

Preservation of alveolar ridge in the maxillary esthetic zone using R.T.R. Cone[®] and Hemocollagen[®]

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Introduction

Timing of placement implant in the esthetic zone is closely related to the reduction of risk of esthetic complications and obtaining the primary implant stability in the 3D implant position. Following tooth extraction implant can be placed immediately, then early, with soft tissue healing and partial bone consideration, or after completed bone healing and remodeling of alveolar ridge.

Although the late implant placement can obtain initial stability of implants and adequate structure and quality of residual bone, early implant placement is determined with increased level of cellular osteogenic activities inside the socket walls with a soft tissue healing that can provide the adequate volume and counter of soft tissue with enough keratinized gingiva of esthetic zone. On the other hand, timing of immediate implant placement is followed with strict indications depending of alveolar socket morphology and possibility of resulting in primary implant stability. However, all of timing protocols for implant placements are characterized by a greater or lesser extent of slight flattening to significant resorption of socket walls requiring contour augmentation

using bone substitutes (Buser et al. 2007, Chen, Buser 2008).

Beta tricalcium-phosphate (betaTCP) has a composition and structure very close to natural bone which ensure osteoconductive and biodegradable effect. BetaTCP can promote osteoblast differentiation and proliferation which is increase in a combination with the type I collagen because of a biocompatibility with variety of human cells and proteins in a process of bone healing (Ormianer et al. 2006, Yang et al. 2013). The bioactivity of betaTCP and type I collagen (R.T.R. Cone[®], Septodont, France) has been confirmed in previous clinical, in vitro and in vivo studies (Brkovic et al. 2008, 2012, Schwartz et al. 2007, Zou et al. 2005).

Preservation al alveolar ridge immediately after tooth extraction may provide reliable support to maintain the initial volume and morphology of bone and soft tissue in the esthetic zone (Vignoletti et al. 2012). This procedure is a less invasive procedure of augmentation of alveolar ridge which change a structural architecture of the regenerate bone inside the socket and

to minimize the absorption of external tissue. Therefore, the preservation of alveolar ridge volume is essential to achieving a successful and esthetically-driven implant prosthodontic rehabilitation in esthetic zone.

Since there is no data showing the effect of a composition of betaTCP and type I collagen (betaTCP/Clg) in the maxillary esthetic zone

used for the preservation of alveolar ridge immediately after tooth extraction and for stabilization of the alveolar soft tissue with collagen sponge of bovine origin at the same preservation sites, the aim of this report was to point out surgical steps, characteristic of method and positive results of bone and soft tissue regeneration.

Report of case (surgical steps and results)

A 45-year old healthy women was presented for implant placement in the maxillary esthetic zone at the position of #11, #12 with a periodontal disease (*Fig. 1*). Minimal invasive tooth extraction was done with subsequent curettage of granulation tissue and debridement of post-extraction sockets. After teeth extraction, exploration of post-extraction socket walls showed 4-walls defect of central incisor and 2-walls defect of lateral incisor with associated reduction of crestal bone walls as a result of periodontal disease (*Fig. 2*).

After minimal invasive extraction of teeth, debridement of socket walls was done regarding peri-radicular granulation tissue. Two blocks of R.T.R. Cone[®] were trimmed to fit properly to socket walls using surgical knife or scissor (*Fig. 5*). Particles of trimmed cones were combining with solid form of cones were leave inside the sockets and in contact with mucoperiosteal tissue were periodontal disease destroyed socket wall bones (*Fig. 3*). R.T.R. Cone[®] was positioned to the level of the most crestal marginal bone (*Fig. 4*). Regarding the absence of buccal bone wall and



Fig. 1: Periodontal disease - indication for extraction

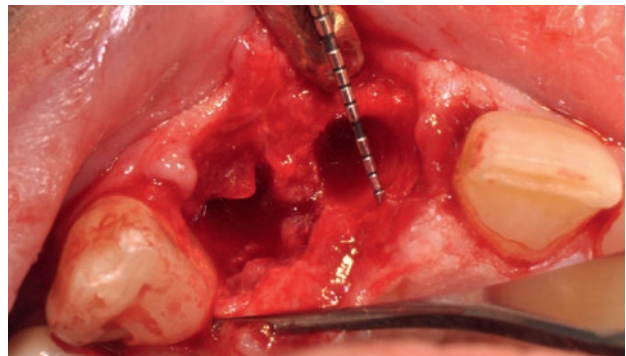


Fig. 2: Postextraction sockets with socket wall deficiency



Fig. 3: R.T.R. Cone insertion for preservation of alveolar ridge in the maxillary esthetic zone

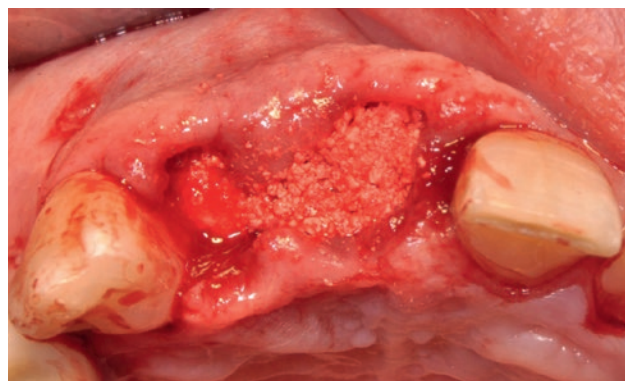


Fig. 4: R.T.R. Cone inside the socket walls

reduction of crestal bone the filled sockets were covered with sponge collagen (Hemocollagen®, Septodont, France) prepared for this indication. The collagen block was separated in two pieces with a sterile scissor and then modified by finger pressure to the form of one-layer membrane. One side of hemocollagen membrane was positioned under the buccal while other side under the palatal attached gingiva which were previously elevated for surgical exploration of sockets. Material and gingiva were secured with interrupted sutures for 7 days leaving the central part which corresponds with socket opening, to healing spontaneously (Fig. 6). The process of epithelization of the external surface of hemocollagen membrane was taken approximately 20 days of healing what was accepted tie for clinical intraoral socket healing. During that period no side effects were recorded. After 4 months of regeneration, the preserved site was open and explored for implant insertion (AstraTech TX Implant System) (Fig. 7-11).



Fig. 5: Preparation of R.T.R. Cone and Haemocollagen

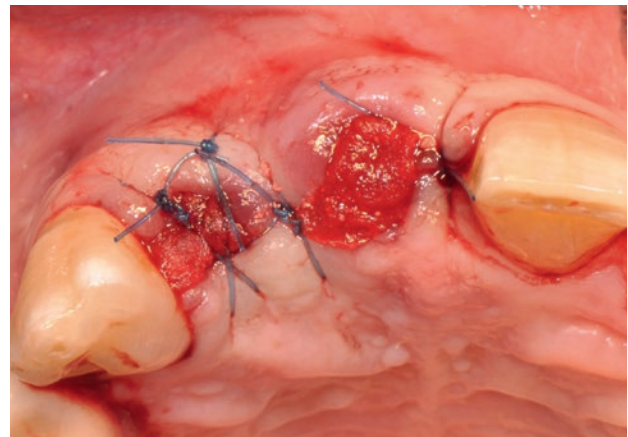


Fig. 6: R.T.R. Cone and haemocollagen secured with sutures



Fig. 7: Preservation of alveolar ridge after 4 months

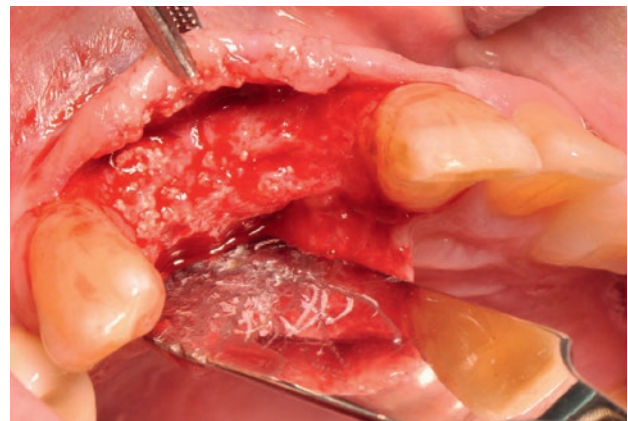


Fig. 8: Preserved surgical site before implant placement, 4 months of healing

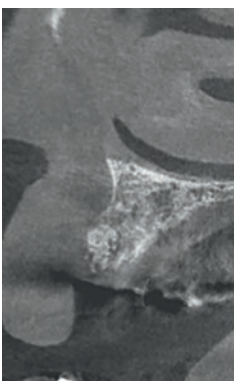


Fig. 9: CBCT view of 4 months healing

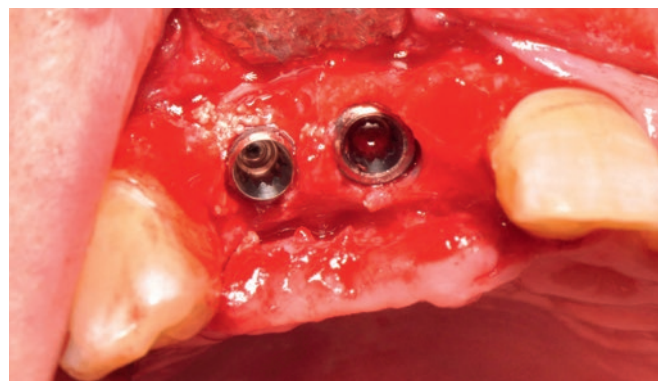


Fig. 10: Implants AstraTech TX placement in the preserved sockets



Fig. 11: Radiography of inserted implants

Discussion

The placement of implants in the anterior maxilla has been a major challenge to surgeon due to insufficient bone volume in the maxillary esthetic zone as a result of expected physiological bone remodeling.

Different studies have shown that the anterior maxillary sites after tooth extraction have a high risk for bone remodeling and consequent reduction due to thin and vulnerable buccal bone walls (Morjaria et al. 2014). It has been demonstrated that the most sites in the esthetic zone have a less than 1 mm of buccal bone wall thickness, while almost 50% of sites have a thickens less than 0.5 mm (Januario et al. 2011). Furthermore, sites in the esthetic zone undergo significant vertical reduction within 8 weeks of healing with a thickness of buccal bone wall less of 1 mm, as shown in the CBCT analysis (Chappuis et al. 2013). Another interesting outcome is documented in the retrospective study of Lee and Poon (2016) reported that a secondary augmentation in the esthetic zone was less after preservation of alveolar ridge, than after spontaneous post-extraction socket healing. These facts are of special concern especially when tooth extractions are related with periodontal disease where is objectively expected to have initial reduction of residual bone in both width and height. Most usually that condition is treated prior to horizontal and vertical augmentation including the principle of guided bone regeneration than with preservation method.

The use of betaTCP with collagen type I for preservation of alveolar ridge is now a standard method with promising results. It has been shown that healing of post-extraction sockets resulted in approximately 42% of new bone and marrow bone with 10% of residual graft,

during the healing period of 9 months (Brkovic et al. 2012). The chemical composition of betaTCP has an influence in the enhancement of mineralization due to a local increase in a concentration of Na and phosphate ions directly stimulated osteoblast activity (Zerbo et al 2005). Similar histomorphometric results of new bone formation were reported by Szabo et al. (2005) using betaTCP in patients undergoing sinus floor augmentation in period of 6 months of healing. In the same surgical model of sinus lift procedure, Perieira et al. (2017) recently reported similar amount of new bone formation after betaTCP alone or in combination with autogenous bone (approximately 45%) with positive immunostaining of bone samples demonstrated high cellular activity for both materials. Regarding the stability of grafted area, de O. Gorla et al (2015) have shown that betaTCP alone or in combination with autogenous bone presented satisfactory results for maxillary sinus lifting procedure regarding the maintenance of graft volume during the healing phase before the insertion of implants, as assessed by means of CBCT.

One of the important results which have to be underlined is the effects of collagen not only as a composite of betaTCP in R.T.R. Cone® but also as a material for socket healing stabilization in a form of Hemocollagen® sponge. Namely, the use of type I collagen, clinically may cover and, in direct contact with blood clot, bond the socket opening what will secure particles of material during early phase of healing. From the standpoint of biology, addition usage of type I collagen may decrease time for collagen development, stimulate precursor cells, increase osteoblast activity and increase of quality of regeneration (Zou et al 2005).

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