

## THE EFFICACY OF BONE SCRAPER FOR BONE WINDOW OSTEOTOMY IN THE COURSE OF SINUS AUGMENTATION

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### ABSTRACT

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**Introduction:** The aim was to determine the efficacy of the bone scraper in the course of sinus augmentation.

**Methodology:** A total of 50 sinus augmentation procedures performed in 35 patients were included in this study. The outcome parameters included membrane perforation and bone volume collected.

**Results:** Twenty-two were female, and 13 males. The age ranged from 55 to 80 years. The average osteotomy site dimensions were  $(12 \pm 2) \times (10 \pm 2)$  mm. There were no perforations of the sinus membrane during the creation of the bony window. The average bone volume from the 50 osteotomies was  $0.75 \pm 0.25$  cm<sup>3</sup>. There were no statistically significant differences between edentulous vs. partially edentulous patients, men vs. women, or time length of edentulism.

**Conclusions:** The proper use of the bone scraper allows autogenous bone harvesting and prevents sinus membrane perforation during the creation of the bony window and is cost-effective financially.

**Keywords:** bone scraper, sinus floor, augmentation, perforation, membrane, bone graft.

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### 1. Introduction

Implant dentistry in the posterior atrophic maxilla still poses a challenge, due to lack of alveolar bone height. Sinus augmentation procedures are done to generate sufficient bone to place an implant. Bone graft may be autogenous bone and/or xenografts and/or alloplasts to fill in the volume created. For the autogenous donor site, the iliac crest or the mandibular symphyseal area are often used [1-9]. Autogenous bone graft particles still serve as the gold-standard of bone grafting [8-12]. Particulate bone grafts are often used alone or in combination with xenografts or allografts during sinus augmentation procedures [13]. Estimating the bone volume to be harvested prior to surgery for maxillary sinus floor bone grafting might help in selecting the donor site, minimizing complications following bone harvesting, and reducing expenses [14].

The bone scraper (Ebner™ grafter, Maxilon Laboratories, Inc. Hollis, NH, USA) is an instrument comprised of a reusable stainless-steel handle and a disposable blade. The blade shaves bone from cortical surfaces producing

short convoluted ribbons. While being cut, shavings combine with blood and flow into the handle's head. This graft material, an osseous coagulum, is then delivered with the handle directly to the recipient site, or to a bowl.

The object of this study was to measure the amount of bone that can be harvested from common bony window osteotomy prior to sinus membrane elevation dental implant osteotomies using the bone scraper in order to give the surgeon an idea of how much bone can be collected. Thus, the surgeon will be able to predict in advance how much additional graft material will be needed to fill the sinus.

### 2. Methodology

Patients undergoing sinus augmentation at the Tel Aviv University or the private practice of the authors were included in the study. Inclusion criteria were absence of clinically significant health problems, use of bone scraper, valid documentation regarding sinus

membrane perforation and bone volume. The study was approved by the ethical committee of the Tel Aviv University.

Surgery commenced as a routine lateral approach sinus augmentation. Following local anesthesia and flap elevation, the entire head of the bone scraper was dipped into sterile saline solution before starting to cut and collect bone from the window osteotomy. Force was applied perpendicularly to the lateral sinus wall surface and the instrument was pulled backwards. The instrument cut with straight-back or side motion. Repetitive strokes were used to cause bone shavings and blood to flow through the aperture into the head. Looking through the view slots monitored progress. Over-filling was avoided to prevent aperture clog. The blade was removed with the aid of a curved 12.5 cm Halstead Mosquito hemostat. The head was placed close to a bowl and the graft material was spooned out with a curette (Figs. 1-3). In order to harvest additional graft material, the blade was reattached and the procedures were repeated as required. Membrane perforations were registered. Mesiodistal and vertical dimensions of the lateral bony window were measured using a periodontal probe. The samples were lightly packed into a 1 mL syringe for volumetric evaluation. Chi square test was used for statistical analysis.

### 3. Results

Thirty-five patients were included in the study. Twenty-two were females and 13 males. The average age was  $62 \pm 3$  years, with a range of 55 to 80 years. A total of 50 augmented sinuses were included. The average window osteotomy site dimensions were  $(12 \pm 2) \times (10 \pm 2)$  mm. There were no perforations of the sinus membrane during the creation of the bony window. The total number of major ( $> 5$  mm) sinus membrane perforations reached 5%. The average bone volume was  $0.75 \pm 0.25$  cm<sup>3</sup> per osteotomy window. There were no statistically significant differences between males and females, partially edentulism and complete edentulism. When comparing length of edentulism,  $< 5$  years to  $> 5$  years, no statistically significant differences were noted.

### 4. Discussion

When using a bone scraper during window osteotomy sites, a predicted  $0.75 \pm 0.25$  cm<sup>3</sup> of bone can be obtained from an osteotomy site of approximately  $(12 \pm 2) \times (10 \pm 2)$  mm. Autogenous grafts can often be combined with xenografts or alloplastic materials to provide extra bulk to fill the sinus or peri-implant defects when implants are placed simultaneously. Collecting graft material in this way can often spare the patient a separate surgical donor site. Surgical expense and time can also be saved when this technique is used, which is beneficial to both the patient and the surgeon. When combining xenografts or alloplastic material with autogenous bone, decreased amounts of xenografts or alloplastic material will have to be used to increase the bulk of the graft. This also reduces the expense for xenografts or alloplastic materials.



Figure 1. Bone harvested from one window.



Figure 2. Bone scraper after blade removal.



Figure 3. Bone spooned out with a curette.

In the present study, a volumetric measurement was used because it is more closely associated with xenografts or alloplastic materials, which are often purchased by volume rather than weight.

A recent study [15] described the use of a mini bone scraper for a lateral bone window approach and simultaneous bone harvesting during sinus floor elevation. There was no injury of the Schneiderian membrane, and the mean volume of particulate bone collected from the anterior wall of the maxilla using this technique was 0.74 cm<sup>3</sup>. Supplementary allogeneic materials were not required in all cases. They concluded that the use of bone scraper is a simple and safe procedure in lateral bone window approach and simultaneous bone harvesting during sinus floor elevation, because it is performed under better

visualization of the membrane without irrigation. The maxillary sinus [14] volume was measured as an aid to determine the volume of graft bone needed before grafting the autogenous bone to the maxillary sinus floor. Maxillary sinus volumes were measured from computerized tomographic images of 38 sinuses using a 3-dimensional reconstruction system. When the sinus-lift procedure was simulated, the mean volume for bone grafting was 0.70 cm<sup>3</sup> for 5 mm lifting, 1.92 cm<sup>3</sup> for 10 mm lifting, 4.02 cm<sup>3</sup> for 15 mm lifting, and 6.19 cm<sup>3</sup> for 20 mm lifting. Combining the data from this study [14] with the mean volume obtained in the present study one can deduce that for a 5 mm lifting there is no need for additional bone, for 10 mm lifting an additional 1 ml of bone substitute will be required. The cost of 0.75 cm<sup>3</sup> bone substitute outweighs the cost of one blade. Therefore, the use of bone scraper is also advantageous from a financial point of view. Using a bone scraper minimized sinus membrane perforations during the creation of the bony window. Sinus membrane perforations may reach up to 44% [16]. We have previously reported [17] an incidence of 28% significant (> 5 mm) membrane perforations, observed intraoperatively, during sinus augmentation procedures. The access to the sinus was achieved by the use of rotatory instruments. The use of the bone scraper highly reduced the incidence of significant (> 5 mm) membrane perforations, to a merely 5%. A recent study [18] compared bone scrapers versus piezoelectric surgery in the lateral antrostomy for sinus floor elevation. The scraper was compared in terms of efficacy, speed, and safety to an ultrasonic insert for osteoplasty, in a randomized controlled clinical trial with a split-mouth design. Twenty-five patients were included. The occurrence of membrane perforation, laceration of vascular branches, and surgical time were recorded. No significant differences were found in terms of surgical time, incidence of membrane perforation during antrostomy (4.3% in both groups), or other intraoperative complications between the 2 techniques. The authors concluded that both surgical approaches represent effective options for performing lateral antrostomies during sinus floor elevation procedures in a safe and predictable way.

## 5. Conclusions

1. When using a bone scraper to harvest bone from the bony window osteotomy prior to sinus membrane elevation, an average of 0.75 ± 0.25 cm<sup>3</sup> of bone can be obtained from a site approximately (12 ± 2) x (10 ± 2) mm.
2. Its proper use minimizes sinus membrane perforations.
3. The use of bone scraper is cost-effective financially.

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## CV

Liat Chaushu, DMD, graduated magna cum laude at the Maurice and Gabriela Goldschleger School of Dental Medicine, Tel Aviv University, Tel Aviv, Israel. She completed her MSc Degree at the Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel. She is a graduate of the Periodontology program and a member of the Department of Periodontology and Implant Dentistry, the Maurice and Gabriela Goldschleger School of Dental Medicine, Tel Aviv University, Tel Aviv, Israel. Graduate of the European Federation of Periodontology. She is a member of the Israeli Society of Periodontology and Osseointegration, A member of the European Federation of Periodontology and also a member of the Israeli Dental Association. She lectures nationally and internationally and has published over 20 manuscripts in peer-reviewed journals. She is the founder of an Israeli start-up company, Implant B, with a unique patent for the treatment of peri-implant disease.

## Questions

### 1. Sinus membrane perforations in general may reach up to:

- a. 10%;
- b. 22%;
- c. 44%;
- d. 63%.

### 2. Sinus membrane perforations using bone scraper may reach up to:

- a. 5%;
- b. 10%;
- c. 44%;
- d. 63%.

### 3. The average bone volume collected from an osteotomy was:

- a. 0.25 cm<sup>3</sup>;
- b. 0.5 cm<sup>3</sup>;
- c. 0.75 cm<sup>3</sup>;
- d. 1 cm<sup>3</sup>.

### 4. The average bone volume collected from an osteotomy in males vs. females is:

- a. Higher;
- b. Lower;
- c. Similar;
- d. Not statistically significant different.



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