The Effect of Injectable PRF Mixed with Composite Bone Graft in Immediate Implant Placement; Randomized Clinical Trial

Thesis

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Dedication

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List of Abbreviations

Abb.	Full term

ABB ..... Anorganic Bovine Bone
ALP ..... Alkaline Phosphatase
A-PRF ..... Advanced Platelet Rich Fibrin
ASA ..... American Association of Anesthesiologists
BCP ..... Biphasic Calcium Phosphate
BIC ..... Bone To Implant Contact
BMP ..... Bone Morphogenic Protein
BPBM ..... Bovine Porous Bone Mineral
CAL ..... Clinical Attachment Loss
CaP ..... Calcium Phosphate
CBCT ..... Cone Beam Computed Tomography
CHA ..... Carbonate Hydroxyapatite
DBBM ..... Deproteinized Bovine Bone Mineral
EGF ..... Epidermal Growth Factor
FDBA ..... Freeze-Dried Bone Allograft
FDP ..... Fibrinogen Degradation Products
FGF ..... Fibroblast Growth Factor
GB ..... Gingival Biotype
GBR ..... Guided Bone Regeneration
GF ..... Growth Factors
GTR ..... Guided Tissue Regeneration
HA ..... Hydroxyapatite
HDD ..... Horizontal defect dimension
HEMA ..... Hydroxyethylmethacrylate
HG ..... Horizontal Gap
HGF ..... Hepatocyte Growth Factor
HU ..... Hounsfield unit
IGF ..... Insulin-like Growth Factor
IIP ..... Immediate Implant Placement

List of Abbreviations (Cont...)

Abb.	Full term
i-PRF	*Injectable Platelet Rich Fibrin*
LBP	*Labial Bone Plate*
MMP-8	*Matrix Metalloproteinase's -8*
MMP-9	*Matrix Metalloproteinase's -9*
MSCs	*Mesenchymal Stem Cells*
NBR	*Natural Bone Regeneration*
OFD	*Open Flap Debridement*
PC	*Platelet concentrates*
PDGF	*Platelet-Derived Growth Factor*
PES	*Pink esthetic score*
PMMA	*Polymethylmethacrylate*
PPD	*Probing Pocket Depths*
PRF	*Platelet Rich Fibrin*
PRGF	*Platelet Rich in Growth Factors*
PRP	*Platelet rich Plasma*
SBS	*Synthetic Bone Substitute*
TGF	*Transforming Growth Factor*
T-PRF	*Titanium Platelet Rich Fibrin*
VEGF	*Vascular Endothelial Growth Factor*
α-TCP	*Alpha Tricalcium Phosphate*
β-TCP	*Beta Tricalcium Phosphate*

INTRODUCTION

Wound healing in post extraction socket is a distinctive process as resorption follows which may lead to many prosthetic difficulties regarding the replacement of a tooth. Extraction socket is characterized by marked bone loss of the socket bony wall in the horizontal plane, which is also escorted by loss of vertical height, the majority of this bone loss occurs during the first year after extraction, and one third of this total bone loss occurs during the first three months. For this reason, applying socket augmentation to preserve the socket immediately after tooth extraction is recommended and has a great result on the functional and aesthetic outcomes ***(Guglielmotti, 1985; Cardaropoli et al.,, 2003; Hayacibara et al.,, 2005; Trombelli et al.,, 2008; Clementini, 2013).***

Immediate implant placement in the post extraction socket has given implant dentistry the opportunity to ascertain preferable and faster functional results, this approach is a routine surgical procedure that has been utilized since 1980s**.** Immediate implant placement is referred to the placement of an implant into a tooth socket concurrently with the extraction. With this procedure the number of surgical procedures a patient would undergo are markedly reduced as well as the overall treatment time as the socket healing and implant osseointegration occur concurrently ***(Wagenberg and Ginsburg, 2001; Chen et al.,, 2009; Khzam et al.,, 2015).***

Many recent studies have focused on treatment outcome of implant therapy performed in the esthetic zone. Placement of dental implant in the esthetic zone is a technique sensitive procedure with little room of error. Yet

challenge remains in many cases. Inadequate bone availability for implant placement and optimal esthetic outcomes are common issue facing clinicians. However, immediate implant with certain cases cannot be placed and hard and/or soft tissue augmentation is required first so that optimum aesthetics can be achieved ***(Al-Sabbagh 2006; Jivraj and Chee, 2006).***

One of the problems that might be encountered with immediate implantation is the unpredictable aesthetic outcome. The residual labial bone plate (LBP), although it might be present and intact at the time of tooth extraction, will be subjected to bone remodeling whose ultimate outcome is difficult to portend because of the great individual variability. This can result, in some instances to a poor aesthetic outcome which is of a great concern for some patients. To overcome such problem, special attention should be paid to the horizontal gap that might exist between the implant and the bony socket walls. A lot of studies have showed that filling of the gap with bone substitutes might modify the pattern of hard tissue modeling ***(Pietrokovski and Massler, 1967; Quirynen et al.,, 2007; Qahash et al.,, 2008; Barone et al.,, 2011; Bashara et al.,, 2012; Degidi et al.,, 2012).***

To promote tissue regeneration growth factors have been used as therapeutic agent because of their expression during different phases of tissue healing. The osseointegration of dental implant can be improved and accelerated by increasing the regenerative capacity of surrounding tissues with appropriate stimuli ***(Anitua et al.,, 2006; DuRaine et al.,, 2011).***

In 1972 fibrin glue had been used for nerve repair. This glue depended on concentration source of human fibrinogen. In 1980s was found the importance of platelet as a source of autologous growth factors

that stimulate angiogenesis, collagen synthesis and cell migration and proliferation. For long time it has been known that fibrin clot and platelets have haemostatic and tissue repairing effect ***(Knighton et al. 1986; Marx et al. 1998; Ness 1990).***

Whitman et al., described autologous concentration of human platelets contained in small volume of plasma called, Platelet-rich plasma (PRP), platelet-rich concentrate and autologous platelet gel which consequently had been used instead of fibrin glue ***(Whitman et al.,, 1997).*** A minor variation of PRP was developed by ***Anitua et al., in 1999*** which have no white blood cells and completely autologous called Plasma rich in growth factor (PRGF) ***(Anitua et al.,, 1999).***

A second-generation platelet concentrate has been developed in France by ***Choukroun*** called Platelet Rich Fibrin (PRF). This technique requires neither anticoagulant nor bovine thrombin compared to cPRP (concentrated Platelet-rich plasma) ***(Dohan et al.,, 2006).*** Recently a new protocol has been developed by Choukroun during the Syfac (International Symposium on Growth Factors) meeting in Paris, injectable Platelet rich fibrin (i-PRF) a liquid and injectable with no anticoagulant neither an additive ***(Choukroun, 2014).***

This study focused upon the effect of i-PRF when mixed with bone graft on the buccal bone plate thickness around immediate implant placement.