



CONE BEAM COMPUTED TOMOGRAPHY AND ODONTOGENIC SINUS DISEASE IN RISK STRATIFICATION OF POSTERIOR MAXILLARY SINUS FLOOR ELEVATION COMPLICATIONS

Halilov Atubiddin Kadritdinovich

Department of Elective Dentistry,
Eurasian Multidisciplinary University,
Tashkent, Uzbekistan

ablesamarkand@gmail.com

<https://orcid.org/0009-0001-8115-3118>

Abstract: Sinus floor elevation remains a routine method for implant rehabilitation in the posterior maxilla when residual bone height is inadequate. Its safety, however, depends not only on surgical technique but also on rigorous preoperative assessment. This extended abstract summarizes contemporary evidence on complications of sinus floor elevation, with emphasis on the diagnostic role of cone beam computed tomography and the need to identify odontogenic maxillary sinus disease before augmentation. The source material was a focused narrative review of publications indexed in major medical databases between 2003 and 2025. The most frequent intraoperative complication is perforation of the Schneiderian membrane, and its probability increases in the presence of sinus septa, unfavorable sinus configuration, and radiological evidence of inflammatory or structural abnormalities [1-4]. Postoperative complications include sinusitis, graft contamination, wound problems, and migration of implants or biomaterials into the sinus cavity. The evidence supports one central practical conclusion: cone beam computed tomography should be treated as the principal tool for risk stratification, and



sinus floor elevation should be postponed when unresolved odontogenic infection or clinically significant sinus disease is suspected [2,5,6].

Keywords: *sinus floor elevation; dental implantation; posterior maxilla; cone beam computed tomography; odontogenic sinusitis; complications*

Introduction: Implant placement in the posterior maxilla is often limited by loss of alveolar bone after tooth extraction and by progressive pneumatization of the maxillary sinus. Sinus floor elevation was developed to compensate for this anatomical deficit and remains a core procedure in implant dentistry [1]. Yet it should not be regarded as a standard intervention with a uniform risk profile. Clinical outcomes are influenced by residual bone height, sinus anatomy, membrane condition, and the biological status of adjacent teeth and of the sinus itself. A planning strategy based only on bone quantity is therefore insufficient.

Aim: The aim of this work was to synthesize current evidence on complications of sinus floor elevation and to clarify the practical significance of cone beam computed tomography and odontogenic sinus evaluation before implant treatment.

Materials and Methods: This text was prepared as a focused narrative review. Publications indexed in PubMed/MEDLINE, Scopus, eLIBRARY, and CyberLeninka from 2003 to 2025 were screened using combinations of the terms sinus lift, sinus floor elevation, implant complications, cone beam computed tomography, odontogenic sinusitis, maxillary sinus, membrane perforation, and related expressions. Priority was given to systematic reviews, meta-analyses, consensus documents, and clinically relevant retrospective studies addressing surgical complications, radiological risk factors, and multidisciplinary management pathways. The review was designed as a clinically oriented synthesis rather than as a formal systematic review with meta-analysis.



Results and Discussion: The leading intraoperative complication of sinus floor elevation is perforation of the Schneiderian membrane [2]. Its clinical significance is determined not only by the presence of the defect, but also by its size, timing of recognition, repair feasibility, and baseline sinus condition. Septa, complex sinus topography, and unfavorable lateral wall anatomy consistently increase perforation risk [3].

Cone beam computed tomography is central to preoperative planning because it permits three-dimensional assessment of the sinus floor, residual ridge, septa, root-sinus relationships, and mucosal abnormalities. It also helps identify radiological patterns that should not be dismissed as incidental findings when they coexist with endodontic failure, periodontal destruction, retained roots, oroantral communication, or prior implant complications [4-6]. In such settings, sinus floor elevation should be deferred until the dental source has been identified and treated.

Postoperative complications are heterogeneous. Not every radiological change after augmentation corresponds to clinically manifest sinusitis, but persistent pain, swelling, purulent discharge, nasal symptoms, or progressive imaging abnormalities require active follow-up. Reported adverse events include acute or chronic sinusitis, graft contamination, wound dehiscence, bleeding, and migration of implants or biomaterials into the sinus cavity [1,2]. When foreign material enters the sinus, treatment often requires coordinated dental and otorhinolaryngological management rather than isolated implant revision [5,6].

Clinical Implications: Several practical principles follow from the reviewed evidence. Cone beam computed tomography should be considered the primary method of preoperative risk stratification. Active odontogenic infection must be eliminated before augmentation. Radiological findings should be interpreted together with dental history and clinical examination, and



surgeons must be ready to modify or abandon augmentation when sinus anatomy or inflammatory status is unfavorable.

Limitations: These conclusions should be interpreted cautiously because the underlying review was narrative rather than fully systematic, and the literature remains heterogeneous in operative technique, imaging criteria, and complication reporting. The present text should therefore be read as a clinically oriented synthesis rather than as a final hierarchy of evidence.

Conclusion: Sinus floor elevation remains an effective method of implant rehabilitation in the posterior maxilla, but its safety depends on diagnostic precision as much as on technical execution. Schneiderian membrane perforation remains the most common intraoperative complication, especially in anatomically complex sinuses. Cone beam computed tomography should be regarded as the principal examination for identifying structural and inflammatory risk factors before surgery. Untreated odontogenic sinus disease should likewise be recognized as a preventable cause of intraoperative difficulty and postoperative failure. The most defensible contemporary strategy is a risk-based and multidisciplinary pathway in which implant planning, dental infection control, and sinus evaluation are integrated before augmentation is attempted.

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