ISSN 1806 - 8324

Volume 25 • Supplement 1
September • 2011

Brazilian Oral Research

Official Journal of the SBPqO - Sociedade Brasileira de Pesquisa Odontológica (Brazilian Division of the IADR)

HISTOMORPHOMETRIC ANALYSIS OF THE REPAIR PROCESS OF SURGICAL CAVITIES FILLED WITH INORGANIC BOVINE BONE (BONEFILL®) IN RAT TIBIA.

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Keywords: Biomaterials, Implantology, Heterologous.

ABSTRACT

1. INTRODUCTION

In Dentistry there are numerous situations where bone loss impair the dental function, such as in periodontitis, or even prevent oral rehabilitation, such as in the case of edentulous patients who require rehabilitation with dental implants, but do not have adequate bone quantity or quality. Boyne, in 1971[1], was the first author to study the application of bone grafts by prosthetic reasons. Over time, the same type of graft has been used on a regular basis allowing the installation of osseointegrated implants (Buck 1994; Buser et al., 1995). [2,3]

Among the inorganic materials, currently the xenogeneic source is highlighted, since it is a material obtained from an abundant source, with affordable cost, and also safe regarding the disease transmission risk, and the treatment process which eliminates any risk of immunogenic response (Wenz et al., 2001) [4].

Bovine-derived materials are biocompatible materials and must be studied in order to learn more about their biological properties, as they are widely used in the clinic.

2. PURPOSE

- The purpose of this study is to histomorphologically analyze the bone repair process of surgical cavities filled with inorganic bovine bone (Bonefill) held in rat tibia.

3. MATERIALS AND METHODS

30 rats (*Rattus norvegicus albinus, Wistar*) were used. They were anesthetized and in antero-lateral regions of the tibiae of both hind limbs, crichotomy, antisepsis and incisions were performed in the longitudinal direction of each member. The left and right tibias were exposed and in each one a surgical cavity of 2 mm in diameter was performed. Cavities were filled with the following materials: (Figure 1)

Control Groups: with 20 animals. The cavity in the left tibia was filled with blood clot and the cavity of the right tibia was filled with autogenic bone particulate

Treated Group: with 10 animals, the cavities were filled with the biomaterial Bonefill ®.

Fig. 1-CC surgical Procedure; CE; and Bone.

Animals were sacrificed 10 and 30 days after surgery and parts were laboratory processed for making blades stained with hematoxylin and eosin and Masson Tricomic, for histomorphometric and histological analysis. The histological analysis was performed by means of morphological parameters as fibroblastic proliferation, capillary, presence of osteoblasts from bone neoformation, macrophages, osteoclasts or multinucleated cells, and resorption or incorporation of the implanted material inside the surgical defect. Histomorphometric analysis was performed by means of the image analysis software "Imagelab 2000" (Figure 2). The results were subjected to statistical tests of Mann-Whitney and Kruskal-Wallis regarding the adherence to the normal curve.

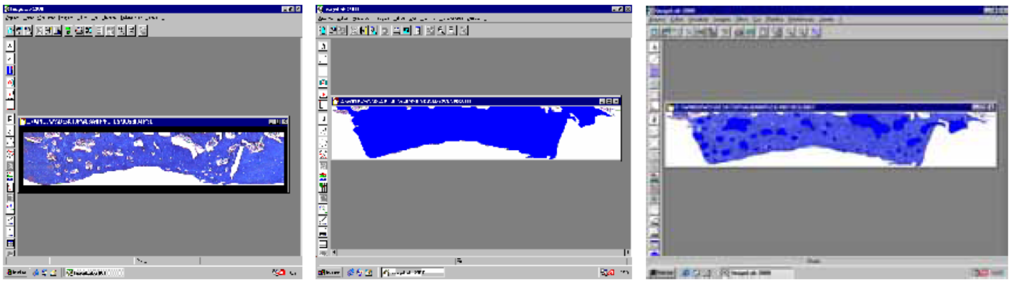

Fig. 2-Imagelab2000 Software.

4. RESULTS AND DISCUSSIONS

On histological analysis it was noticed that there was a full repair of bone cavities in all groups. In the treated group, in 10 days (Figure 3) and 30 days (Figure 4), no foreign body reaction was observed in relation to biomaterial granules. The material was incorporated to neoformed bone trabeculae, as well as in the control groups. In 30 days, the biomaterial was not reabsorbed in the treated group.

Fig. 3-Clot control group in 10 days; Graft control group in 10 days; Group treated with biomaterial in 10 days (bone).

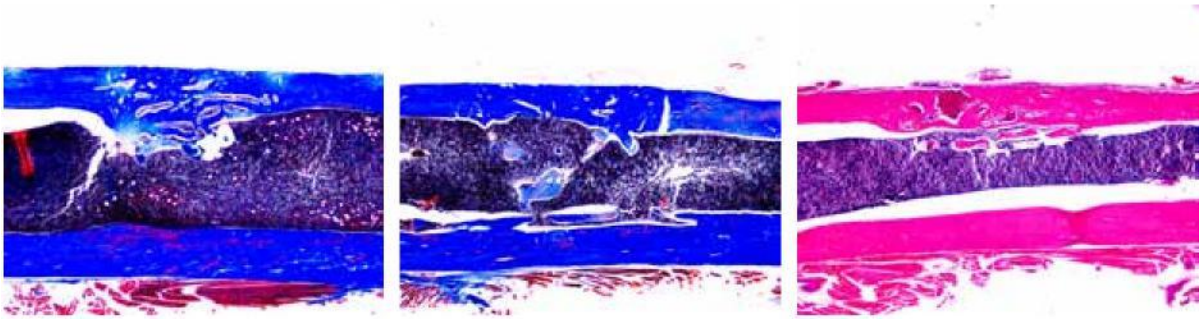

Fig. 4-Clot control group in 30 days; Graft control group in 30 days; Group treated with biomaterial in 30 days (bone).

Histomorphometric analysis, in 10 days (Figure 5) control groups (clot and autogenous graft), in relation to bone formation, showed no significant differences, while the treated group, by the presence of biomaterial granules in the cavities, showed a greatest amount of mineralized tissue. (Figure 7)

In 30 days (Figure 6) the cavities filling by newly formed bone area was similar between treated and control groups, showing the full repair of bone cavities.

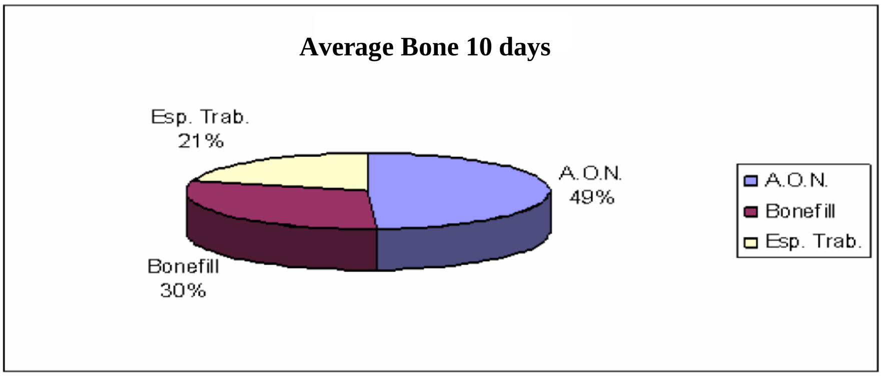

Fig. 5 – AON averages graph in 10 days.

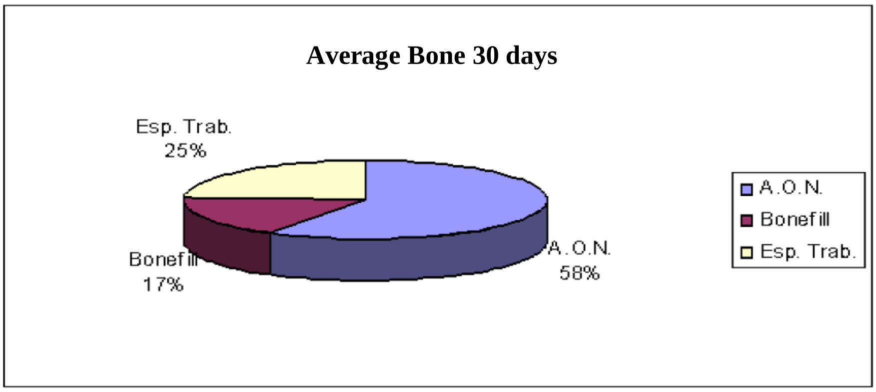

Fig. 6 - AON averages graph in 30 days.

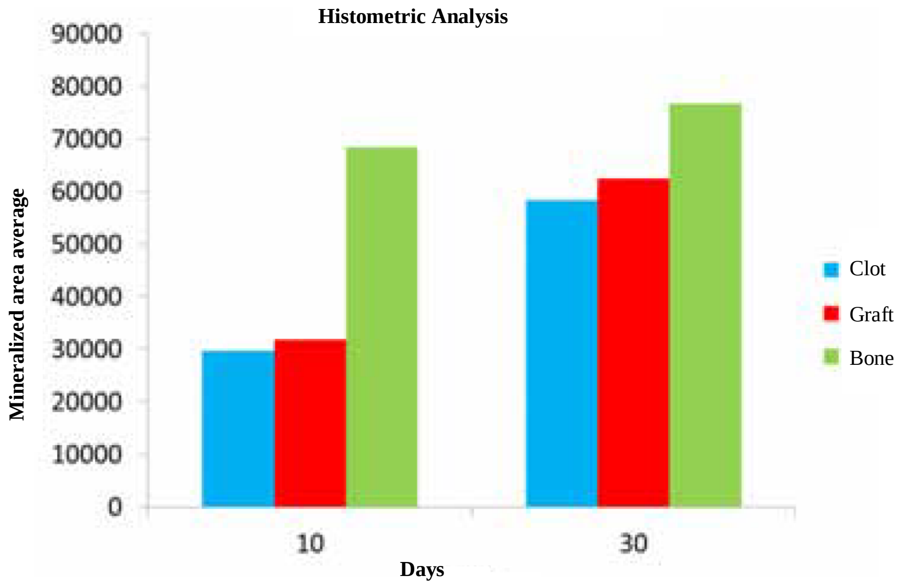

Fig. 7- Statistical results graph in the comparison between groups.

In this work it was possible to state that the biomaterial tested is a biocompatible material which allows the newly formed bone tissue to be in contact with its particles, what characterizes its osteoconductive activity.

5. CONCLUSIONS

It is concluded that the cavities of the control and treated groups were completely repaired; histologically the bovine biomaterial used proved to be biocompatible and with osteoconductive potential; histometrically it was noticed that the biomaterial presence kept the area mineralized, being slowly replaced.

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PROTOCOL FOR THE ETHICS COMMITTEE APPROVAL: FOA-6066/10