1996 Sinus Consensus Conference Revisited in 2016

Twenty years ago, the 1996 Report of the Sinus Consensus Conference was published in this journal. At that time, an important reason for the conference was to validate a relatively new procedure and attempt to quantify scientific variables that impacted sinus floor bone grafting success. Scientific progress in the past 20 years has advanced this effort in the following five ways.

Materials. It has now been shown that noninductive materials with slow resorption profiles can work better at forming and maintaining bone than inductive materials such as maxillofacial or extremity autografts and allografts. This is a remarkable and counterintuitive conclusion to state. Therefore, the need for biologic enhancement with growth factors and morphogens may be limited.[1–8]

Technical Method. The second point of interest is the method of space creation. It appears that any method that elevates the sinus membrane and maintains space will lead to new bone formation. The Sinus Consensus Conference strictly reported on the use of the lateral approach via a Caldwell Luc antrostomy. Now, depending on available bone, a commonly used method is the transcrestal approach using osteotomes.[9–19]

Angled Implants. The third aspect to undergo change over the past 20 years is less need for sinus bone grafting for complete arch restoration in edentulous settings. This entails the use of angled implant placement, including the use of zygomatic implants. This generally four-angled implant method has sparked a revolution in fixed prosthodontics of the edentulous maxilla. Use of angled implants, pterygoid implants, and zygomatic implants avoids the need for sinus grafting altogether, yet they are able to restore posterior maxillary function with a fixed restoration on implants.[20–29]

Combined Sinus and Alveolar Grafts. The fourth change in thinking is alveolar manipulation in conjunction with sinus floor grafting to create orthoalveolar form, usually in partially edentulous settings. The need for an optimal crown-implant ratio similar to the dentate-crown root ratio is discredited biomechanically, but aligning alveolar restoration of the segmental alveolar bone continues to be thought of as favorable for gingival alveolar bone health. Thus, alveolar crest augmentation in conjunction with sinus floor manipulation continues to be employed to correct reverse or deficient crestal bone architecture, increase bone for osseointegration, improve emergence profile esthetics, and establish bolus deflection.[30–43]

Short Implants. The fifth alteration in thinking relates to the partially edentulous patient with missing molar or premolar teeth, either segmental or single missing teeth, with sinus proximity. A relatively small amount of available bone may be enough for the use of implants as short as 5 mm in height in some settings, obviating the need for sinus floor manipulation. Improved implant sizing and surface texture make single sites in the area of the sinus unique possibilities. An example is molar extraction followed by simultaneous placement of a short and wide-diameter implant. However, this area of interest has the least long-term evidence, particularly for posterior maxillary bone.[44–51]

Long-term studies have determined implant success in sinus floor bone graft settings. It remains uncertain, however, how much of a role sinus graft–directed osseointegration has compared with residual bone implant osseointegration. In fact, for a large proportion of cases, it has been reported that the sinus graft may not have been needed for long-term implant support.[52–58]

Bone has been shown to form in the sinus bone graft by migration from the sinus floor into an osteoconductive scaffold. Pluripotent cells in the sinus membrane also participate in bone formation such that the entire periphery of the graft consolidates in advance of the central portion of the graft. Inductive agents such as bone morphogenetic protein (BMP)-2 accelerate this process by cell recruitment and local cell differentiation, but the graft still consolidates in a similar way. Despite the material used and the technique employed, the primary determinant of bone formation in the sinus floor is by early vascularization of the graft matrix.[59–69]

Space maintenance is required for sinus bone graft consolidation to occur. Though small rents in the membrane repair do not lead to failure of the graft, rents increase graft loss and decrease graft performance by reducing space. If the entire membrane is lost, space can be confined by a barrier membrane and still lead to graft consolidation.[68–72]

The minimum requirement for bone formation appears to be an intact membrane supported physically, such as by tenting of dental implants. In this setting, blood clotting alone is sufficient to form sinus floor bone and osseointegration of exposed implant threads.[73–77]

Implants passing through the sinus ungrafted and exposed do not cause sinus reactions of significance.[78–80]

Smokers have been shown to have poor wound healing and less successful sinus grafts, including higher rates of implant loss.[81–84]

Simultaneous implant and graft placement continues to be reported in the literature as a favorable treatment and is acceptable when mechanical fixation of the implant is possible.[85–86]

Immediate loading of sinus-grafted implants has been reported but is not as well documented.[87–90]

The early consensus of 1996 continues to be verified using a number of biomaterials, sinus membrane elevation methods, and loading protocols. In addition, avoidance of sinus grafting appears to be on the rise with the greater frequency of the use of short implants, angled implants, and zygomatic implants.

The future of sinus grafting appears to be best considered for partially edentulous patients or in cases where orthoalveolar form is desired.

See online appendix containing the 1996 Report of the Sinus Consensus Conference.

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