

## Bone formation in extraction sockets augmented with Bio-Oss Collagen after a healing period of 6 weeks

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**Introduction**

After tooth extraction, the alveolar ridge will commonly decrease in volume and change morphologically. These changes are usually clinically significant and can make placement of a conventional bridge or an implant-supported crown difficult. If bone resorption is significant enough, then placement of an implant may become extremely challenging. Postextraction maintenance of the alveolar ridge minimizes residual ridge resorption and, thus, allows placement of an implant that satisfies esthetic and functional criteria. Recent advances in bone grafting materials and techniques allow the dentist to place implants in sites that were considered compromised in the past. This study focuses on the bone formation of sockets augmented with Bio-Oss Collagen after a healing period of 6 weeks.

**Material and Methods**

Ten patients, 1 male and 9 female, with an average age of 52 years (range 46-65 years) and representing 18 extraction sockets were included in this study. In all patients the walls of the extraction sockets were intact and Bio-Oss Collagen (Geistlich, Switzerland) was applied. Primary closure of the socket or the application of a membrane was not performed. After a 6-weeks healing period, at time of implant placement, bone biopsy specimens (length 4-8 mm) were taken using a trephine bur ( $\square$  2mm). The bone specimens were fixed in 4% formalin for 2 days and then decalcified in 17% nitric acid. After processing (Thermoshandon, Lifescience, Pathcenter), tissues were embedded in paraffin. Serial sections 5 $\mu$ m thick were prepared and stained with Toluidine blue and Masson's trichrome. A mean of 2 sections were obtained from each specimen. The sections were photomicrographed using a Zeiss AxioPhot I equipped with a digital camera (MC-5). For the qualitative and morphological analysis of the remodeling process, the stained preparations were examined under a light microscope (AxioPhot I) at a magnification of up to x 100. The amount of bone, trabeculae, fibrous and fatty tissue was calculated using a millimeter eyepiece in a binocular microscope at 40x10 magnification by a single observer who was unaware of the clinical data and using AXIO VISION. The percentage of each type of tissue (new bone, necrotic bone, graft material) in every section was calculated by taking the cross-sectional area of each type of tissue and dividing it by the cross-sectional area of the whole section.

**Results**

In ten patients (6 male/4 female) a total of 18 implants (11 Camlog Rootline, Winsheim, Germany; 7 Wital, Pforzheim, Germany) were successfully inserted 6 weeks after augmentation. Six extraction sites were located in the molar region (2 mandible/4 maxilla) and 12 in the anterior region (4 mandible/8 maxilla). Biopsy specimens of the autologous bone site showed 46.6 % (range 35-59%) newly formed bone, 19.4% (range 11-25%) fibrous tissue and 34% (range 28-40%) Bio-Oss remnants (Fig 1). Newly formed bone was found in all extraction sockets regardless of their location within the jaw, showing a close contact of woven bone with the bovine bone mineral in the histologic specimens (Fig. 2).

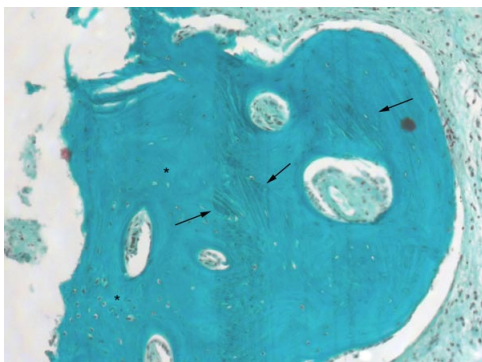


Fig. 1: Histologic specimen showing the formation of new bone around Bio-Oss particle (Masson Trichrome, x10)

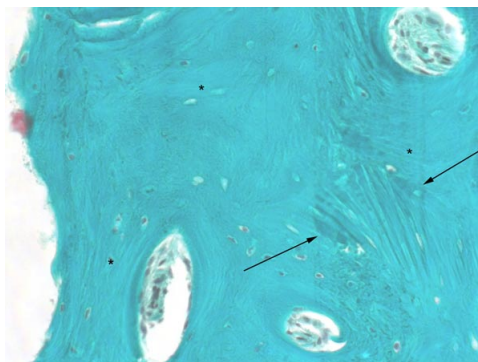


Fig. 2: Intimate contact of the woven bone(\*) with the bovine bone mineral (Masson trichrome, x20)

**Conclusions**

The findings in this study show a similar rate of new bone formation as in the study of Lindhe et al. in extraction sockets in canines after 12 weeks. These preliminary results indicate a high rate of new bone formation in the extraction sockets after a 6-week healing period allowing the supposition that it might be advantageous to place the implant during this period of high-bone formation to prevent the onset of bone resorption described in the study of Lindhe et al. The process of osseointegration of the implant is known to increase bone density as a result of the stimulation of the remodeling process in the bone. This has been described as the regional acceleratory phenomenon (RAP). It is known that woven bone needs mechanical loads to be replaced on BMU (basic molecular unit) based remodeling by lamellar bone. The healing process following tooth removal results in pronounced remodeling and resorption of tissues within a period of 4-8 weeks. These processes seem to be more pronounced during the initial phase of healing. Whether this phenomena can be übertragen in the human extraction socket is currently subject of an ongoing clinical study.

This Poster was submitted by *Dr. Katja Nelson*.

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#### Poster Faksimile:

## Bone formation in extraction sockets augmented with Bio-Oss Collagen after a healing period of 6 weeks

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**Abstract:** In this present study new bone formation of fresh extraction socket after augmentation with Bio-Oss Collagen was analyzed after a healing period of 6 weeks using histomorphometry. **Material and methods:** Ten patients, referred for extraction of decayed teeth of all regions, were included in this study. The extraction sockets were instrumented to eliminate all remnants of periodontal ligament tissue and showed no defect in extraction site. Each socket was grafted with Bio-Oss Collagen without flap management. After a 6 weeks healing period, at implant placement, bone biopsy samples were obtained with a trephine bur and evaluated histomorphometrically, using Masson's trichrome and Toluidine staining. Quantification of new bone formation and BioOss-remnants was performed using a digital imaging system (AxioVision, Zeiss, Germany). **Results and discussion:** The values found for new bone formation ranged from 25%-59% and 34% for remaining BioOss-particles. This is comparable to the findings of studies with healing period of 12 weeks in canines. These results encouraged an early onset implantation after healing period of six weeks. The long-term success and survival rate of these implants will be the subject of future investigation.

#### Introduction

After tooth extraction, the alveolar ridge will commonly decrease in volume and change morphologically. These changes are usually clinically significant and can make placement of a conventional bridge or an implant-supported crown difficult. If bone resorption is significant enough, then placement of an implant may become extremely challenging. Postextraction maintenance of the alveolar ridge minimizes residual ridge resorption and, thus, allows placement of an implant that satisfies esthetic and functional criteria. Recent advances in bone grafting materials and techniques allow the dentist to place implants in sites that were considered compromised in the past. This study focuses on the bone formation of sockets augmented with Bio-Oss Collagen after a healing period of 6 weeks.

#### Material and Methods

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#### Results and Discussion

In ten patients (6 male/4 female) a total of 18 implants (11 Camlog Rootline, Wunsheim, Germany; 7 Wital, Pforzheim, Germany) were successfully inserted 6 weeks after augmentation. Six extraction sites were located in the molar region (2 mandible/4 maxilla) and 12 in the anterior region (4 mandible/8 maxilla). Biopsy specimens of the autologous bone site showed 46.6 % (range 35-59%) newly formed bone, 19.4% (range 11-25%) fibrous tissue and 34% (range 28-40%) Bio-Oss remnants (Fig 1). Newly formed bone was found in all extraction sockets regardless of their location within the jaw, showing a close contact of woven bone with the bovine bone mineral in the histologic specimens (Fig. 2). The findings in this study show a similar rate of new bone formation as in the study of Lindhe et al. in extraction sockets in canines after 12 weeks.

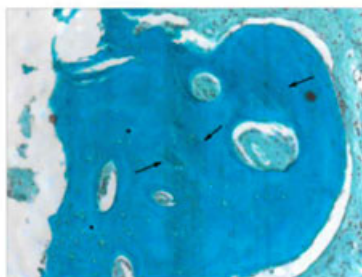


Fig. 1 Histologic specimen showing the formation of new bone around Bio-Oss particle (Masson trichrome, x10).

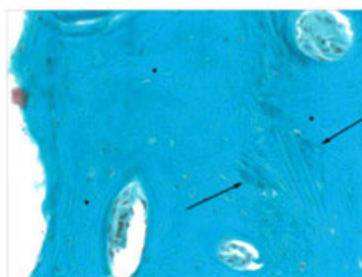


Fig. 2 Intimate contact of the woven bone (\*) with the bovine bone mineral (---) (Masson trichrome, x20).

These preliminary results indicate a high rate of new bone formation in the extraction sockets after a 6-week healing period allowing the supposition that it might be advantageous to place the implant during this period of high-bone formation to prevent the onset of bone resorption described in the study of Lindhe et al. The process of osseointegration of the implant is known to increase bone density as a result of the stimulation of the remodeling process in the bone. This has been described as the regional acceleratory phenomenon (RAP). It is known that woven bone needs mechanical loads to be replaced on BMU (basic molecular unit) based remodeling by lamellar bone. The healing process following tooth removal results in pronounced remodeling and resorption of tissues within a period of 4-8 weeks. These processes seem to be more pronounced during the initial phase of healing. Whether this phenomenon can be transferred in the human extraction socket is currently subject of an ongoing clinical study.