Rehabilitation with Sinus Augmentation

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There is much variation in the terminology for Sinus Augmentation in the literature. It has been known as Maxillary Sinus Elevation, Maxillary Lift, Maxillary Sinus Augmentation, and Subantral Augmentation. No matter what its name, Sinus Augmentation is the surgical procedure when the floor of the sinus is low and the sinus membrane needs to be lifted up in order to gain sufficient bone height for implant placement.

The sinus is a cone shaped space of about 3 cubic centimeters located under the eye and outside the nose cavity and above the mouth cavity. Sinus membrane is a lightly attached mucoperiosteum layer called the Schneiderian Membrane, with thickness of 0.3 to 0.8mm. As early as 1962, Boyne and Kruger discovered that when objects (e.g., a tooth root when pulling a tooth) are pushed into the sinus cavity and the membrane moved upwards, the bone formation would appear. In 1980, Boyne and James reported on the Posterior Caldwell-Luc Approach. They opened a 1 cm² hole in the sinus cavity, moved up the membrane, and inserted an autogenous bone graft. After 10-12 weeks, a blade implant was inserted. Tatum in 1986, reported utilizing the lateral wall approach to make a greenstick facture in the lateral wall of the sinus cavity and horizontally rotate it upward to become a ceiling. If the thickness of the alveolar ridge exceeds 4-5mm, then both autogenous bone augmentation and implant placement was simultaneously performed. After 4 to 6 months healing, a prosthesis was placed. In 1989, Kent and Block published a paper on sinus augmentation and simultaneous implant placement. They reported three horizontal incisions according to the width of the keratinized gingiva, also grinding to form a U shaped osteotomy by using a no. 8 round bur. The outside bony wall was then turned and lifted up to become the ceiling. If the thickness of the alveolar ridge only needs to be 1-2mm. They used both autogenous graft bone and decalcified freeze-dried bone allograft (DFDBA) for the graft. The second surgery was 9 months later, and in the 2 years following, no
The Academy of Osseointegration held the Sinus Consensus Conference in 1996 and published the results in 1998. The consensus reported that 1,007 sinus graft patients were surveyed, and 2,997 implants had been followed for 10 years with an above 90% success rate achieved. The bone graft materials included Autogenous Bone, Allograft, Alloplast, and Xenograft; single and combined use. The conclusion reached by the Conference was that no matter which bone graft material is used, sinus augmentation is a highly predictable and effective rehabilitation technique. Kanfman in 2003, published various discussions about sinus surgery including, the importance of patient’s overall health and dental evaluation, different methods, pro and cons of different materials, possible risk factors and side effects. Also in 2003, Fugazzotto focused on the upper jaw posterior area and the possible need for lateral placement for a bone graft, the need of the bone height to be 4mm, he also addressed treatment methods of different surgical procedures.

Case report

A 68 year old female patient, first to my clinic because her upper right first premolar had a deep cavity and was sensitive to hot and cold water. Her height was 148cm, weight 38kg, smoked seven cigarettes a day and drank some wine. She had been to different dental clinics for treatment.

From the oral examination: ill-fitting crowns and bridges, poor oral hygiene, mild to moderate gingival inflammation, a very deep overbite and overjet (Figs 1). From the full mouth x-ray examination: slight loss of alveolar bone, ill-fitting prosthesis, improper root canal
filling, and caries were found (Figs 2).

Treatment procedure divided into three phrases:

I. Preparation Phase:
   a. Basic periodontal inflammation control
   b. Provisional restoration
   c. Root canal treatment

II. Surgical Phase:
   a. Sinus augmentation combined with implant first stage surgery
   b. Second stage implant surgery

III. Prosthetic Phase:
   a. Implant provision placement
   b. Readjusting occlusion of full mouth provision crown and bridge
   c. Final prosthesis placement

The purpose of the preparation phase is to control the inflammation of the teeth and periodontium. Removing the original ill-fitting prosthesis and replacing with temporary provision plus basic periodontal treatment is able to control periodontal inflammation. It is also to maintain normal functional occlusion of the patient and prepare for root canal treatment (Figs 3).

The objective of the surgical phrase was use of the sinus augmentation and implant to achieve stability of posterior occlusion for the patient in the future. The surgery was to open a full thickness flap, using a no. 8 round bur to ground an approximately 6mm x 6mm diameter window, and lift the sinus inner membrane. Both FDBA and DFDBA were combined as bone graft and implants were also inserted. The window was then covered with a non-absorbable barrier membrane to help bone formation (Figs 4). The root of the left second premolar was extracted and immediately replaced with an implant. This socket opening was then covered with a barrier membrane, and the soft tissue sutured. After 9 months, second stage surgery proceeded by opening a partial thickness flap to remove the barrier membrane. Then using a bone profiler to shape the crestal bone around implants, healing abutments were then inserted, and the flap was apically positioned sutured.

At the prosthetic phase, provisional crowns were placed, for the patient to become accustomed to the occlusion as well as to ensure osseointegration of the implant (Figs 7). The final prosthesis was inserted around 6 months after readjusting the occlusion (Figs 8).
Discussion and Conclusion

Cases of full mouth treatment need to begin with inflammation control, and to achieve stable posterior occlusion as goal. The aesthetic treatment is not just whitening teeth and cosmetic treatment for front teeth, but needs careful attention to the details of the total treatment. By attention to basic details, an aesthetic result in the overall treatment can be achieved.

Basic control of inflammation divides into tooth and periodontal treatment. For tooth, this is to make sure there is correct treatment of decay and root canal problems. Periodontal treatment is to improve patient’s oral hygiene, scaling, root planing, and to remove the original ill-fitting crowns and place temporary provisions in order to control the inflammation of the periodontium.

Techniques of sinus augmentation include lateral window and osteotome approaches. In this case, the lateral window approach was used to get a clear view for the surgical process. The large quantity of bone graft material with a small window opening can achieve a better healing result.

Sinus augmentation can be catalogued a type of guided bone regeneration, traditionally using a lateral window approach, with a window opening of around 1 cm². However, by using a self-modified Kirkland Chisel of the writer’s, the opening can be reduced to 6–7mm² while still lifting the sinus membrane. In this way, the disruption is minimal and the bone graft can be surrounded by more original bony wall. From the writer’s point of view, this should achieve better reformation of the bone.

References