.5	0	2	2	2	0	0	0	6	
	13	0	14	14	12	0	0	0	40	
Total										
%			16/14§	16/14§	14/11§	3/2§	2/1§	1	52/42§	

Table 1. Distribution of placed implants (n=123) according to the position in the jaws and length of implants\* immediate implantation (ii), §immediate loading

## References

1. Ratner B, Biomaterials science: an introduction to materials in medicine. San Diego, CA, Elsevier Academic Press, 2004:557.
2. Buser D, Janner S, Wittneben J, Brägger U, Ramseier A, Salvi G: 10-Year Survival and Success Rates of 511 Titanium Implants with a Sandblasted and Acid-Etched Surface: A Retrospective Study in 303 Partially Edentulous Patients. *Clinical Implant Dentistry and Related Research*, 2012;14, 839-851. DOI: 10.1111/j.1708-8208.2012.00456.x
3. Simonis P, Dufour T, Tenenbaum H. Long-term implant survival and success: a 10–16-year follow-up of non-submerged dental implants. *Clin. Oral Impl. Res.* 2010;21, 772–777. DOI: 10.1111/j.1600-0501.2010.01912.x
4. Pjetursson BE, Brägger U, Lang NP, Zwahlen M. Comparison of survival and complication rates of tooth-supported fixed dental prostheses (FDPs) and implant-supported FDPs and single crowns (SCs). *Clin. Oral Impl. Res.* 2007; 18,97-113.
5. Lang NP, Pjetursson BE, Brägger U, Egger M, Zwahlen M. A systematic review of the survival and complication rates of fixed partial dentures (FPDs) after an observation period of at least 5 years. II. Combined tooth--implant-supported FPDs. *Clin. Oral Impl. Res.* 2004;15, 643-653.
6. Pjetursson BE, Tan K, Lang NP, Brägger U, Egger M, Zwahlen M. A systematic review of the survival and complication rates of fixed partial dentures (FPDs) after an observation period of at least 5 years. *Clin. Oral Impl. Res.* 2004; 15, 625-642. DOI: 10.1111/j.1600-0501.2004.01117.x
7. Brägger U, Karoussis I, Persson R, Pjetursson B, Salvi G, Lang NP. Technical and biological complications/failures with single crowns and fixed partial dentures on implants: a 10-year prospective cohort study. *Clin. Oral Impl. Res.* 2005; 16, 326–334. DOI: 10.1111/j.1600-0501.2005.01105.x
8. Albrektsson T, Zarb G, Worthington P, Eriksson AR. The long-term efficacy of currently used dental implants: a review and proposed criteria of success. *Int J Oral Maxillofac Imp* 1986;1, 11-25.
9. Smith DE, Zarb GA. Criteria for success of osseointegrated endosseous implants. *J Prosthet Dent.* 1989; 62,567-72.
10. Hardt CR, Gröndahl K, Lekholm U, Wennström JL. Outcome of implant therapy in relation to experienced loss of periodontal bone support: a retrospective 5- year study. *Clin. Oral Impl. Res.* 2002; 13,488-494.
11. Karoussis IK, Salvi GE, Heitz-Mayfield LJ, Brägger U, Hämmerle CH, Lang NP. Long-term implant prognosis in patients with and without a history of chronic periodontitis: a 10-year prospective cohort study of the ITI Dental Implant System. *Clin. Oral Impl. Res.* 2003;14,329-339.
12. Schou S, Holmstrup P, Worthington HV, Esposito M. Outcome of implant therapy in patients with previous tooth loss due to periodontitis. *Clin. Oral Impl. Res.* 2006;2,104-123.
13. Ong CT, Ivanovski S, Needleman IG, Retzepi M, Moles DR, Tonetti MS, Donos N. Systematic review of implant outcomes in treated periodontitis subjects. *J Clin Periodontol.* 2008;35, 438-62. DOI: 10.1111/j.1600-051X.2008.01207.x.



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