Tenting of Maxillary Sinus Lining with Titanium Inserts™

A Thesis Submitted to the Faculty of Dentistry, Ain Shams University in partial fulfillment of the requirements of Master degree in Oral and Maxillofacial Surgery

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Dedication

To my wonderful dad & mam, to my lovely wife, to my sons Ammar & Malek, to my lovely sisters and to my uncle Mahmoud's soul.

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LWT	Lateral Window Technique
ISL	Internal Sinus Lifting
CT	Computerized Tomography
CBCT	Cone Beam Computerized Tomography
OPG	Orthopantogram
Mm	Millimeter
IV	Intravenous
HU	Hounsfield Unit
IM	Intramuscular
NSAID	Non-steroidal anti-inflammatory drug
H&E	Haematoxylin and Eosin stain
TAT	Transalveolar Technique
AMBE	Antral Membrane Balloon Elevation
MIAMBE	Minimally Invasive Antral Membrane Balloon Elevation
BMP	Bone Morphogenic Proteins
PMCB	Particulate marrow and cancellous bone
FDBA	Freeze-dried bone allograft
DFDBA	Demineralized freeze-dried bone allograft
SD	Standard Deviation
MSM	Maxillary sinus membrane

Introduction

Edentulism partially or completely is one of the major problems in restorative dentistry. Fixed and removable prostheses offer solution for some cases but not all cases. Cases with free end saddle can't have fixed prostheses because of distal support lacking. In the same time the removable prosthesis cannot offer comfortable and stable feeling as a fixed one.

Endosseous dental implants are an excellent solution for prosthetic reconstruction in partially or completely edentulous patients. But as any treatment modality there are many limitations for dental implants, one of them is decreasing in the vertical and horizontal bone dimensions in the maxillary arch especially in the posterior region. This is occurred due to alveolar bone atrophy and maxillary sinus pneumatization. Loss of maxillary molar teeth leads to rapid resorption of bone in alveolar process below maxillary sinus floor. In addition, poor bone quality of maxilla which composed of fine trabeculae with little or no cortical crest, making it the least dense bone of the body. These limitations can prevent placement of dental implants of sufficient length leading to unsuccessful prosthesis loading, ended by implant failure [1-3].

To meet the basic requirements for implants placement in posterior region of maxilla many approaches have been developed. These approaches can be divided in non-surgical and surgical approaches. Non-surgical approach was concerned with modification in implants surface treatment or placement themselves without intervention in maxillary sinus itself. While surgical approach was concerned with subantral maxillary sinus augmentation. It has become one of a standard procedure to increase the

quantity of bone in the sinus floor region in order to use longer implants than the atrophied jaw could normally accommodate [1-7].

Placement of implants anterior, posterior or medial to the sinus area was a non-surgical approach to avoid modification of the maxillary sinus topography. Attempts to place implants posterior to the maxillary sinus into the tuberosity and pterygoid plates although surgically feasible they resulted in improper prosthodontic support. Other attempts to place implants medial to the maxillary sinus also resulted in high failure rates due to inadequate bone support for implant in the medial aspect of the sinus [4, 5].

Another non-surgical approach was using of short implants, although their use has long been associated with low success rates and discouraged from the biomechanical point of view when combined with poor bone quality and high occlusal loads [6-8].

So due to these limitations of implants placements and designs, thinking in maxillary sinus topography modification was taken a priority to overcome these limitations. A lot of surgical techniques and grafting materials for augmentation have been developed to overcome the problem of reduced bone height in the posterior maxilla [9-11].

There are currently two techniques widely used for maxillary sinus augmentation, the ***Lateral Window Technique*** (LWT) and ***Internal Sinus Lifting Technique*** (ISL). These techniques have been shown to be two of the most stable techniques for vertical augmentation in the oral cavity [12].

Although these techniques offer the solution for maxillary sinus height deficiency, they have limitations and disadvantages. Compromising implant initial stability, possibility of sinus membrane perforation, alveolar

ridge fracture, or patient discomfort are examples for this disadvantages [10, 13-15].

Many different bone grafting materials have been used in sinus augmentation to encourage or stimulate bone growth in this area. For the reconstruction of bony defects of the maxillary sinus, autologous bone from the iliac crest is still the gold standard. Its disadvantages are the limited availability of bone, and the necessity for an additional operation under general anesthesia, a prolonged stay in hospital, and the risk of postoperative pain, parasthesia, hypersensivity, pelvic instability, and infection. To reduce morbidity at the donor site, allogeneic, xenogeneic, alloplastic, composite or tissue engineered bone materials were introduced [16].

There for, recent reports by **Lundgern S**. **et al** [1], **Ta-Wei C**. **et al** [3] and **Andreas T**.**et al** [17], which our study is based on, showed new bone formation at the maxillary sinus floor following simultaneous mucosal lining of sinus elevation and implants placement "***Tenting Technique***". This can be explained by the reorganization of formed blood clot to bone, due to surgical procedure of elevating the sinus lining through a Caldwell-Luc approach.