# MIGRATION OF DENTAL IMPLANTS INTO THE SINONASAL COMPLEX: PREDISPOSING FACTORS, DIAGNOSIS, AND SURGICAL MANAGEMENT

**Halilov Atubiddin Kadritdinovich**
Department of Elective Dentistry,
Eurasian Multidisciplinary University,
Tashkent, Uzbekistan
ablesamarkand@gmail.com
https://orcid.org/0009-0001-8115-3118

***Abstract:*** *Displacement of a dental implant into the maxillary sinus, and only exceptionally into the nasal cavity, is an uncommon but clinically important complication of implant therapy in the upper jaw. The posterior maxilla is particularly vulnerable because reduced residual bone height, low bone density, sinus pneumatization, and technically aggressive placement may compromise primary stability. This focused review synthesized clinically useful evidence on risk factors, presentation, imaging, complications, and surgical treatment. The evidence base consists mainly of retrospective series, systematic reviews, and selected case reports with verifiable quantitative data. Across the literature, the leading complication is odontogenic sinusitis, whereas displacement may occur intraoperatively, early after surgery, or later under functional load. Cone-beam computed tomography is the diagnostic standard because it defines implant location, sinus condition, and oroantral communication. Surgical management must be individualized. Transoral access remains useful when direct sinus revision and closure of an oroantral*

*defect are required, while endoscopic transnasal surgery is especially valuable when rhinosinusitis predominates or the implant is located near the ostiomeatal complex. In most patients, early removal is the preferred strategy.*

***Keywords:*** *dental implants; maxillary sinus; nasal cavity; implant migration; cone-beam computed tomography; odontogenic sinusitis.*

**Introduction:** Implant rehabilitation in the posterior maxilla is technically demanding because tooth loss is often followed by vertical alveolar resorption and sinus pneumatization, which reduce the amount of bone available for stable implant anchorage [1,3,5]. Under these conditions, displacement of an implant into the maxillary sinus becomes a low-frequency event with disproportionate clinical consequences. The complication may remain asymptomatic for some time, but it can also initiate or maintain odontogenic sinusitis, create oroantral communication or fistula, and require combined management by oral surgeons and otorhinolaryngologists [2,4,5]. Migration into the nasal cavity is much rarer, yet it reflects a more unfavorable anatomical course [1]. The aim of this review was to critically summarize current evidence on the predisposing factors, clinical presentation, radiological diagnosis, complications, and contemporary surgical management of dental implants displaced into the maxillary sinus or nasal cavity.

**Materials and Methods:** This paper was designed as a focused narrative review. Priority was given to studies reporting verifiable quantitative outcomes, including the number of patients or sinuses involved, frequency of sinusitis and oroantral communication, association with sinus floor elevation, residual subantral bone height, and patterns of surgical retrieval [2]. Unsupported numerical statements without a traceable primary source were excluded.

Because the evidence base is dominated by retrospective series, case reports, and systematic reviews derived from heterogeneous reports, all conclusions were formulated conservatively and without meta-analytic claims.

**Results and Discussion:** The dominant predisposing conditions are limited residual subantral bone height, poor bone quality, marked sinus pneumatization, and underestimation of anatomical constraints during implant placement [1,3,5]. Clinically, three temporal scenarios should be distinguished: intraoperative displacement, early postoperative migration before osseointegration, and delayed migration after loading [5]. In the retrospective study by Sgaramella et al., 68% of events were associated with indirect sinus floor elevation, 82% occurred during implant placement, and 64% of patients had a residual subantral bone height of only 2–4 mm [3]. Recent comparative data also support the role of reduced alveolar bone height and unfavorable sinus anatomy in both intraoperative and postoperative displacement.

Clinical presentation is variable. Patients may report facial pressure, purulent discharge, postnasal drip, nasal obstruction, pain, or symptoms consistent with chronic odontogenic sinusitis, but incidental detection is also possible [1,4,5]. Absence of symptoms must not be interpreted as safety because a foreign body retained in the sinus may later impair mucociliary clearance and maintain inflammation. In a series of 55 patients, oroantral communication or fistula was identified in 83%, sinusitis in 67%, postnasal drip in 49%, nasal obstruction in 23%, and pain in 16% [4].

Cone-beam computed tomography is the imaging modality of choice because it reveals the exact three-dimensional position of the implant, mucosal thickening, fluid levels, obstruction of the ostiomeatal unit, bony boundaries, and the presence of oroantral communication [1,4,5]. This information is

decisive not only for diagnosis but also for choosing the safest surgical corridor. Panoramic radiography may suggest displacement, yet it cannot reliably characterize sinus pathology or determine whether the implant has migrated toward the natural ostium or beyond the sinus into the nasal cavity.

No single retrieval technique is universally optimal. Transoral approaches, including the Caldwell–Luc route and more conservative lateral antrostomy variants, remain useful when direct access to the sinus is required or simultaneous closure of an oroantral defect is needed [1,2,4]. Endoscopic transnasal surgery offers major advantages in patients with established rhinosinusitis, pathology centered around the ostiomeatal complex, or migration into the superior sinus or nasal cavity [4,5]. Both systematic and multicenter evidence indicate that treatment selection should be driven by implant topography, sinonasal status, and the presence of oroantral defects rather than by a rigid algorithm [5].

The most relevant practical conclusion is that delayed observation is usually a weak strategy. Even when symptoms are initially mild, persistent foreign-body retention may favor chronic sinus disease and make subsequent surgery more difficult [1,5]. Prevention therefore begins before surgery: three-dimensional preoperative assessment, realistic appraisal of bone volume and density, careful implant selection, atraumatic site preparation, and avoidance of simultaneous implant placement in borderline anatomical conditions remain the main safeguards against this complication [1,3,5].

**Conclusions:** Migration of a dental implant into the maxillary sinus or nasal cavity is uncommon, but it should be regarded as a meaningful surgical complication rather than a radiological curiosity. Risk is highest in the atrophic posterior maxilla when residual bone height is limited and primary stability is

overestimated. Cone-beam computed tomography is essential for confirmation and planning, and the choice between transoral and endoscopic retrieval must be individualized. In most clinical scenarios, prompt removal is the safest evidence-based option.

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