BONE GRAFTS AND IMPLANTOLOGY WITH IMMEDIATE PROSTHETIC RESTORATION IN AREAS OF HIGH AESTHETIC VALUE

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MAKING IMPLANTOLOGY SIMPLE

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1. INTRODUCTION

Loss of teeth leads to bone resorption which can be vestibular or palatal, depending on the area within the jaw from which the teeth are lost. The edentulous maxillary bone was classified based on the study of 300 craniums. Reduced differences were noted in the shape and resorption of the basal bone postextraction, while sharp variations were seen in the edentulous alveolar processes.

Generally speaking, changes in shape follow a foreseeable pattern and resorption also varies depending on where it actually occurs:

- In the intraforaminal region of the mandible, the bone resorption is almost entirely vestibular with horizontal development.
- Posterior to the mental foramina, it is predominantly vertical.
- In the upper maxillary, it is horizontal along the vestibular side of the entire arch [1].

This indicates that a vestibular bone defect is very likely to occur with the loss of a tooth in the upper arch or the intraforaminal lower arch. To reliably position an implant, the bone tissue must envelop the implant along its entire length and have acceptable vascularisation, so that the supporting bone structure is maintained [2].

In cases of edentulism, when there is insufficient bone tissue, surgical techniques must be applied to modify the bone shape [3]. There are numerous techniques for increasing bone volume, including bone regeneration, grafts and split crest. In 1992, Gottlow [4] presented 88 instances in which the Guided Tissue Regeneration (GTR) technique was applied, and had obtained an average increase of approximately 2 mm. In 1994, Simion et al [5] demonstrated that it is possible to achieve vertical regeneration of approximately 7 mm; however, this also resulted in substantial contractions of the graft material. Therefore, when carrying out these interferences, extra graft should be carefully planned to obtain the required volumes.

In recent years, the split crest technique has also undergone significant development, as a result of the use of piezoelectric instruments. These ensure improved incision linearity, as well as a reduction in the breadth of the cutting instruments when compared to traditional drills [6][7][8]. The split crest technique involves the creation of a vertical incision, enabling the dilation of the bone section and expandable-aided implant insertion. In certain cases it may not be possible to apply the split crest technique, particularly if the residual bone tissue is extremely thin, and necessitates a block graft. This entails the removal of a block of bone from a donor site, which is then attached to the host bone site using osteosynthesis screw(s) [9].

Komanos [10] demonstrated that it is possible to carry out bone grafts and obtain a similar tissue response to the traditional technique in the implantation phase, including immediate prosthetic restoration of the implants. The purpose of this study is to assess the percentage of success in implants placed on an alveolar ridge, augmented using the block bone graft technique; also whether this surgical approach is compatible in areas of high aesthetic value.

One of the more significant points to consider regarding the aesthetic assessment of an anterior element is the presence (or absence) of papilla. The position of the papilla is determined by the distance from the interproximal bone crest at the point of contact with the elements. It is possible to use papilla in 98% of cases, up to 5 mm. If the distance increases by even as little as 1 mm, the possibility of using papilla is reduced to 56% [11]. It is therefore necessary to consider the effect that the implant will have on the surrounding tissue and more importantly, whether it could cause an increase in the distance between the point of contact and the papillary bone crest. In particular, the position of the junction between abutment and implant creates a micro gap, which in turn causes some form of biological implant elasticity, at approximately 1.5 – 2 mm vertically and 1.4 mm horizontally. This should always be a significant consideration, to enable the implants to be positioned correctly [12].

A further issue that was noted was that when a bone graft is carried out, a tissue of different density is created (see Fig. 1). Leinhom and Zarb [13] have classified four different types of bone (types 1-4) progressing from the most compact to the most trabeculated, depending on the qualitative ratio between the cortical and medullary bones. As a consequence of the regenerative treatment in the maxilla, the positioning of the implant often creates insertion problems, since the host bone tissue is “softer” than the graft from the mandible. This affects the drills, pulling them towards the areas of lower density. Consequently, there is a risk that the implant alveolus will be positioned in an area near the site receiving the graft, which could cause potential aesthetic and functional problems. The use of piezoelectric instruments is not affected by the differences in bone density, enabling a surgically correct alveolus be created. It demonstrates that Piezosurgery overcomes the limits of traditional drills and ensures a very high degree of precision, enabling total control of the tissue, with an increased recovery response and improved positioning of the implant [14].

2. OBJECTIVES

In the presence of a horizontal bone deficit, various surgical techniques can be selected, with the objective of restoring suitable bone volumes and correctly positioning the implant. When the horizontal bone deficit has been reduced and the implant structure has achieved primary stability, a G.B.R. (guided bone regeneration) can be implemented, using a scaffold designed to support the new osteogenesis and a barrier required to reduce cellular competition. A split crest can also be performed, when the remaining crest presents a thickness of at least 4 mm in the direction of the apex and tends to remain constant or increase its thickness. Using the piezoelectric instrument, a crestal incision is made and enlarged to allow the implant to be positioned, using specific expanders.

When the thickness of the remaining tissue is less than 3 mm, the elective indication is that of autologous graft. A block of bone is taken from an introral donor region (lower retromolar area,
mandibular branch or symphysis menti) and is grafted into a host area by attaching it with osteosynthesis screws, to tightly connect the two interfaces and prevent micro movements.

The purpose of this is to apply the implant technique of immediate non-functional prosthetic restoration onto a bone site that has been reconstructed by means of a block graft taken from the mandible. This technique is decided upon to make the long waiting periods between the bone graft operation and the final prosthetic restoration and also to use non-functional provisional prosthetic restorations to try to condition the soft tissue, which is frequently altered in shape and appearance by the grafting procedure.

3. MATERIALS AND METHODS

The operational protocol proposes the use of SPI type AlphaBio (Bis) implants, namely implants with a spatial structure that allow optimal primary stability with regards to a prosthesis. The patients were not selected according to any specific criteria; only those who presented absolute contraindications to surgery were excluded. Since this was an outpatient study, the assessment of the treatment’s success relied heavily upon the surgical and functional follow-up and the final prosthetic restoration.

The implants were inserted corresponding to the bone graft operation and the final prosthetic restoration. This technique was decided upon to tightly connect the two interfaces and promote the stress on the graft caused by the vibrations modified the block without it affecting its spatial position, unlike rotating instruments where the movements of the drills tend to affect the graft, running the risk of making it unstable. The flap was raised in the vestibule and the marginal gingiva was fashioned, with paramarginal incisions approximately 2 mm away from the dental elements, in an attempt to respect the papilla. The flap was grafted with autogenous cortical tissue taken from the retromolar mandibular region, with a cortical tissue taken from the retromolar region, with a cortico-cancellous graft from the mandible.

Using the piezoelectrical instrument to perform the osteotomy, which is grafted into a host area by decortication to promote take up and integration period. After the complete integration of the graft, roughly four months after the procedure (see Fig. 4), an access flap was fashioned, with paramarginal incisions, 2 mm away from the dental elements, in an attempt to respect the papilla. The flap was grafted with autogenous cortical tissue taken from the retromolar region, with a cortico-cancellous graft from the mandible.

Upon the complete integration of the graft, roughly four months after the procedure (see Fig. 4), an access flap was fashioned, with paramarginal incisions, 2 mm away from the dental elements, in an attempt to respect the papilla. The flap was grafted with autogenous cortical tissue taken from the retromolar region, with a cortico-cancellous graft from the mandible.

4. RESULTS AND CONCLUSIONS

Nineeen implants were placed in 13 patients in areas of high aesthetic value (see Figures 8-9). The aesthetic considerations, together with the request for the least social discomfort possible, led us to consider immediate provisional prosthetic restoration (see Figures 10-11). The cases presented were all temporarily restored with a minimum follow up of 18 months. The use of the piezoelectrical instruments enabled the implants to be positioned and angled correctly, without being influenced by the varying bone topography in the region (see Fig. 12). The use of the piezoelectrical instrument also ensured greater precision when assessing the biological stability and implant positioning, reducing the stress on the graft caused by the vibrations and rotations of the implantation instrument. The shape of the SPI implants ensured remarkable implant stability and enabled immediate non-functional prosthetic restoration. Consequently, it was possible to condition the tissue, in an attempt to achieve the best aesthetic outcome, so that prosthetic restoration with “metal-free” prostheses (Fig. 10) could be performed following the integration period.

Harvey (13) also documented how it is possible to optimise the proportions of the soft tissues in the aesthetic regions, after having inserted an implant with an immediate, non-functional provisional prosthetic. The level of the peri-implant tissue is maintained without resorption, and with an implant success rate of 97.2%, even with the immediate prosthetic restoration implant technique. In a segmental ridge-split procedure, first Brunski (16) and later Smuzler-Moncler (17), identified the existence of a range of tolerances to micro movements of between 50 and 150 microns at the bone implant interface. Remaining within this range, the implant bone interface maintains the integrity of the bone, and the aesthetic results achieved are not compromised; rather it is promoted. Beyond these movements, fibrous tissue is interposed and osseointegration is compromised. Immediate prosthetic restoration enables the control of the maturation of the soft tissue and helps achieve osseointegration (18). These concepts are already prevalent in the existing literature regarding standard implants, and are also applicable to implants which are attached directly to bone grafts and the guided bone regeneration technique with collagen membranes: a clinical study with autogenous block grafts and the guided bone regeneration technique with autogenous block grafts.

Intrasulcular element of the last two incisors was fashioned, with paramarginal incisions approximately 2 mm away from the dental elements, in an attempt to respect the papilla. The flap was grafted with autogenous cortical tissue taken from the retromolar region, with a cortico-cancellous graft from the mandible.

The purpose of this is to apply the implant technique of immediate non-functional prosthetic restoration onto a bone site that has been reconstructed by means of a block graft taken from the mandible. This technique is decided upon to make the long waiting periods between the bone graft operation and the final prosthetic restoration and also to use non-functional provisional prosthetic restorations to try to condition the soft tissue, which is frequently altered in shape and appearance by the grafting procedure.

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Upon the complete integration of the graft, roughly four months after the procedure (see Fig. 4), an access flap was fashioned, with paramarginal incisions, 2 mm away from the dental elements, in an attempt to respect the papilla. The flap was grafted with autogenous cortical tissue taken from the retromolar region, with a cortico-cancellous graft from the mandible.

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Alpha-Bio tec complies with ISO 13485:2003 and the Canadian Medical Devices Conformity Assessment System (CMDCAS).