Future Dental Journal xxx (2016) 1–7

Contents lists available at ScienceDirect

Future Dental Journal

journal homepage: http://www.journals.elsevier.com/locate/fdj

Evaluation of implant stability simultaneously placed with sinus lift augmented with putty versus powder form of demineralized bone matrix in atrophied posterior maxilla

Lobna Abdel Aziz Aly [a, *], Nelly I Hammouda [b]

[a] Faculty of Dentistry, Future University, Cairo, Egypt
[b] Faculty of Dentistry, Mansoura University, Cairo, Egypt

ARTICLE INFO

Article history:
Received 28 November 2016
Received in revised form
21 December 2016
Accepted 22 December 2016
Available online xxx

Keywords:
Implant stability
Sinus lift
Putty and powder DBM

ABSTRACT

Background: Rehabilitation of edentulous posterior maxilla with dental implants is a challenging problem in oral and maxillofacial surgery due to alveolar resorption and excessive pneumatisation of maxillary sinus. This study was designed to compare the efficacy of Putty Versus Powder Form of Demineralized Bone Matrix (DBM) augmented in lifted maxillary sinus in atrophied posterior maxilla with evaluating the implant stability simultaneously placed with both of them.

Patients and Methods: sixty four implants were placed in twelve patients in the period between 2013 and 2016. Lateral approach, open window method for sinus lift with peizosurgical unit and placement of Putty or Powder Form of DBM were carried out simultaneously with implant placement. The implant success was defined when the prosthesis had been delivered and followed for 18 months without infection, pain, marginal bone loss and the implant stability quotient (ISQ) of each implant was measured using resonance frequency analysis.

Results: Radiographic bone formation was evident in all 12 patients, and all implants were stable after 18 months of placement. No statistically significant differences were observed in marginal bone loss around the implants between the powder and the putty groups at 6 months ($p = 0.60$), 12 months ($p = 0.85$) and 18 months (0.49). The difference between ISQ values in both groups was only significant at the baseline ($p = 0.023$).

Conclusion: Sinus lifting with simultaneous implant placement could be used to treat atrophic maxilla with initial stability obtained by using taper designed implants and with minimal intraoperative complication susing peizosurgery. No statistically significant differences in the stability were observed between implants placed with both putty and powder forms of DBM.

1. Introduction

Recently, clinicians have recommended augmenting the maxillary sinus to facilitate placement of endosseous implants in the severely atrophic posterior maxilla [1]. There are various techniques for sinus lift such as lateral window, crestal approach, summers osteotomy, bone aided augmentation. The most popular technique for sinus lift is found to be lateral window with autogenous corticocancellous grafts. The most effective standardized grafting material is autogenous bone grafts due to osteoinductive and osteoconductive potential [2–4]. Various alternative materials have also been used however compromising the osteoinductive potential, such as allografts, xenografts and alloplastic grafts that used for bone substitution to make implantation more predictable and successful clinically [4–7].

Over the years demineralized bone matrix (DBM) has been frequently used for bone grafting. DBM contains active proteins such as bone morphogenetic protein (BMP), transforming growth factor-beta (TGF-β), osteogenin, insulin-like growth factor, and

* Corresponding author. 90th street New Cairo, Cairo, Egypt. Tel.: +20 1001324032.
E-mail addresses: Lobna72@gmail.com (L.A.A. Aly), Nonalytaj1@yahoo.com (N.I. Hammouda).

Peer review under responsibility of Faculty of Oral & Dental Medicine, Future University.

http://dx.doi.org/10.1016/j.fdj.2016.12.001

fibroblast growth factor, which are mostly regarded as members of the TGF-β superfamily [8]. In recent years, several studies have demonstrated the success of DBM for reconstructive maxillofacial surgery, and sinus augmentation is used in various graft sizes and forms [9–11].

The types of DBM based on particulate size, survival of implants and operation time have been compared, resulting in no significant difference in terms of implant success during the loading time, but the putty form was found to be more successful than the powder form for the ease of application and operation time. Also, optimal bone induction was found with DBM particle sizes of 250–500 μm. On the other hand, marginal bone resorption and implant success between the putty and powder forms has not been evaluated [10,12].

Implant stability can be defined as the absence of clinical mobility, which considered to be the most important prerequisite for success of ossointegrated dental implants. Implant success is influenced by primary stability factors such as implant diameter, shape, thread forms and pitch values, and adequate bone height. While the secondary stability factors included the host environment where bone density plays a vital role in their placement and successful osseointegration [13].

Primary stability can be measured by different methods [14]: "biomechanical tests, including insertion and disinsertion torque measurements, and non-invasive techniques such as resonance frequency analysis (RFA)". RFA offers a clinical measure for implant stability and presumed osseointegration and make it possible to measure implant stability without damaging the bone-implant junction [15]. Most studies have focused on implant stability in augmented posterior regions of maxilla after osseointegration [15,16].

The aim of this study was to compare the dental implant stability and the marginal bone resorption around dental implants placed simultaneously placed with sinus lifting using peizosurgery and the efficacy of augmentation with putty and powder forms of DBM.

2. Patients and methods

Twelve patients referred to private practice in Cairo, Egypt, for bilateral maxillary sinus lifting between 2013 and 2016. The study was conducted in accordance with the moral, ethical, regulatory, and scientific principles governing clinical research as set out in the Declaration of Helsinki (2013). All patients were fully informed about the treatment prior to the surgical procedure and provided written consent for the procedure. All procedures and materials were approved by the local Ethics Committee of Future University, Egypt.

A preoperative computer tomography scan was used to quantify the amount of available bone at individual implant sites under the maxillary sinus to decide whether the patient could be included in the study. Before the procedure, the anatomy and pathology of the sinuses were evaluated using panaromic view (Fig. 1). The width of the alveolar bone ridges was considered a noninterfering parameter because the width was always sufficient for a secure implantation. According to Cawood-Hawell's classification [17], Class V and VI cases were included in the study. Patients who had residual bone height less than 2 mm were excluded. The other exclusion criteria were sinus pathologies, systemic diseases, smoking habits, alcohol consumption and poor oral hygiene. All patients underwent bilateral.

sinus surgery and the residual bone height of the edentulous sites for implant placement was measured, a 4–6 mm of the bone level was required in the alveolar ridge for primary stability, with sufficient inter-arch space for the prosthesis.

Treated lateral window open sinus lifts performed bilaterally on 12 partially or completely edentate patients (8 males and 4 females, aged 49–68 years) with a piezoelectric surgery unit. Patients were treated under local anesthesia using articaine 4% with 1:100,000 epinephrine. After elevation of a full-thickness flap, all cases had their lateral antrostomies created by outlining an island of bone or completely removing the entire lateral aspect of the window using the piezoelectric unit according to the manufacturer's instructions. The elevation of the Schneiderian membrane was accomplished by initially exposing and mobilizing the membrane using the piezoelectric hand piece followed by hand instrumentation to further elevate the membrane along the medial wall of the sinus (Fig. 1).

A total of 24 sinus lifts were performed and 64 taperd dental implants (Implant Microdent System S.L-Comapedrosa, Barcelona, Spain) measuring 3.4–5.0 mm in width and 12–14 mm in length were placed concurrently with sinus augmentation to achieve primary stability. In all patients, the left side was grafted with DBM putty form (DynaGraft Keystone Dental, Burlington, Massachusetts) and the right side was grafted with DBM powder form (Pacific Coast Tissue Bank, Los Angeles, California) after a minimum of 30 min rehydration process in 0.9% Saline solution. The lateral wall of the sinus was then covered with a membrane (Bio-Gide, Geistlich Pharma AG) (Fig. 2).

After the graft had been placed, the flap was re-positioned and sutured with 3/0 silk suture. Antibiotic (Augmentin 625 mg, Glaxo Smith Kline, Egypt) and analgesic (BRUFEN 600 (Ibuprofen 600 mg)) therapy was administrated 1 h before surgery and for 5 days following the surgery. Chlorohexidine gluconate 0.12% mouthwash was used twice daily for 2 weeks. The patients were advised to have a soft diet and to avoid sneezing till suture removal.

None of the implants were loaded before a minimum of 6 months from the date of first surgery. Implants were manually tested for stability when unscrewing the cover screws and impressions were taken with pick-up impression copings using a polyether material (Impregum 3M/ESPE, Neuss, Germany) with customised resin impression trays. The vertical dimension as registered and models were made with class 4 precision plaster and mounted in standard articulators. Implant stability as manually checked by tightening the abutment screws with a 20 Ncm torque, and definitive restorations were delivered.

2.1. Clinical and radiographic evaluation

One dentist not involved in the treatment of the patients, made all clinical assessments without knowing group allocation, therefore outcome assessor was blind. Implant success was evaluated based on the clinical and radiologic criteria [18,19] that included: absence of mobility; absence of persistent subjective complaints (pain, foreign body sensation and/or dysaesthesia); absence of a continuous radiolucency around the implant; and marginal bone level changes in the first year implant insertion less than 1–1.5 mm and the ongoing annual bone loss less than 0.2 mm. Marginal bone loss around mesial and distal side of the implants were measured (in mm) at implant placement, at the time of loading, after 12 and 18 months of placement. For measurements purposes, 2 visible and easily localized reference points were selected at the junction point between the implant and prosthetic restoration. A straight line was traced joining the 2 reference points. The marginal bone resorption was determined by measuring between this line and the highest crestal bone point around the implant.

The implant stability quotient (ISQ) of each implant was measured using resonance frequency analysis (an Osstell device (Integration Diagnostic AB, Savedalen, Sweden)) on the day of surgery (baseline, ISQ0) and monitored at 14 days (ISQ1), 30days (ISQ2) and 60 days (ISQ3) post-implantation in each group.

Please cite this article in press as: Aly LAA, Hammouda NI, Evaluation of implant stability simultaneously placed with sinus lift augmented with putty versus powder form of demineralized bone matrix in atrophied posterior maxilla, Future Dental Journal (2016), http://dx.doi.org/10.1016/j.fdj.2016.12.001