



Analysis of Soft and Hard Tissue Changes Following Immediate Implant Placement in the Esthetic Zone using Bone and Connective tissue grafting

<<A Comparative randomized clinical study>>

A Thesis

Submitted to the Faculty of Dentistry,
Ain Shams University

**In partial fulfilment of the requirements for master
degree in Oral and Maxillofacial Surgery**

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2020**

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Acknowledgment

I would like to express my deepest gratitude and appreciation to **Dr. Rehab Ahmed**, lecturer of Oral and Maxillofacial Surgery, Faculty of Dentistry, Misr International University, for her support, help and advice.

My sincere thanks to **Dr. Noha Taha**, Ass. Lecturer of Removal Prosthodontics, Faculty of Dentistry, Misr International University & **Dr. Sara Hossam**, Teaching assistant of Removal Prosthodontics, Faculty of Dentistry, Misr International University, for their cooperation and efforts.

Finally, I would like to express my deep thanks to all my colleagues and staff members of the Oral and Maxillofacial Department, Misr international university for their support, cooperation and help.

Dedication

To my mother and father for their everlasting support,
endless love and care.

To my beloved husband and son for their continuous
encouragement and support.

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List of Abbreviations

Abbreviation	Definition
AAOMR	American academy of oral and maxillofacial radiology
ABB	Anorganic bovine bone
ADA	American Dental Association
ASA	American society of anesthesiologists
CBCT	Cone beam computed tomography
GBR	Guided bone regeneration
PES	Pink Esthetic Score
SAC classification	S: straight forward A: advanced C: complex
WES	White Esthetic Score

Introduction

One of the most frustrating problems to the patient is the loss of one of his teeth especially in the anterior esthetic zone. This is not only frustrating for the patient but also it is one of the most aesthetically challenging cases to restore teeth in aesthetically sensitive zone. After tooth extraction, changes in the bone occur. Bone continues to resorb and remodel meaning that two thirds of this bone reduction occurs within the first three months after extraction and within one year approximately 50% of the ridge width is decreased.¹

The average vertical tissues loss that takes place at single extracted sites ranges from 1-4 mm varying according to the site. That's to say the rate of resorption is not the same in all cases being more pronounced in some cases more than others which is a physiological phenomenon that occurs at different rates and degrees.¹

Pietrokovski et al² conducted a study on 123 human edentulous dry bone specimens and found that bone resorption pattern differs in maxilla than in mandible. In maxilla, bone resorption occurs in centripetal and apical way meaning that bone resorption was overwhelmingly from the buccal surface of the extraction socket in comparison to significant less bone resorption from the palatal aspect of the socket.

On the other hand, resorption in the mandible was in a centrifugal and apical pattern leading to the formation of an edentulous crest central to the former tooth sockets. This difference in the pattern of the resorption produces a reverse horizontal overlap of the residual crests leading to a

change in the maxilla/mandible relationship.²These physiological hard and soft tissue changes that occur after extraction often make deformities in the alveolar ridge making ideal restoration with proper function and aesthetics is not an easy case .³

Therefore, the idea of immediate implant placement was created to decrease the time period between extraction and implant placement. Moreover, having the ability to place the implant in more ideal position, decreasing the number of surgical procedures, enhancing hard and soft tissue maintenance and having better psychological impact on the patient are considered as advantages of immediate implant placement.⁴

What supported the idea of immediate implant placement is that several studies showed successful osseointegration when implants were immediately placed after tooth extraction, with similar survival rates when compared to implants inserted in healed sites, with or without the help of guided bone regeneration procedures.⁴

Review of Literature

Dental implant is one of the most exciting and rapidly growing fields in dentistry. What is fascinating about the history of dental implants that the first implant design returns to the era of early Egyptians and south Americans cultures.⁵ Cranin⁶ suggested that the earliest recorded dental implant specimen was inserted during the pre-Columbian era. Progress in this field started to be recorded in the 1800s when a porcelain crown on a platinum shell with lead molded to a root form was created.⁵ In the late 1940s to 1960s⁵, more endosteal designs were created rapidly that a single helix wire spiral implant made of either stainless steel or tantalum was developed in 1947.

In 1986 Brenmark⁷ got the American Dental Association “ADA” acceptance on the endosteal implant design after extensive prospective studies. Traditionally dental implants were designed for healed extraction sockets but with better understanding of the biological principles of bone healing around dental implants, another principle was developed. Implant placement in fresh extraction sockets was tried with a high success rate reported and such implants were called immediate implants.⁵

In the Third International Team for Implantology Consensus Conference, three different basic protocols were defined based on the timing of implant placement. In the type-1 protocol implants were placed in fresh extractions sockets while in type -2 implants were placed after 4-8 weeks post extraction. The rationale behind this protocol was to ensure the absence of any infection or pathology and to provide time for that primary healing of soft tissues and possible lateral bone augmentation.⁸

Moreover, it enhances the availability of crestal bone for implant placement as part of the socket bone walls is still preserved within this short period of time. In type-3 protocol implants are inserted after 12-16 weeks where most of the dimensional changes in the alveolar bone had already taken place. That makes immediate implant placement an appealing option for many surgeons.⁸

In 1989 Lazzara⁹ was one of the initial surgeons to attempt placing the implant immediately after extraction aiming for better preservation of the alveolar architecture and shortening the treatment time. Studies on immediate implant started to develop. In 1997¹⁰ Gomez recorded a 98.84% five-year success rate for eighty-three implants placed in fresh extraction sockets. Another prospective study made by Grunder in 1999¹¹ reported the success rates of immediate implants. Decreasing in rehabilitation treatment time is one of the major advantages of immediate implants in addition to other advantages as better psychological impact on the patient, less number of surgeries and enhanced preservation of hard and soft tissues.⁴

A systematic review of randomized controlled trials published in 2010 by Esposito et al¹² found that immediately placed implants are associated with better outcomes in terms of aesthetics and patient acceptance compared to the conventionally placed implants. Although prevention of changes in bone dimensions was considered one of the advantages of immediate implant placement, recent studies⁸ failed to prove that. It was hypothesized that placing implants immediately in fresh

extraction sockets may prevent dimensional changes that happens routinely after tooth extraction.¹³

Unfortunately, the subsequent animal and human clinical trials¹³ fail to prove that and major alveolar changes were found for immediate implants after 3-4 months healing period. It was clarified that changes in the alveolar ridge occurs independently of the timing of implant placement. Moreover, significant changes in buccal bone in both apico-coronal and bucco-palatal dimensions occur in fresh extraction sockets which could reach up to 56% .¹⁴⁻¹⁶

There are three main types of blood supply to the buccal bone which are the periodontal ligament, the periosteum and the endosseous marrow. When the tooth is extracted, the periodontal ligament blood supply is lost and only the two other nourishment sources remain. Moreover, the cortical bone is poorly vascularized in comparison to the medullary bone and if a flap is elevated then the second blood supply is lost even if the flap is immediately repositioned till the reanastomosis with the vessels flap occurs.¹⁷⁻¹⁸

In addition to that, it was found that labial bone plate thickness in maxillary anterior region is 1 mm or less in about 90% of the patients and is made mainly of cortical bone rather than medullary bone which leads to more critical bone remodelling of the buccal bone and make it more prone to marked resorption.¹⁹ Due to all these facts implant placement without raising flap is an attractive alternative to minimize buccal bone resorption, preserve blood supply and maintain soft tissue aesthetics around implants. Careful planning is the key for the success of immediate implant

placement. These include initial primary stability, osseointegration and proper aesthetics.²⁰

Immediate implants were classified according to the bone and soft tissue levels of the potential site at extraction time into four classes (table 1). Class I: where the buccal bone is present and the gingiva biotype is thick. Immediate implant placement without raising a flap is a viable option in this situation. Class II where buccal bone is intact but with a thin gingiva biotype. Flawless implant placement is viable but together with connective tissue graft.²¹

In class III, buccal bone is lost where the implant is still can be placed with the remaining alveolar housing of the socket. In this case using guide bone regeneration to provide the necessary bone support is essential with simultaneous connective tissue graft placement. According to the degree of buccal bone compromise, staged approach may be chosen meaning that bone augmentation procedures are done first followed by implant placement especially in thin gingiva biotype cases as this gives more predictable outcomes. Finally, class IV where the buccal bone is severely compromised leading to placing the implant off axis in order to anchor the remaining palate bone. This will lead severe compromise in aesthetics. In this case bone and soft tissue augmentation with delayed implant placement is preferred.²¹