

SINUS GRAFTING SURGERY.

Dental implants inserted into the jawbones to support dental prostheses rely on the maintenance of a direct structural and functional connection between living bone and the implant surface. This connection termed **osseointegration** was first described by Brånemark in 1977. Insufficient bone volume is common. The bone available for implant placement may be limited by the presence of the maxillary sinus together with loss of alveolar bone height.

Bone volume may be increased by augmentation of the sinus cavity with autogenous bone or **biomaterials** or both.

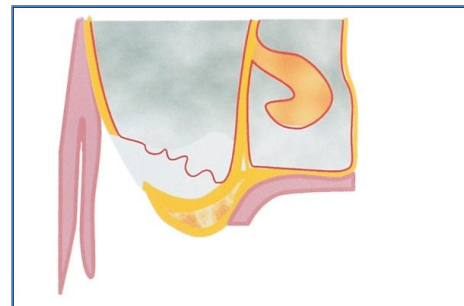
Implant placement may be combined with sinus augmentation as a 'one-stage' technique. Alternatively sinus augmentation may be carried out at some time prior to implant placement, as a 'two-stage' technique which requires an additional surgical episode.

Techniques of sinus augmentation (sinus lift)

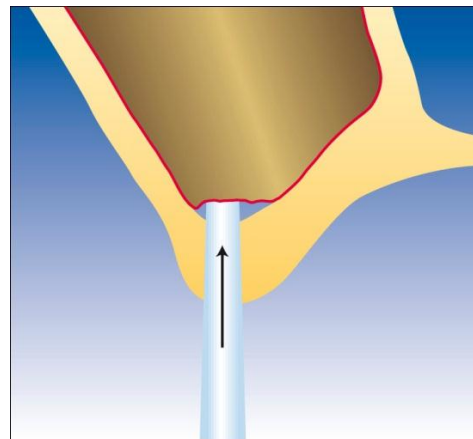
In 1980 Boyne first described the pre-prosthetic surgical technique of retrograde sinus augmentation. The technique required a window to be prepared in the lateral wall of the sinus via a buccal sulcus incision, the mucosal lining was elevated to create a cavity into which particulate bone from the iliac crest was placed and allowed to heal for about 6 months or more before placing the implants.

Tatum described five tissue incisions (crestal, palatal, split thickness palatal, vertical and horizontal vestibular), three types of bone access (crestal, buccal wall and Le Forte I). In addition Tatum described sinus augmentation and implant placement as a one-stage and a two-stage technique in 1986.

The technique, known as a **lateral window sinus lift**, is widely used today and is considered reliable particularly when autogenous bone is used (Wallace 2003; Del Fabbro 2004).



Summers described a less invasive one-stage technique for sinus floor elevation with simultaneous implant placement called the **osteotome sinus floor elevation**. Summers considered a requirement for at least 6 mm of residual bone to ensure primary stability of the implant. Concave tipped osteotomes of increasing diameter applied via a crestal approach advance a mass of bone beyond the level of the original sinus floor, elevating the mucosal lining. Summers combined this procedure with the addition of a bone graft material (Summers 1994). For cases of less than 6mm residual bone height, Summers proposed a two-stage approach. A bone plug is defined with a trephine and displaced superiorly with the use of a broad osteotome. Hydrostatic pressure elevates the mucosal lining of the sinus. The resultant osteotomy is filled with a bone graft material and the implant placed after a period of healing (Summers 1995).



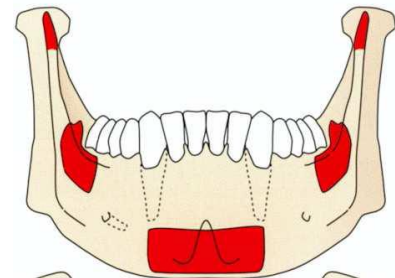
Crestal technique (summers) v Lateral Window

A minimum of 3 mm crestal bone height is generally recommended to stabilize the implant at placement (Cosci 2000). The crestal approach is less invasive and is a one-stage technique. The amount of bone which can be gained is usually less than that obtained with the lateral window technique.

Materials used in sinus lift procedures

Autogenous bone has long been considered the gold standard (Palmer 2000). Intra-oral donor sites such as the chin and ramus (shown in red) are convenient but yield limited volume.

Extra-oral donor sites (iliac crest, tibia, ulna, rib and calvaria) increase surgical complexity and are associated with significant and significantly under reported morbidity.



Alternative grafting materials can be described as being either:

1. Allografts tissue from the same species.

Cadaveric bone is harvested and various techniques (freeze drying and irradiation) reduce antigenicity. The grafts are then sterilised and supplied by specially licensed tissue banks.

2. Xenograft tissue from different species.

Anorganic bovine and equine bones predominate. Chemical removal of the organic component creates a mineral scaffold.

3. Alloplastic or synthetic bone substitutes.

There are many types classified in terms of porosity as dense, macro-porous, microporous, and either crystalline or amorphous. The structure influences performance.

Examples are: beta tri-calcium phosphate, Hydroxyapatite, Bio-active glass and Calcium Sulphate.

Alternative techniques.

Several alternative techniques to sinus lift surgery exist such as:

1. Onlay bone grafts for horizontal or vertical augmentation.
2. Implants can also be placed with an angulated direction to avoid the maxillary sinus (Aparicio 2001). Such 'tilted' or 'angulated' implants can only be used when anatomical conditions permit.
3. Zygomatic implants offer an alternative to sinus augmentation. Long implants pass through the sinus directly into the zygomatic process.
4. Short implants are proposed for use without augmentation and offering a less complex and faster alternative to augmentation. A review of studies suggested a failure rate of approximately 10% for implants 7 mm long (das Neves 2006) which suggest shorter implants may have a poorer prognosis than longer ones. Several company propose implants of 5mm with a corresponding increased width which.

Ref: Interventions for replacing missing teeth: augmentation procedures of the maxillary sinus (Review) 5 Copyright © 2010 The Cochrane Collaboration.