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Bone changes in ridge split with immediate implant placement: A systematic review

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ABSTRACT

Introduction: Alveolar width deficiency represents loss of buccal cortical or/and medullary bone. Deficiency of the buccal represents significant difficulty in implant reconstruction. A variety of implant-driven bone augmentation techniques for the deficient alveolar bone have been proposed. Alveolar ridge split is an excellent tool for regaining alveolar ridge width.

Material and method: Publications on the subject in English were searched to select articles up to June 2015. A systematic review was conducted searching an electronic database (MEDLINE, Pub-Med and Cochran) for articles in pre-reviewed journals concerning studies on humans. Two independent reviewers screened 815 papers.

Result: A consensus on the studies to be selected was reached after discussion; 804 articles were excluded on the basis of the title and abstract. Kappa score for the selection of the paper was 0.89. Full-text articles were obtained for the 11 selected publications. The 11 full texts were independently assessed by the two reviewers and 3 studies were found to qualify for inclusion.

Conclusion: Alveolar ridge splitting might be considered a predictable approach that demonstrates a high implant survival rate, adequate horizontal bone gain and minimal post-operative complications. Weak evidence showed the effect of flap design and immediate implantation on marginal bone loss and survival rate.

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1. Introduction

Atrophic maxilla or mandible can lead to lack of prosthesis retention because of an inadequate bearing area causing both functional and physiological problems for patient, these problems can be treated for patient satisfaction with an implant supported fixed or removable complete or partial

denture. Atrophic edentulous jaws can represent a significant challenge to the successful use of endosseous implants for prosthetic reconstruction of the edentulous mandible [1,2].

An implant must be surrounded by at least 1 mm of cortical bone in buccal and lingual sides; if the alveolar ridge is narrower than 5 mm, it is difficult to insert an implant to replace posterior teeth [3,4].

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Alveolar ridge volume reduction is a direct consequence of tooth loss [5,6]. This dimensional change occurs mainly at the expense of bone remodeling [7,8]. The limited amount of remaining bone volume may compromise conventional implant placement and, subsequently, the functional and esthetic rehabilitation of the edentulous span.

Bone collapse after tooth loss in a horizontal and vertical direction, the horizontal deficiency or bone width loss develops in a larger extent [9,10]. Alveolar width deficiency represents loss of buccal (labial) cortical or medullary bone, or both. Deficiency of the buccal cortex (cortical plate) after tooth extraction can present significant difficulty in implant reconstruction [11,12]. The buccal cortical plate with a thickness < 2 mm next to an implant appears to have a higher risk of subsequent resorption [13].

A variety of implant-driven bone augmentation techniques for the deficient alveolar bone have been proposed [14,15]. Four of these techniques are frequently performed: (1) guided bone regeneration (GBR)/particulate bone grafting; [16,17] (2) onlay (veneer) block bone grafting with intraoral sources, such as chin, ramus, posterior mandible, zygomatic buttress, and maxillary tuberosity; [18–20] (3) ridge split; [21–23] and (4) alveolar distraction osteogenesis [24]. These techniques are designed to improve horizontal bone loss before or simultaneously with dental implant placement.

Ridge splitting can be performed by splitting the cortical plate and further opening the space between the tables with Summers's osteotomes [25]. This creates room for implant placement with sufficient surrounding bone.

Splitting can be performed with chisels and hammers [26] or with rotating [27] or oscillating saws [28]. The use of bone chisel can cause trauma and stress to the patient. Fine tuning of the splitting is difficult when the crest is dense, especially in the mandible [29]. Ultrasonic bone surgery (USBS) represents a

valid alternative to this procedure [30]. The principle of USBS consists of inducing energetic micro-vibrations with an ultrasonic of 20–32 kHz frequency.

2. Material and method

Publications on the subject in English were searched to select articles up to June 2015. A systematic review was conducted searching an electronic database (MEDLINE, Pub- Med and Cochran) for articles published in English in pre reviewed journals concerning studies on humans.

The key words used were [(Dental implant) OR (Dental implants) OR (Implant) OR (Implant placement) OR (Implantation) OR (Dental implantology AND Narrow ridges) OR (Thin ridge AND Horizontal Ridge augmentation) OR (Ridge alteration) OR (Ridge split) OR (ridge splitting) OR (Split crest techniques) OR (Alveolar ridge split) OR (Alveolar ridge splitting) OR (Ridge split techniques) OR (Ridge splitting) OR (Split crest) OR (Ridge splitting techniques) OR (Ridge splitting technique)].

The following journals were hand searched: Clinical Oral Implants Research, International Journal of Periodontics and Restorative Dentistry, Journal of Periodontology, Journal of Clinical Periodontology and International Journal of Oral and Maxillofacial Implants, Journal of Prosthetic dentistry, Journal of Prosthodontics, Journal of Oral Rehabilitations. Moreover, the bibliographies of the selected articles and relevant reviews were thoroughly screened.

2.1. Inclusion criteria

- Randomized Control Trials (RCT) or retrospective studies on ridge splitting

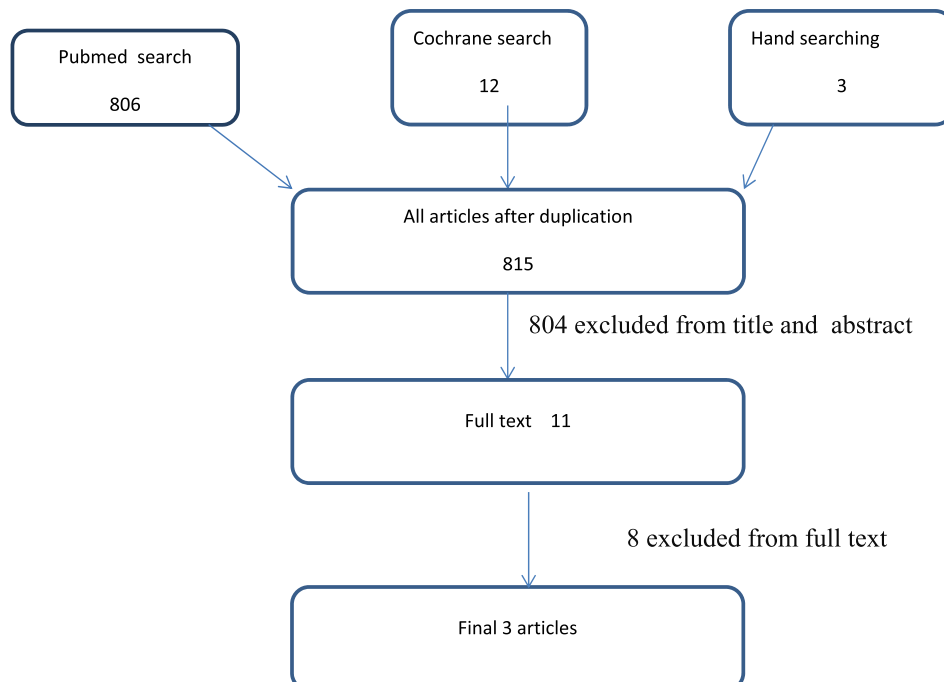


Fig. 1 – Prisma chart of exclusion criteria.

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