Dental Surgery

Clinical Sheet

COMPARISON BETWEEN HETEROLOGOUS AND AUTOGENOUS BONE GRAFT

Equine heterologous bone substitutes as a valid alternative to autogenous bone. A split-mouth prospective study.

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The loss of a tooth triggers morphological alterations that over time lead to atrophy of the alveolar process, to the extent that its volume is no longer sufficient to insert dental implants. In these cases, alveolar bone volume must be increased before performing implant surgery by using an osteoconductive, resorbable and possibly osteoinductive graft that stimulates osteogenesis.
The autogenous bone is considered the preferred material for bone augmentation. However, it has certain disadvantages: it requires a second surgical site, increasing the likelihood of postoperative complications and risks, and the amount of bone that may be collected is limited, especially if the harvesting site is intra-oral. The morphology and mineral composition of heterologous grafts is similar to human bone. They are obtained through a treatment of animal bone aimed at eliminating the risk of antigenic responses. However, the treatment may affect the biological and mechanical properties of the tissue of origin. Equine bone made antigen-free using enzymes represents a safe, osteoconductive heterologous material with proven bone regeneration ability. No study has directly compared this material with autogenous bone up to now.

Materials

The procedure entails using an equine origin Bioteck bone substitute in blocks that underwent an enzyme antigen elimination process.
The equine bone is treated with the advanced enzymatic process Zymo-Teck, which uses hydrolytic enzymes at controlled temperature to remove the antigens from the bone.
At the same time, this process does not alter the chemical-physical properties of the mineral constituents and preserves the collagen component.

An autologous block, harvested from the ascending ramus of the mandible, was inserted contralaterally.
To promote bone reconstruction and complete filling, either Bioteck equine cortical-cancellous bone granules were used – also obtained through the Zymo-Teck process – or autologous bone granules.

Both grafts were protected with a collagen membrane (Biocollagen, Bioteck).

Fig. 1 – *A patient presenting an atrophic anterior maxilla, requiring horizontal ridge augmentation.*

Fig. 2 – *Equine origin cancellous bone blocks made antigen-free enzymatically (Bioteck) used in this study.*

Fig. 3 – *The heterologous cancellous bone block (left) and the autogenous cortical-cancellous block (right) are adapted to the morphology of the receiving site.*

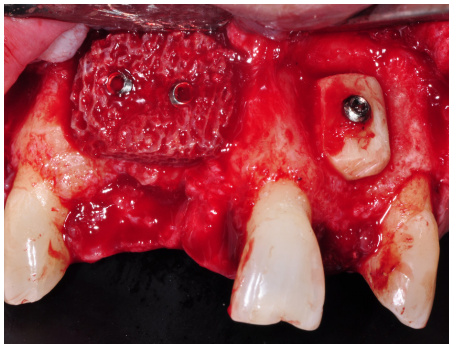

Fig. 4 – *The heterologous block (left) and the autogenous one (right) are fixed and stabilized using osteosynthesis screws.*

Fig. 5 – *The granules of equine bone made antigen-free used in this study (Mixture of cortical-cancellous 0.5-1mm granules, Bioteck).*

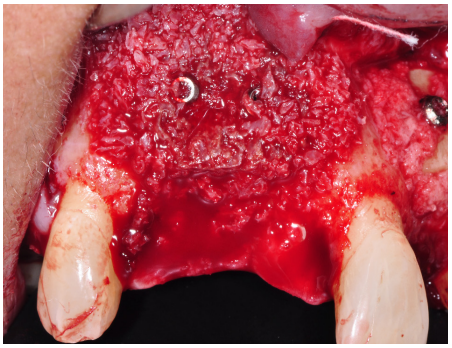

Fig. 6 – *Heterologous (left) or autogenous (right) bone granules are used to fill the graft.*

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Results

The sheet describes results for 7 patients aged between 34 and 65 who presented with horizontal atrophy of the anterior maxilla (Fig. 1) and who required implant-supported rehabilitation. Patients were grafted according to a split mouth design using two different grafts: an equine origin heterologous bone substitute in blocks (Bioteck) (Fig. 2) and autogenous bone blocks collected from the ascending ramus of the maxilla.

The grafts were adapted to the morphology of the receiving site (Fig. 3) and fixed with the aid of osteosynthesis screws (Fig. 4).
Granules of equine cortical-cancellous bone made antigen-free (Bioteck) (Fig. 5) or autogenous bone granules were added to cover and complete the graft, in the heterologous and autogenous graft site respectively (Fig. 6). Subsequently, the grafts were covered with a collagen membrane (Bioteck) (Fig. 7 and 8).

A cone beam computed tomography (CBCT) was performed at the time of the graft (T0), 15 days (T1) and 6 months (T2) after the operation. The CBCT made it possible to analyze the change in bone and graft volume between T2 and T1 and, at T2, to plan implant placement.

At T2, the volume had significantly decreased for both graft types (Fig. 9). However, autogenous bone showed a higher resorption rate, maybe due to inflammation resulting from the presence of necrotic tissue formed from the time of collection to the time of grafting. The excessive resorption commonly observed with autogenous bone may sometimes interfere with implant insertion.

Six months after the operation, both graft types showed 100% success and the absence of complications such as infections. The blocks appeared stable, vascularized and well incorporated (Fig 10-12), allowing implants to be inserted in the planned positions.

The results of this study suggest that the Bioteck equine origin bone block provides a valid alternative to the autologous block for the rehabilitation of the atrophic anterior maxilla.

1. D'Oliveira E. M. & Shibli J.A. Grafting heterologous bone blocks in the atrophic anterior maxilla as an alternative option to autogenous bone. Preliminary short-time results from a split-mouth prospective study. Italian Journal of Dental Medicine, 1(1), 17-22 (2016)

Fig. 7 – *The equine origin membrane (Biocollagen, Bioteck) used in this study is obtained from Achilles tendon collagen.*

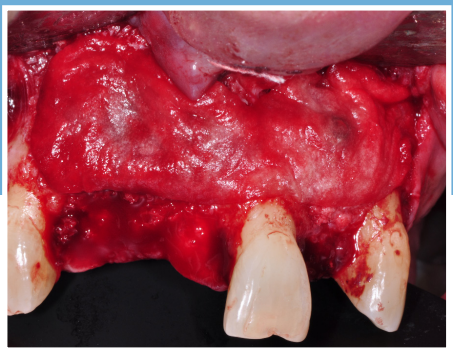

Fig. 8 – *The Bioteck Collagen membrane is placed on the graft sites to prevent soft tissue invasion.*

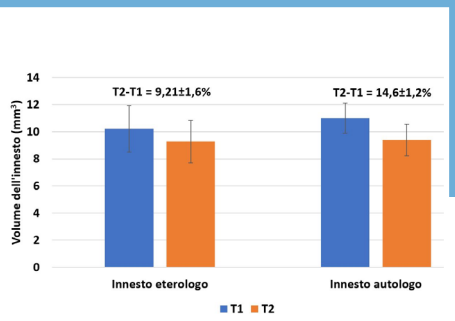

Fig. 9 – *VVolume of the heterologous and autologous graft (average±standard deviation) 15 days (T1) and 6 months (T2) after the procedure. Notice how autogenous bone was resorbed to a greater extent.*

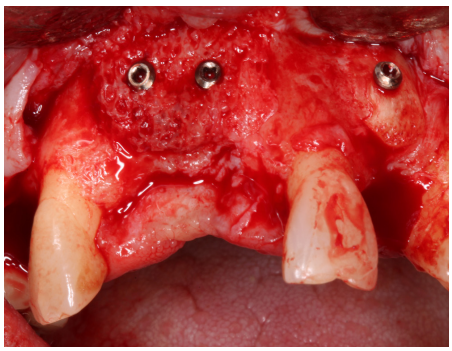

Fig. 10 – *Six months after the graft both bone blocks were stable and the tissue was adequately vascularized.*

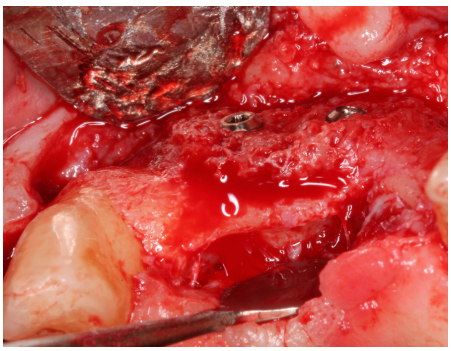

Fig. 11 – *Occlusal view of the graft site where the heterologous block was used. The graft appears well incorporated.*

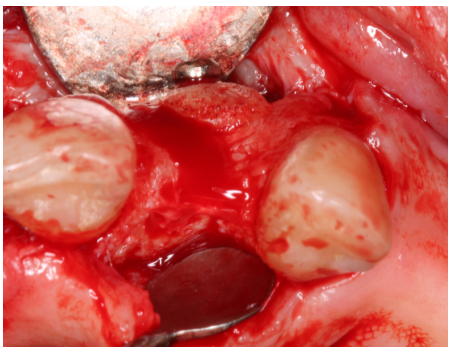

Fig. 12 – *Occlusal view of the graft site where the autologous block was used. The graft appears to be successfully incorporated.*

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