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Graft materials in lateral window approach for maxillary sinus lift procedure before implant placement

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ABSTRACT

Endosseous dental implants have been widely used in the past decades for rehabilitation of edentulous area as a successful and predictable treatment strategy. Achieving the adequate volume of bone is the prerequisite and a challenging issue for severely atrophic areas. Several reconstructive procedures have been used for vertical and horizontal bone augmentation before implant placement. Maxillary open sinus lift procedure is a conventional technique for elevating the sinus floor and placing the bone graft in the posterior atrophic maxilla before implant placement. This article represents the graft materials used for lateral approach sinus lift surgery.

Keywords— *Graft material, Maxillary sinus lift*

1. INTRODUCTION

Since the dream of osseointegration became a clinical reality in the late 1950s by Per-Ingvar Branemark's experiences, modern dental implants have been used as a reliable treatment option for replacing missing teeth in both partially and complete edentulous jaws. Achieving true osseointegration and survival of dental implants can be influenced by several factors including general health, bone quality and quantity of the edentulous area, implant design and surface and continuing well maintenance considering both oral hygiene and Load-bearing capacity of dental implants for all over the life [1-3].

Considering the low density of available bone, implants placed in the posterior maxilla may endure significantly greater failures compared with all other intraoral implant positions. Surgical Implant procedure in the posterior maxilla often represents a clinical challenge because of the inadequate bone volume resulting from *pneumatization* of the maxillary sinus along with resorption or loss of alveolar crestal bone. Therefore, several procedures are suggested to increase the volume of vertical bone height through the sinus before implant placement in the posterior maxilla. The aim of these procedures is to lift the schneiderian membrane from the floor of the sinus to an upward position, thus creating superiorly located sinus floor with a space between the membrane and the alveolar crest. This space can be filled with an autogenous or nonautogenous bone graft and the implants can place simultaneous or after a healing period delayed. The time for bone graft healing varies from 3 to 9 months depending on several issues such as graft's volume and type, patient's age and health, the technical procedure of the surgery and etc [4-7].

2. GRAFT MATERIALS AND PROCEDURES

Boyne and James' for the first time presented maxillary sinus floor elevation using the autogenous bone for placing a blade-like implant in 1980. They entered the maxillary sinus for Schneiderian Membrane elevation through a superior opening in the lateral wall which is known as "Caldwell-Luc" procedure. Then they placed the particulate iliac bone graft at the prepared site and inserted the implants following 3 months. Several graft materials for sinus lift surgeries have been investigated, although the sinus elevation can be attained without the use of bone grafts in meticulously indirect sinus lift procedure with Osteotome technique.

The original principle for the use of graft materials in sinus lift procedure is to maintain a space for raising the membrane and provide a scaffold for osteoblast migration from the lateral walls of the sinus through space and bone healing. Originally graft materials are categorized into 4 groups including *autografts, allografts, xenografts* and nonbone graft materials. Table 1 shows the origin of various graft materials that can be used for sinus lift surgery [8, 9].

Table 1: Origin of various graft materials and their definition

Bone graft materials based on their origin	Definition
Autografts	Bone grafts that are obtained from the same individual either intra-orally or extra-orally.
Allografts	Bone grafts that are obtained from a different individual of the same species.
Xenografts	Bone grafts from a different species.
Nonbone graft materials	Substitutes that can be used as bone graft materials include calcium sulfate and calcium phosphate biomaterials, plastic materials, ceramics, and coral-derived materials.

Table 2: Bone graft materials based on their function and mechanism of action

Bone graft materials based on their function	Mechanism of actions
Osteogenic	*Osteogenesis* means formation or development of new bone by vital osteoblasts contained in the graft. This process occurs in the favoured autograft transplants.
Osteoinductive	*Osteoinduction* is a biochemical process achieved by graft's growth factors or bone morphogenetic proteins for converting the neighbouring cells into osteoblasts or stimulates their migration through graft for bone formation.
Osteoconductive	*Osteoconduction* is a physical property of graft materials that have no inductive effect and the matrix of the graft just provides a scaffold for neighbouring cells to penetrate the graft and form new bone.

2.1 Open versus closed sinus lift procedure

The Maxillary sinus graft procedure for increasing bone height in the posterior maxilla in order to place dental implants can be performed by either an open or closed surgical approaches. The differences of techniques used for sinus elevation and bone augmentation are mainly based on the anatomic site of the window used to gain access to the maxillary sinus. Distinctively, for different purposes four special anatomic locations have been used for entering the maxillary sinus: (a) the superior lateral wall, or "Caldwell-Luc," surgery, (b) the middle lateral wall entrance, (c) the inferior lateral wall entrance, which is positioned at the same level of the alveolar ridge; and (d) the crestal surgical approach, which is an opening through the alveolar bone crest [10, 11].

3. CONCLUSION

Currently, the most common surgical technique for sinus elevation and bone augmentation is the lateral wall window osteotomy (middle or inferior approach) for its visibility, convenience and accessibility of the surgical area. Several grafting materials including allografts, alloplasts and xenografts alone or in combination with autogenous bone can be effective as bone substitute graft materials for sinus bone augmentation.

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