Immediate implant placement and loading in the anterior maxilla

Is insertion torque and implant stability quotient (ISQ) an influence of a big value? A two clinical cases report.

By Rabih Abi Nader1, Lebanon, Carine Tabarrani2, Lebanon

Abstract

Immediate implant loading is considered nowadays a successful viable treatment, even though many criteria’s needs to be considered in order to insure implant procedures success, especially in the anterior maxilla.

The aim of this article is to assess the influence of the stability quotient and insertion torque on the immediately placed and loaded implants in anterior maxilla by exposing two clinical cases and reviewing it through a literature review.

Keywords

Immediate implant, stability quotient, insertion torque, anterior maxilla.

1. DDS, MSc Oral Surg. Dipl., Oral Path. Lebanese University Faculty of Dental Medicine, Beirut, Lebanon.
2. DDS, MSc Oral Surg. Dipl., Oral Path. Senior lecturer. Saint Joseph University Faculty of Dental Medicine, Beirut, Lebanon.

Nowadays the use of immediate implant loading protocol is considered an attractive option in order to preclude dramatic post extraction bone resorption.

Buccal alveolar plate loss following tooth extraction in the maxillary anterior may lead to palatal implant positioning with esthetic complications.

Immediate loading of implant-supported restorations replacing single missing tooth could be a successful procedure.17 Many clinical reports suggest that implants for the mandible have higher survival rates than those for the maxilla.18

Immediate placement and loading of single implants placed in fresh extraction sites carried no risk of failure in the present cases.

The purpose of this article is to compare the parameters associated with the implant insertion torque for enhancing implant primary stability at implant insertion during immediate implant placement and to identify the relation between these parameters.

Literature review

The successful outcome of any implant procedure requires a series of the patient-related and procedure-dependent parameters.

- Insertion torque

A torque corresponds to the association of the cutting part of the tip of implant in the bone and to the friction between implant surface and the hole in the bone. It depends also on how sharp is the cutting tip of the implant, in the surface texture and design of the implant and on the blood supply. The diameter also plays an important role, since a narrow implant will have a lower torque.4

A study conducted by Turkyilmaz et al. showed a strong correlation between the primary stability and insertion torque values of Branemark system at the time of implant placement.5 An insertion torque should be around 30-40 Ncm in order to have good implant stability. An insertion torque less than 50 N/cm seems to significantly impair the immediate implant loading protocol by interfering with the primary stability.

- Implant stability quotient (ISQ)

Implant stability can be measured by non-invasive clinical test methods (insertion torque, periosteal, resonance frequency analysis (RFA)).14 RFA with Ostell instrument, has been introduced by Meredith and used in clinical studies. The resonance frequency analysis (RFA) calculates the stiffness of the bone and implant interfaces from a resonance frequency as a reaction to oscillation placed on the implant-bone system. A correlation between implant stability quotient (ISQ) and implant micromobility was established.15 The implant oscillation under a given transducer frequency is mainly dependent on the character of the implants bony fixation with the implant stability quotient (ISQ) as a unit of measurement and ranges with the increasing stiffness of the interface from 0 to 100 units.20

- Maxillary v/s Mandible anatomy

Anatomical site plays an important role in the success of the immediate implant placement and loading.

The bone in the maxilla is considered anatomically different than mandibular area. Therefore more risk of implants failure. It has been proven using CT tool that local bone density has a prevailing influence on primary implant stability which is important for implant success.21

It is well proven that the bone around the implant has better quantity and quality in the mandible than the maxilla.22

- Surgical procedure influence

Bone drilling is associated with the rise of temperature in the drilled site.23 Immediate implant placement will lower the extent of the treatment time and will prevent the rise of temperature

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Figure 1: Extra oral view of the right lateral incisor showing a traumatic occlusion.

Figure 2: A periapical radiograph showing a horizontal fracture of the root and a limited radiolucency in the apical area.

Figure 3: Implant placed more palatal and extended apically into periapical bone.
in the site by a minimal drilling technique.

Clinical cases
Case 1
A 54 years old man presented to our clinic with tenderness in the upper right lateral incisor area as a chief complain. Patient presented no significant health problems. The Extraoral examination showed a traumatic occlusion focused on the tooth (Figure 1). The intraoral examination showed tenderness on percussion and a mobility type II. Periapical radiograph showed a horizontal fracture of the root with limited radiolucency in the periapical area (Figure 2). A 4x11.5mm (Any Ridge Implant-Megagen) was placed (Figure 3) after conservative atraumatic removal of the lateral incisor tooth with a 30 N/cm insertion torque. Xenograft was placed buccally after the buccal hiatus proved to be more than 2mm (Figure 5), with implant stability quotient (ISQ) measured to be 75 (Figure 4). Having a high RFA (Resonance frequency analysis) an immediate provisional tooth was placed under occlusion (Figure 6, 7). Four months post operatively, the provisional crown was replaced by a permanent cemented restoration (Figure 8). Four months post operatively, the provisional crown was replaced by a permanent cemented restoration (Figure 8). Four months post operatively, the provisional crown was replaced by a permanent cemented restoration (Figure 8). Four months post operatively, the provisional crown was replaced by a permanent cemented restoration (Figure 8). Four months post operatively, the provisional crown was replaced by a permanent cemented restoration (Figure 8).

Case 2
A 38 years old woman consulted our clinic for evaluation of the upper left lateral incisor. The patient did not have any medical conditions and was not taking any medications that were associated with compromised healing response. An intraoral examination showed a traumatic occlusion focused on the tooth (Figure 1). The intraoral examination showed tenderness on percussion and a mobility type II. Periapical radiograph showed a horizontal fracture of the root with limited radiolucency in the periapical area (Figure 2). A 4x11.5mm (Any Ridge Implant-Megagen) was placed (Figure 3) after conservative atraumatic removal of the lateral incisor tooth with a 30 N/cm insertion torque. Xenograft was placed buccally after the buccal hiatus proved to be more than 2mm (Figure 5), with implant stability quotient (ISQ) measured to be 75 (Figure 4). Having a high RFA (Resonance frequency analysis) an immediate provisional tooth was placed under occlusion (Figure 6, 7). Four months post operatively, the provisional crown was replaced by a permanent cemented restoration (Figure 8). A two years follow up showed good results with no bone loss.
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A conservative extraction was planned followed by immediate implant placement. A (Nobel Biocare AB: Goteberg, Sweden) speedy implant of 3.5x11.5 mm (figure 11), was placed in anterior maxilla and restored within 24 hours period with a temporary crown (figure 12). The insertion torque was of 35 N/cm with an implant stability quotient (ISQ) of 72. The marginal void about 2mm wide was grafted with bovine xenograft bone. Selection of the abutment was done after evaluating the bony level and gingival thickness (Figure 13). After 4 months the final ceramic retained crown was placed and designed to receive an occlusal masticatory load (Figure 14, 15, 16). A 4 years follow up showed a very stable satisfactory results (Figure 17).

Discussion
The extended treatment period and the need for a provisional prosthesis during healing phase may seem inconvenient to certain patients.

Guidelines recommend 3 months of alveolar bone remodeling following teeth extraction. Still the original approach was modified to include immediate implant placement and immediate provisionalization. Immediate provisional crowns should only be proposed with early loading if an appropriate initial insertion torque has been applied.

On the other hand some researches on animal and human have shown that immediate implant placement into extraction sockets failed to prevent socket dimensional changes follow- ing tooth extraction. A minimal width of 1-2mm of buccal bone was found to be essential in order to maintain a vertical dimension of the alveolar crest.

The previous implants had to meet Albrektsson et Zarb success criteria to be regarded as successful. The RFA measurements were performed using Osstell instrument(Integration Diagnostics AB, Goteberg, Swe-
Rabih Abi Nader, DDS, Lebanon
MSc Oral Surg. and Implantology,
Dipl. Pathol. Oral.
rabar680@hotmail.com

Carine Tabarani, DDS, Lebanon
MSc Oral Surg. and Implantology,
Dipl. Pathol. Oral.
tabarani@hotmail.com

Contact Information
Rabih Abi Nader, DDS, Lebanon
MSc Oral Surg. and Implantology,
Dipl. Pathol. Oral.
rabar680@hotmail.com
Carine Tabarani, DDS, Lebanon
MSc Oral Surg. and Implantology,
Dipl. Pathol. Oral.
tabarani@hotmail.com

Figure 14: Periapical radiograph taken at the final examination.

Figure 15: The final crown was delivered after the temporary prosthesis was in function for four months.

Figure 16: Clinical photograph showing permanent prosthesis in function after four months of temporary provisional crown.

Figure 17: Four years follow up showing satisfying esthetic results.

Conclusion:
Given the two clinical cases, and considering the clinical evidence-based parameters, immediate provisional crowns should be proposed with immediate implant placement if they achieve appropriate initial insertion torque of 30 N/cm and stability quotient (ISQ) not less than 65. Immediate loading of implant-supported restorations replacing single missing teeth is considered a successful procedure. A significant correlation was found between bone density and implant stability parameters that indicates that clinicians may predict the primary stability before the final prosthesis is placed and they modify their treatment dependent on each relevant parameter.

References:

Editorial note:
The full list of references available from the publisher.