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Alveolar ridge preservation by ((synthetic bone substitute and bovine-derived xenograft)) with guided bone regeneration: a randomized histological study

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Abstract

Background: Alveolar ridge resorption has long been considered an unavoidable consequence of tooth extraction. Guided bone regeneration techniques and the use of bone replacement materials have both been shown to enhance socket healing and to potentially modify the resorption process. alveolar ridge preservation procedure was introduced which aims to preserve the height of alveolar bone for multiple function like implant installation and prosthetic function and etc... This requires atraumatic teeth extraction and freshly immediate grafting to extracted socket. various alveolar ridge preservation material has been utilized like alloplastic and xenograft material was used as graft biomaterial to serve as a scaffolding for new bone generation. Histophotometric and 2D histological analysis was recommended for post grafting assessment in teeth extracted area.

Aim of study: The aim of ridge preservation procedures, is to prevent alveolar ridge atrophy and maintain adequate dimensions of bone in order to facilitate implant placement in prosthetically driven positions or to maintain an acceptable ridge contour in areas of aesthetic concern. This randomized, clinical trial compared the healing effect and the potential of a synthetic bone substitute (OSTEON III)® and a bovine-derived xenograft (BIGOSS)®, both in combination with a collagen barrier (GENOSS) according to the GBR principle by histological and histomorphometric analysis parameter, in the incisor, canine and bicuspid areas (except molar region), after 24 weeks postoperatively.

Materials and methods: This study conducted between from April 2018 to December 2018, included 20 healthy eligible patients (20 teeth extracted case) with age ranged from 21-61 years with nonrestorable tooth indicated for extraction and simultaneous bone grafting material placement.

Following preoperative clinical and radiographical evaluation, those patients underwent alveolar ridge preservation with the aid of bone grafting material and collagen barrier membrane with either alloplastic bone grafting material (OSTEON III) ® in 10 cases (group A) and xenograft bone grafting material (BIGOSS) ® in 10 cases (group B), and collagen barrier membrane for both group (GENOSS). the harvested bone was taken after 24 weeks postoperatively by trephination procedure for all 20 cases and then the histomorphometric method was adaptation of the point counting procedure for both group to measure the total difference of new bone formation (bone gain) area and connective tissue area and residual graft area between two group.

Result: The twenty consecutive patients with mean age for group A was (32.9) and for group B (36.6). years involved in this study were divided equally for allograft and xenograft bone placement protocol. No significant correlation was observed between age of patients and histological outcome. A mean of volumetric measures of newly formed bone with group (A) on histological slide was (19.98±3.15%) . and volumetric measure of residual graft percentage was higher (35.46±4.65%). and Mean (±SD) of bone marrow area (as percentage) was (22.09±6.28%). While volumetric measures of newly formed bone with group (B) on histological slide was (38.18 ± 5.36%). highly significant bone gains in the group (B) That's mean the osteoconductivity was evident according to promotion of bone growth and intimate integration of newly formed bone. The p value here refers to significance of osteoblastic activity and its superiority in comparison with group (B). While volumetric measure of residual graft percentage was lower ($P<0.01$), (19.59±2.29%). Mean (±SD) of bone marrow area for group (B) was (18.23±2.21). No major complications were reported.

Conclusion: With in the limitation of this short term clinical study, BIGOSIS xenografting bovine bone grafting material are an appropriate biocompatible bone derivative in fresh extraction sockets for alveolar ridge preservation with highly significant in newly formed bone could be considered as an alternative reasonable grafting material with comparable outcomes to (osteon III) ® with less postoperative complication. The resorbablity and remodeling of xenografting material could not be recognize completely in a 24 weeks' period. Further investigation is needed to clarify the resorptive mechanism of both materials with long period of time.