CERAGRAFT: BONE GROWTH STIMULATING BIO-MATERIAL

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Keywords: *alloplatic materials, osteoinduction, osteogenesis, apposition, opacity*

Cuvinte cheie: *materiale aloplastice, osteoinducţie, osteogeneză, apoziţie, opacitate*

Abstract: *Alloplastic biomaterials, in this case, Ceragraft, by their features and properties have proved to have osteogenetic effect. These materials introduced into bone loss following traumatism or maxillary cysts are not imunogenic, citotoxicity tests being negative. Bone results were radiologically relevant 12 weeks after application.*

Rezumat: *Biomaterialele aloplastice, în cazul nostru, Ceragraftul, prin calităţile şi proprietăţile lor s-au dovedit a avea un efect osteogenetic. Aceste materiale introduse în pierderi osoase în urma unor traumatisme sau chiste maxilare, nu sunt imunogenice, testele de citotoxicitate – negative. Rezultatele osoase au fost relevante radiologic la 12 săptămâni după aplicare.*

INTRODUCTION

Materials used for bone growth are introduced into areas of bone loss, caused by pathology, infection or trauma. Substituents may act upon the bone through three types of mechanism: osteoconduction, osteoinduction and osteogenesis.

Osteoconduction determines bone growth by apposition to and on a preexisting bone.

Biocompatible osteoinductive materials give no toxic reactions, are entirely synthetic in nature and may be classified into ceramics, composites and polymers.

Of alloplastic materials, bioactive ceramics, including hydroxyapatite and trycalcic phosphate are the most numerous and are used for bone growth.

These materials are of two kinds: resorbable and non-resorbable.

Hydroxyapatite

Inorganic components of bone make up approximately 50% of bone frame mass. Calcium and phosphorus are the most common components, followed by bicarbonates, magnesium, sodium, potassium, etc. Research has proven that phosphorus and calcium can form together hydroxyapatite crystals. Visual images have been taken of 40x25x3 nm hydroxyapatite crystals, disposed along collagen fibres, surrounding amorphous matter. The association of hydroxyapatite and collagen fibres gives the bone tissue resistance and hardness. Thus, hydroxyapatite has been used on a large scale as a good bone replacement material.

The material is osteophilic and nonresorbable. It is recommended to be used in bone preparation for maxillary cysts where tissue interface is more probable on bone. It needs to be emphasised that all hydroxyapatite based products are reabsorbed in case of decreased pH (infection).

In bone composition, collagen together with the calcium-phosphorus combination forms a structure almost identical to that of hydroxyapatite.

In Romania, hydroxyapatite obtains under the form of powder or granules of between 0.2-1.4 mm, under the tradename Ceragraft.

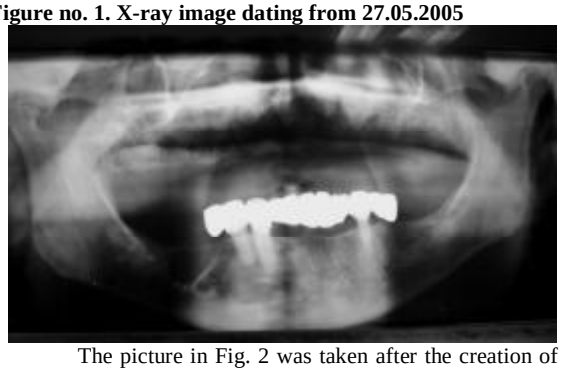
The main characteristics of these biomaterials are:

- easily soluble
- resorbable as the bone regenerates, the rest is maintained intact
- determines bone regeneration and not reparation
- in animal testing, newly formed bone attains the density and structure of pre-existing bone in 12 weeks
- not immunogenic
- biocompatibility is proved by the absence of cytotoxicity and hemocompatibility
- its use as bone replacement represents an alternative to autografts

CLINICAL CASE

27.05.2005 – Pacient aged 80, without major health problems presents with tumefaction, extensible at intraoral palpation, extending between 4.3 and 4.6. Vitality tests for teeth 4.4 and 4.3 are negative, sensitivity of lower alveolar is not affected. Orthopantomography provides the image of a possible ameloblastoma (Fig. 1).

Figure no. 1. X-ray image dating from 27.05.2005



The picture in Fig. 2 was taken after the creation of a mucoperiosal flap; macroscopically the presence of a bone-cyst affecting the bone is detected, after removal of the diseased tissue as well as of the surrounding membrane.

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Article received on 04.06.2010 and accepted for publication on 29.06.2010
ACTA MEDICA TRANSILVANICA September 2010; 2(3)318-319

The diagnosis of radicular cyst affecting the bone was confirmed by the result of histopathology. (Fig. 5) Post-operative clinical evolution was good and X-ray images taken 8 weeks after the operation (Fig. 4) and 5 years later (Fig. 6) confirmed the presence of bone regeneration process.

Figure no. 2. Intraoperatory image

Figure no. 3. Suture of the mucoperiost after cystectomy

Figure no. 4. Radioopacity showing development and bone apposition (4.4, 4.3) (X-ray image dating from 08.08.2005)

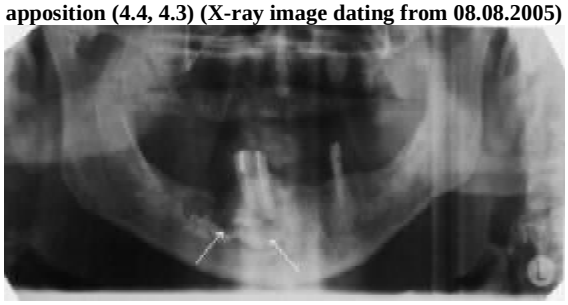


Figure no. 5. Odontogenic cyst with surroundig moderate lymphocytic inflammatory infiltrate visible

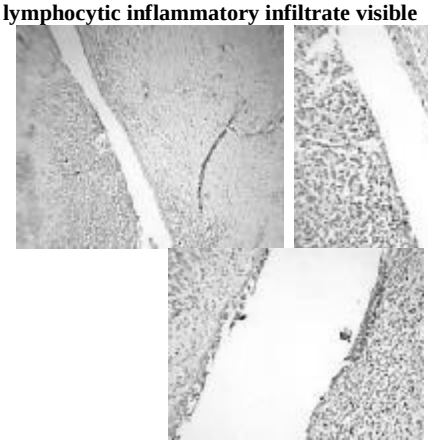
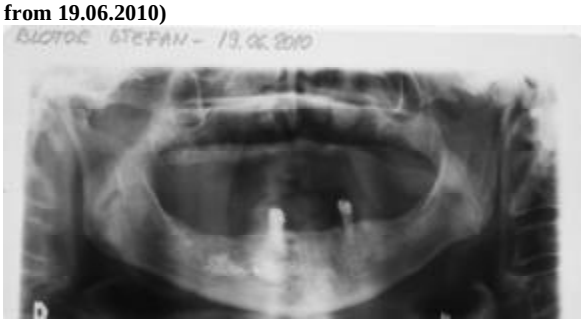


Figure no. 6. Zone of regeneration with bone apposition extending over the whole area of the former cystic cavity, radiopaque images and absence of 4.4 (X-ray image dating from 19.06.2010)



CONCLUSIONS

Applying Cerograft in bone loss caused by a cystic formation has proved over time the bone regenerative, not reparative qualities of the bio-material; thus they offer a good alternative to autograft.

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