Research Article

Evaluation the Efficacy of Gelfoam in Bone Regeneration in Maxillary Cyst Defect

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Abstract
Introduction: We had hypothesized that the gelfoam has effect in Promoting Bone Regeneration After Maxillofacial Cyst Enucleation. **Methods:** Eighteen patients with maxillary cysts had been treated, they were selected and randomized into 2 equal groups: 1- Control group **(A)** (lesion were be enucleated and not be subjected to any graft material). 2- Experimental group1**(B)** (subjected to only gelfoam placement in bone defect). CBCT scan was performed for each patient to evaluate bone density immediately and after 6 months. **Results:** All groups showed decrease in bone defect size after 6 months .and with no markable difference. **Conclusion:** Gelfoam could be a candidate for a bone-scaffold in low-load areas or as a drug delivery carrier to promote bone regeneration in defective areas.no as aprimary materials for regeneration.
Key Words: bone regeneration, Gelfoam, cysts.

Introduction
Odontogenic cysts are the most common osteolytic lesions (90% to 97% of reported cysts) in the oral region. Its growth is slow, from remnants of odontogenic epithelium of Malassez. Thus, its histogenesis is related with debris that are trapped within the bone, enamel or gingival tissue; they are usually intraosseous location. Although benign, can become destructive, because they are frequent incidence and represent a major cause of bone destruction in the jaw and mandible[1,2]

A healthy bone has the ability to regenerate spontaneously if the volume of the defect does not exceed a certain size [3.] In cases involving large defects, or when bone metabolism is not able to properly repair the bone defect (e.g. high bone turnover cases such as osteoporosis or Paget's disease) bone graft biomaterials can be used to both bridge the defects and to facilitate bone formation in the defective areas[4,5] Various types of bone graft materials such as autograft (patient bone), allograft (human cadaver bone), xenograft (animal bone), and synthetic biomaterials (e.g. ceramics, metals, polymers, and composites) have been tested and used to repair bone defects[6].All of these materials have their associated disadvantages such as limited healthy available bone grafts from patients, additional surgical trauma caused by donor site, and longer operation times for autograft ; risk of host reaction due to genetic differences, high resorption, disease transformation, ethical and religious concerns for allograft and xenograft. Low rate of biodegradability, inadequate architectural properties (lack of interconnected pores), low affinity to matrix macromolecules (resulting in interfacial instability with bone), and lack of mechanical stimulus in the surrounding bone (resulting in a higher bone resorption) are all concerns when using synthetic bone graft materials

The biomaterials used for bone grafts should provide three dimensional support for cell migration, proliferation, differentiation, and thereby act as a scaffold for new bone formation in the defective areas. The scaffolds must possess a wide range of different characteristics. They need to be biocompatible, biodegradable, porous, adequate mechanical

properties, for some applications preferably malleable into desired shapes or injectable, and most importantly show compatibility and affinity to osteogenic bone matrix proteins and growth factors [7,8]. Biodegradable polymers derived from natural sources (e.g. collagen, gelatin, elastin, fibrin, hyaluronic acid, chitosan/chitin, and alginate) have been studied and used as bone graft or cartilage graft materials to repair defects in various orthopaedic and dental applications 'Natural-derived' polymers are extracellular matrix proteins of different tissues providing a scaffold for cellular support in body. As bone graft materials, protein-derived materials have superior properties over synthetic materials due to their excellent biocompatibility, and their high affinity to and compatibility with the other matrix proteins[11].

Gelatin is a thermal-denatured collagen that may be prepared either by acidic (type A) or alkaline (type B) treatments (extraction) of bovine or porcine skin, bone or tendon, followed by heat-treatment in an aqueous environment (hydrolysis). The final product is separated from bouillon using various methods such as settling ,filtering ,and centrifuging. Gelatin has a long history of usage in the food industry as a clarification agent, stabilizer and protective coating material, and in the pharmaceutical industry for manufacturing capsules, ointments, cosmetics, tablet coating, and emulsion[12]. Due to its hemostatic properties, gelatin sponge has been widely used in surgery as a wound dressing, adhesive and absorbent pad. The advantage of gelatin over collagen matrix is its ease of extraction and preparation, which results in a cheaper and high quantity production of gelatin matrix. Furthermore, unlike collagen, gelatin does not express any antigenicity in physiological conditions [13] Gelatin is composed of some 18 different amino acids repeated in particular sequence to form a coil structure (collagen has a triple helix structure). One-third to half of all amino acids in gelatin structure is either glycine or alanine. Gelatin prepared using acid extraction (type A) has a higher quantity of alanine than that prepared by alkaline treatment (type B). The other predominant amino acids in gelatin are either proline or hydroxyproline.[14,15]

Aim of the study

The present study aimed to evaluate the ability of gel foam in enhancement bone regeneration after cyst removal

Patient and Methods

The current study was conducted on 20 patients from both gender seeking for cystic lesion enucleation. The patients were selected from the Oral and Maxillofacial Surgery (OMFS) Department Outpatient Clinics in the faculty of dentistry Minia University. The selected Patients fulfilled the following: The inclusion criteria of this study were: Lesion in the anterior maxillary arch, with age range (20-40)years. The proposed postsurgical defect size not more than 3cm, and the patients Free from any systemic disease compromise bone. While the exclusion Criteria were: Patients with immune-logical diseases, Haematological disorder, History of chemotherapy or radiotherapy, heavy Smokers, and lesions encroaching to nasal cavity.

The patients were be randomly divided into 3 equal groups:

1- Control group. (lesion were be enucleated and the bone defect cavity not be subjected to any graft material).

2- Experimental group 1. (bone cavity subjected to only gelfoam placement.

Preoperative preparation

CBCT were be obtained from all patients to assess the site, size, shape of the lesion, relation to the anatomical landmarks..

- Endodontic treatment was performed for the indicated teeth before surgery one week before surgery.

The surgical procedures:

The surgery was performed under complete aseptic conditions, and the patients were draped using the standard technique of maxillofacial surgery, the local anesthesia was given by 4% articaine for infraorbital nerve block and regional infiltration. A full thickness pyramidal mucoperiosteal flap was performed using Bard-Parker blad no.15 in the buccal aspect, extending one tooth mesially and distally to the cystic lesion to allow excellent acceccesability to the full lesion. The mucoperiosteal flap was

reflected to expose the bone using periosteal elevator. The pathological lesion was exposed by removing the overlying un healthy bone by sharp cutting bone rongure or bone cutting surgical low speed bur (rose head bur) under copious irrigation by normal saline. The whole pathological tissues were carefully enuclated as one piece and the remnants were curreted by sharp bone currete or large round surgical bur ,and sent for histopathological examination. Apicectomy with retrograde filling was performed for the teeth that were involved in the lesion using fissure bur on the high-speed hand piece and unsolvable teeth were extracted. The bone cavity was washed with normal sterile saline solution.

In Group (A), after cyst enucleation no any graft were be placed and kept as a control group.

While Group (B) after surgery, bony defect were be filled with gelfoam only and was taken as experimental group

- The flap was repositioned to it is original place and was closed primarily with 3–0 black braided silk with reverse cutting needle.

- Agauze pack was placed to cover the wound for one hour post-operative instructions were given to patients include cold packs on the first day, oral hygiene instruction, soft diet for one week

Post-operative medications including**:**

Antibiotic: Cephalosporin (ceporex – Egypt) (1 GM/12 hours) was prescribed for 5 days post-operatively. Non-steroidal anti-inflammatory: Ibubrufen (brufen, Abbott, cairo) (600 mg/8 hours) prescribed for 3 days.

IV. Follow up phase

Followed up clinically for any signs of graft rejection , infection ,discharge .The parameters were be measured via CBCT were the size of the healed bony defect.

Result

This study was conducted on forty-five patient diagnosed with maxillary cysts in anterior region.ranged in age from 20 to 40 years divided into 2 groups. After comparison between the defect size of 2 groups after 6 months using CBCT

Comparison between the two studied groups according to changes of defect size after 6 months.

	Group A	Group B
Mean ± SD	-7.5 ±2.6	-6.8 ± 2.31
Median	-8	-6
F	18.06	
P	< .00001	
Sig. bet. groups	P1=0.215	

F, p: F and p values for, Sig. bet. groups was done using Post Hoc Test (LSD)
p1: p value for comparing between group A and group B

Discussion

After cystectomy, The defect size should be considered as one of the most influencing factors for total defect consolidation. It is hypothesized that there will be no complete bony regeneration in cystic lesions with a diameter larger than a CSD that have been left without grafting. Defects larger than $1cm^3$ do not completely and spontaneously heal no matter how long they are observed.[16,17]

For improvement the quality of bone regeneration many studies use of different types of bone grafts after cyst enucleation in order to reduce infection, accelerate bone formation, prevent soft tissue collapse into the defects. According to the vast amount of literature studies it has been concluded that the use of autogenous bone grafts is still the gold standard in bone defects reconstruction. Unfortunately, the use of autogenous bone carries the disadvantages of limited amount availability, donor side morbidity and lengthening time of the operation, these limitations are not faced with alloplastic material[18].

In our study, gelfoam capability for enhancing bone formation in defects after cystectomy was radiographically evaluated. The result of the study showed that the local application of gelfoam have no great effect than without gelfoam.

The ability of gelatin sponge to play the role of scaffold for supporting chondrocyte and osteoblast cells was demonstrated in vitro by Stanton et al.,[28]. Stanton et al., reported the formation of cartilaginous matrix in the pores of gelatin sponges after 25 days in culture. In an vitro study Yang et al.,[29] reported that a cross-linked gelatin scaffold composed of tricalcium-phosphate provided an excellent porous structure, conductive to osteoblast attachment and differentiation, and that this ability was significantly improved by the incorporation of BMP-4 into the scaffold structure.

Osteoinduction property of BMP loaded-gelatin sponges (with different contents of tricalcium phosphate) was also demonstrated in an in vivo study.

When measured bone density using CBCT fixed one point at the follow-up and period by using a normal structure as a reference point for each patient. however there was no a statistical significant difference between the median of density changes of 2 groups after 6 months.

Conclusion

Gelatin sponge could be acandidate for abone-scaffold in low-load areas or as a drug delivery carrier to promote bone regeneration in defective areas.

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