

# One Abutment-One Time” Technique: Crestal Bone Loss In Immediate Provisionalization

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## Abstract

**Aims:** purpose of this study is to evaluate crestal bone reabsorption through prosthetic rehabilitation of mono or bi-edentulism in aesthetical sectors using non post-extractive implants with “one abutment – one time” method.

**Methods:** 24 patients have been selected and randomized in two groups: PA group: 12 patients rehabilitated using provisional abutments and DA group: 12 patients rehabilitated using definitive abutments through “One abutment – one time” technique.

**Results:** comparison between our study and those of literature confirm that if implant-abutment unit is not altered or modified through time, marginal bone loss can be reduced during the first months after surgery.

**Conclusions:** within the limits of this study, non removable abutments positioned during surgery resulted in 0.47 mm of marginal bone reduction.

**Keywords:** One abutment-one time; Non post-extractive implants; Crestal bone reabsorption; Immediate provisionalization

## Introduction

Immediate restoration implantology is having a greater success in dentistry since it provides a better aesthetical result and a better comfort for the patient [1, 2].

Literature concerning this protocol follow up is very poor. Objective of this work is to compare results from the literature with those gained from studies of 2014/2015 performed at the Implantoprosthesis Unit in the Department of Oral and Maxillo Facial Sciences at Sapienza University of Rome. Main issues of immediate restoration prostheses concern reabsorption of crestal bone and the following gingival retraction, leading to exposition of the implant platform and compromising the final aesthetical result [3-5].

In traditional procedures, at the end of surgical period, a Provisional Abutment (PA) is screwed on the implant on which

a provisional resin crown is cemented. Later on provisional abutment gets replaced with a definitive one.

In the One Abutment One Time (OAOT) technique, at the end of surgery, a definitive abutment (DA) is placed directly on the implant with a provisional resin crown. This way gingival reshaping that takes place during the following prostheses phase is eliminated [6- 8].

## Materials and Methods

From January 2014 an in vivo study is conducted at the Implantoprosthesis Unit in the Department of Oral and Maxillo Facial Sciences at Sapienza University of Rome.

**Patients were considered eligible for inclusion if they fulfilled the following criteria:**

- 1) at least 18 years of age;
- 2) in need of one or more single implant in the aesthetic maxillary or mandible area from the left second premolar

to the right second premolar, between two natural teeth (or crowned teeth);

- 3) sufficient bone to allow the placement of an implant at least 11.5 mm long with a 3.7 mm diameter;
- 4) adequate oral hygiene, i.e. maximum score for Plaque Index  $13 \leq 2$ .

**Patients were not accepted into the study if they met any of the following exclusion criteria:**

- 1) dehiscence or lack of buccal bone plate after tooth extraction;
- 2) general contraindications to implant surgery;
- 3) subjected to irradiation in the head and neck area;
- 4) immunosuppressed or immunocompromised patients;
- 5) treated or under treatment with intravenous amino-bisphosphonates;
- 6) uncontrolled diabetes;
- 7) addiction to alcohol or drugs;
- 8) heavy smoking ( $\leq 20$  cigarettes daily);
- 9) lack of opposing occluding dentition at the proposed implant site.

12 patients were included in the study. Each patient underwent emathological analysis to evaluate glycemic level, coagulation factors, blood count and HbsAg, HCV and HIV present. After analysing Orthopantomogram and TC Cone Beam, plasters for surgical and prosthetic study were realized.

For each patient Plaque Index (PI) was detected and one week before surgery patient received their first oral hygiene session during which they were instructed to use clorexidine 0,2% mouthwash for one minute twice a day starting from 3 days before surgery until one week afterwards. 1 g Amoxicillin and Clavulanic Acid (Augmentin, Roche, Milan, Italy) Antibiotic prophylaxis was administered every 12 hours for 6 days starting from the day before surgery. Patients allergic to penicillin were treated with 500 mg of Clarithromycin (Klacid, Abbott, Rome, Italy) 1 hour before surgery and 250 mg twice a day for one week.

All surgical procedures were performed by the same operator. If implants did not reach an insertion torque of at least 35 Ncm, patients were excluded from the study. Before suturing wound edges transfer was screwed on the implant and a positioning bicomponent monophase polyvinyl siloxane impression was taken with pick up technique.

After surgery oral hygiene instructions were provided and patients were instructed to have a soft diet for 8 days.

A post surgical intraoral radiography using Rinn XCP film holder (Dentsply Rinn, Elgin, IL, USA) was taken measuring peri-implant alveolar bone.

Impressions were sent immediately to the dental laboratory where master casts were made and the titanium abutment was milled; furthermore on the abutment a methacrylate provisional resin crown was customized, refined and polished. Occlusal centric and eccentric contacts were not permitted on the provisional restorations, and 200  $\mu\text{m}$  articulating paper was used following the guidelines for immediate non-func-

tional loading [9]. On the same day of surgery a titanium definitive abutment was screwed on the implant and a frequency resonance test was performed showing an Implant Stability Quotient (ISQ)  $\geq 60$  in every test.

After evaluating Resonance Frequency (RF) a provisional crown was cemented on each abutment with zinc oxide eugenol-free cement, TempBond NE (ZNE).

After 8 weeks intraoral radiography using Rinn XCP film holder (Dentsply Rinn, Elgin, IL, USA) was taken measuring peri-implant alveolar bone.

PI was also detected and a new oral hygiene session was performed.

2 months after surgery implant restoration was divided into steps:

1. bicomponent monophase polyvinyl siloxane impression of the definitive abutment
2. Metal structure test
3. rough porcelain test
4. Final Aesthetical test and cementation with zinc oxide eugenol-free cement, TempBond NE (ZNE).

A 3-months (T1), 6-months (T2), 9-months (T3) and 12-months (T4) follow-up was reported after surgery. An intraoral radiography using Rinn XCP film holder (Dentsply Rinn, Elgin, IL, USA) was taken measuring peri-implant alveolar bone. An oral hygiene session was performed at each follow up.

One of the limits of this study was to recreate repeatability on measurements of the alveolar bone on periapical radiograph, due to the difficulty of positioning the RVG sensor in a repeatable way. The limit was overcome by using a device called the Precision Implant X-ray Relator and Locator (PIXRL) developed by researchers [10].

A radiograph positioning device was developed to fit with commercially available film holders and implant systems. The device is indexed to the dental implant body and the adjacent dentition by using an implant placement driver and polyvinylsiloxane occlusal registration material. By fitting the device to a conventional film holder, accurate orthogonal radiographs can monitor changes in bone architecture and prosthetic misfit [11].

A further limit was discrepancy between implant and alveolar bone radiographic and real measures. Considering this discrepancy, in order to avoid any projection error, alveolar bone measurements were taken following a proportional mathematical scheme.

## Statistical Analysis

Assessments were made for statistically significant differences in the peri-implant bone levels at each follow-up between the test and the control group using the non-parametric Wilcoxon-Mann-Whitney test. The mesial and distal measurements on each implant were averaged, and then were averaged at patient level and then at group level. Statistical analysis was performed

using the statistical package StatView (version 5.01.98, SAS Institute Inc, Cary, NC, USA). Significance was considered at  $P < 0.05$ . The intra-observer reliability was assessed using Pearson's correlation coefficient. The inter-observer reliability was assessed using the intraclass correlation coefficient (ICC) [12].

## Results

12 patients, between 40 and 67 years of age, with monoedentulism in aesthetic area starting from the second premolar, were rehabilitated within 24 hours with definitive abutment and provisional resin crown.

Male	5
Female	7
Average age	56,08 (40-67)
Smokers (less than 20 cigarettes a day)	4
Diabetes	1
Implant length 11,5 mm	8
Implant length 13 mm	4
Implant diameter 4,3	4
Implant diameter 3,7	8
Insertion torque	> 35 N
ISQ	> 60

**Table 1:** Patients distributed by main characteristics of the study.

For each patient an intraoral Rx was performed at each time:  
T0 – Surgery day after screwing the definitive abutment and cementing provisional crown

T1 – 3 months after surgery, when definitive prothesization was concluded

T2 – 6 months after surgery

T3 – 12 months after surgery

After measuring level of the crestal bone compared to the implant length following dates were analyzed (Table 2):

T0	T1	T2	T3
1	0.2	0.2	0.2
2	0.5	0.55	0.5
3	0.2	0.2	0.2
4	0.4	0.35	0.35
5	0.3	0.3	0.3
6	0.3	0.3	0.3
7	0.6	0.55	0.6
8	0.4	0.4	0.4
9	0.35	0.4	0.4
10	0.4	0.4	0.4
11	0.45	0.45	0.4
12	0.2	0.2	0.2
Average ± DS	0.35	0.35	0.35
Range	0.2-0.6	0.2-0.55	0.2-0.6

## Discussion

The aim of this study is to evaluate the amount of crestal bone reabsorption in the prosthetic rehabilitation of monoedentulism of aesthetic zones using "One abutment one time" technique. This study compared obtained results with two experimental studies from literature where non post-extractive implants were placed, immediately rehabilitated with a provisional abutment (PA) in the aesthetic zone (from the left second premolar to the right second premolar).

In the first study made by Cooper LF et al. [13] reabsorption of crestal bone was 0,40 mm one year after surgery. In the other study made by Oyama K. et al. [14] reabsorption of crestal bone was 0,28 mm after 6 months and 0,38 mm one year after surgery.

Definitive abutment positioning doesn't reduce crestal bone reabsorption one year after surgery. Different experimental studies concerning OAOT technique are shown in literature. In these studies different clinical situations have been analyzed. The first main distinction concerns timing of implant placing. Grandi et al. in their study of 2012 [8] used OAOT technique in 12 post-extractive implants: crestal bone resorption was 0,11 mm one year after surgery. The same technique was used placing 15 implants by Canullo et al. [7], showing a mean crestal reabsorption of 0,35 mm after 3 months and 0,33 mm 1,5 years after surgery.

On the other hand this study analyzed crestal bone reabsorption using OAOT technique on non post extractive implants. A crestal bone reabsorption of 0,35 mm 6 months after surgery and 0,35 mm one year after surgery was measured. Comparing these results with those of Canullo et al. [7] no significant difference between the data was found. Major difference is shown between this study and Grandi et al. [8]. One year after surgery difference between average measurements is in fact 0,24 mm. OAOT technique would show better results if the implant is placed right after tooth extraction. From the study by Canullo et al. [7] is also shown that OAOT technique used in post-extractive surgery gives better results than the traditional method with provisional abutment. As a matter of fact 3 years after surgery a significant difference of 0,21 mm of crestal bone reabsorption between provisional and definitive abutment has emerged. Remarkable advantages using OAOT technique have been shown by rehabilitating two implants prosthetically attached, even in non-aesthetical areas. Two different studies concerning this topic exist in literature. In the first one, made by Degidi et al. [9], average crestal bone reabsorption was 0,27 and 0,25 respectively 6 months and 1 year after surgery. These data concern prosthetic rehabilitation of one or more elements (not specified) in posterior areas using non post-extractive one-abutment one-time technique. In the second study made by Grandi et al. [8], implants were placed right after tooth extraction (post-extractive) and crestal bone reabsorption was 0,065 mm after 6 months and 0,094 mm 1 year after surgery compared to 0,36 mm (6 months) and 0,44 mm (1 year) measured with traditional technique used in the control group with provisional abutment. Average reab-

sorbed bone in both these cases is lower if compared to our study measurements, and results have been significantly better in post-extractive implants. This is probably due to the fact that implants were often contiguous and were prosthodontized together improving stability and reducing therefore crestal bone reabsorption.

In the following **Table 3**, data concerning crestal bone reabsorption in different studies analyzed in literature are shown, compared to the data of this study.

Study and year	Type of abutment		6 months	1 year
Sapienza study 2014	DA	Non post-extractive	0,35	0,35
Cooper LF. et al. 2010	PA			0.4
Oyama K. et al. 2012	PA		0.28	0.38
Grandi et al. 2014	DA	Post-extractive	-	0.11
	PA		-	0.58
Canullo et al. 2010	DA		0.35(3months)	0.33(1.5years)
	PA		0.36(3months)	0.43(1.5years)

Except for Grandi et al. [8], for the other studies in literature, including ours, there is a small and non significant difference between OAOT and traditional provisional abutment technique 1 year after surgery. This study sought to show that there is no significant difference between OAOT post-extractive and non post-extractive technique for what concerns single implants in the aesthetic area 1 year after implant positioning. Gingival reshaping due to abutment continuous repositioning [15] doesn't adversely affect on peri-implant crestal bone reabsorption whether it's placed in a post-extractive or non post-extractive site. Advantages of OAOT technique are more appreciable in case of two contiguous implants prosthetically attached. This advantage is probably not due to OAOT technique itself, but to the greater biomechanical stability gained by implants when attached together.

Within the limits of this study, one abutment-one time technique used for rehabilitation of single non post-extractive teeth in the aesthetic area, has shown not to significantly affect peri-implant crestal bone reabsorption compared to traditional technique. More clinical studies are needed. Furthermore additional studies are required to evaluate crestal bone reabsorption with OAOT technique in order to rehabilitate contiguous implants prosthetically attached.

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