

# Preoperative algorithm for sinus lift procedure

## Algorytm postępowania przed zabiegiem podniesienia dna zatoki szczękowej

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### ABSTRACT:

The dental implants are becoming more used by dental surgeons to perform prosthetic rehabilitation, therefore sinus lift procedure is more often performed. The complications after this procedure by the ENT specialists will be observed. So far a valid algorithm of candidates with naso-sinusal diseases for sinus lift procedure was not established. The interdisciplinary management, including ENT specialist, not only increases the expectation of a better procedural outcome, but also provides a better control while complications occur. The authors postulate that knowledge about sinus lift technique and possible postoperative complications should be well known, both by stomatologists and ENT specialists.

### KEYWORDS:

sinus lift, dental implants, maxillary sinus diseases

### STRESZCZENIE:

Wraz z rozpowszechnieniem rehabilitacji protetycznej pacjentów przy wykorzystaniu implantów zębowych zwiększyła się także częstość wykonywania zabiegu podnoszenia dna zatoki szczękowej. Z tego względu lekarz laryngolog częściej będzie spotykał się z powikłaniami pozabiegowymi u pacjentów po zabiegu sinus lift. Do tej pory nie ustalono konsensusu, co do algorytmu postępowania u pacjentów z chorobami nosa i zatok przynosowych przygotowywanych do zabiegu podniesienia dna zatoki szczękowej. Wydaje się, że podejście interdyscyplinarne pozwala na obniżenie ryzyka możliwych powikłań pozabiegowych, a w przypadku ich wystąpienia opanowanie trudnej sytuacji. Z tego względu autorzy są zdania, że dla lepszej współpracy pomiędzy lekarzem stomatologiem a laryngologiem procedura zabiegu podniesienia dna zatoki szczękowej oraz możliwe komplikacje pozabiegowe powinny być powszechnie znane.

**SŁOWA KLUCZOWE:** podniesienie dna zatoki szczękowej, wszczepy zębowe, choroby zatok przynosowych

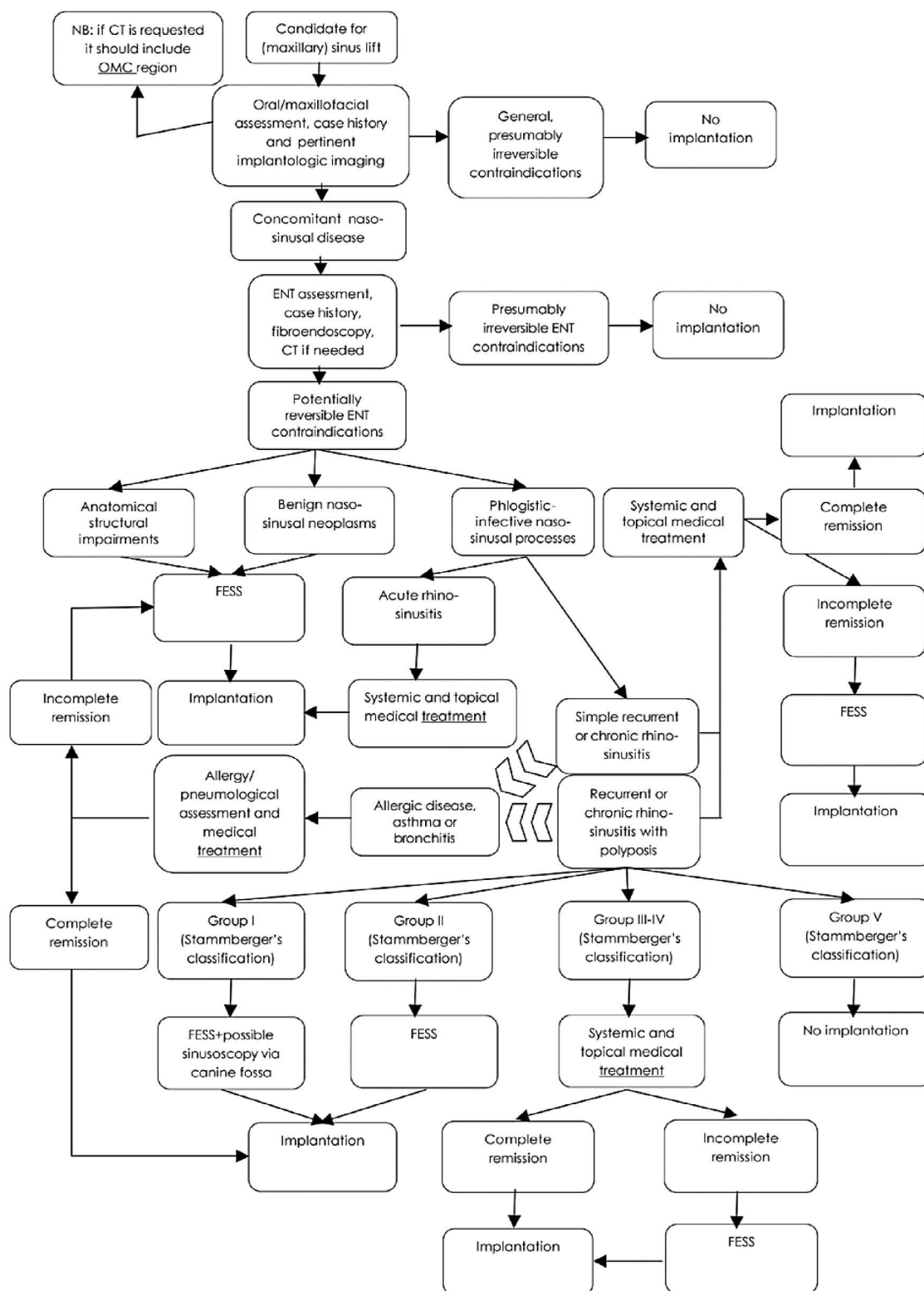
## INTRODUCTION

Loss of lateral incisors in the mandible occurs with alveolar atrophy, most often due to untreated caries and chronic periodontal disease. This leads to a reduction in height between the alveolar recess of the maxillary sinus (the fundus of the maxillary sinus) and the alveolar process margin. For this reason, patients who are being prepared for the introduction of dental implants often have indications for augmenting the fundus of the maxillary sinus (sinus lift). Although many authors consider the treatment

itself to be predictable and simple, the risk of its failure significantly increases with abnormal aeration and drainage of the maxillary sinus. The aim of the article is to propose the procedure and laryngological preparation of the patient for a sinus lift.

## PROCEDURE METHODOLOGY

Due to the types of sinus lift, the open method or closed methods (osteotomic, hydraulic method) can be distinguished.



**Fig 1.** Procedural algorithm proposed by Pignataro et al. 2008. Classification according to Stammberger: group I - choanal polyp; group II - polyps arising from the sphenoid or ethmoid sinus; group III - chronic inflammation of the paranasal sinuses without allergic origin; group IV - chronic rhinosinusitis with nasal polyps with allergic origin; group V - nasal polyps associated with cystic fibrosis, tumors.

Open method [1] - after local anesthesia of the oral cavity in the vicinity of lateral non-existing incisors, a broad-base mucoperiosteal flap is made; next, a piezoelectric instrument, a metal drill or a diamond drill is used to cut out a "window"; then using special curved raspators, the mucous membrane of the fundus of the maxillary sinus (Schneider membrane) is moved to obtain adequate space for the bone or bone substitute material. Due to faster migration of proliferative cells of the connective tissue, in relation to bone-forming proliferative cells, it is advisable to use a barrier membrane on the "window". After supplementing the bone deficiency, a barrier membrane is placed outside to separate the cavity from the lobe. Then, a mucoperiosteal flap is sewn in. Formation of bone tissue takes approx. 6-12 months. This procedure is recommended when the height of the alveolar process is <4 mm.

Closed method - osteotomic method [2]. This is a less invasive method. After local anesthesia and formation of mucoperiosteal flap, the bone of the alveolar process is drilled in the planned site of dental implant insertion to a depth of about 1-2 mm below the mucous membrane of the maxillary sinus. Then, using special osteotomes, the mucous membrane of the fundus of the maxillary sinus is elevated along with the broken bone fragment. This technique is reserved for cases where the height of the residual alveolar process is > 4 mm.

Closed method - hydraulic technique. In contrast to the osteotomic method, here a special tool is used, which during drilling of the bone administers 0.9% NaCl at a pressure of about 1.5 bar. The drilling process itself is similar to the previous method, but it must be carried out at the full height of the alveolar process. Then, after the first local perforation of the bone of the fundus of the maxillary sinus, the fluid under pressure passes between the mucous membrane of the fundus and the bone - in this way, it detaches the mucous membrane of the fundus of the maxillary sinus. Next, the remaining liquid should be sucked out, and the bone or bone substitute material inserted into the pre-prepared space. After that, a dental implant is inserted in the previously prepared bed. A faster healing time can be expected when choosing this technique. The creators of this method noted a lack of complications in more than 99% of cases during 8-year follow-up [3].

## THE IMPACT OF SINUS LIFT ON THE MAXILLARY SINUS

The above-described operations in the maxillary sinus will cause an inflammatory reaction and transient maxillary sinusitis. An inevitable consequence is swelling of the mucous membrane of the maxillary sinus fundus. Acute sinusitis and perforation of

the sinus mucosa are the most common complications [4-11]. A sinus lift is associated with at least temporary deterioration of the natural drainage pathway to the middle nasal duct. A secondary infection may occur as a result of perforation, which may result in the loss of a bone graft or bone substitute material. In addition, the patency of the ostiomeatal complex may be impaired by transient inflammation, too high elevation of the maxillary sinus (in particular with the presence of cysts), bone graft [12], which enters the inside of the maxillary sinus and blocks the natural outlet (particularly fragments > 5 mm) [13]. It must be assumed that for at least some time, physiological drainage of the maxillary sinus after surgery will be impaired. In the case of proper drainage from the maxillary sinus, the mucous membrane should heal [14-16]. Post-surgical inflammation should be treated as a natural consequence of the immune system, an inflammation of similar intensity may also occur in healthy people who have not undergone surgery [16, 17]. However, in the case of a sinus lift, homeostasis of the maxillary sinus mucous membrane should be obtained quickly [16, 18].

## TREATMENT

During an interview, the dentist should ask the patient a question about nasal patency, the presence of nasal discharge (anterior or posterior rhinitis), pain/feelings of facial spreading (?), and dyssomnia. In the case of an affirmative answer to at least 2 symptoms, one of them being nasal obstruction, or nasal discharge, an otolaryngology consultation is recommended prior to the planned sinus lift. A full laryngological consultation should include a comprehensive laryngological examination with endoscopic assessment of nasal cavities. In order for the otolaryngologist to examine the patient, it is advisable to perform computed tomography of the paranasal sinuses including the ostiomeatal complex. For these purposes, cone-beam computed tomography (CBCT) should be considered instead of conventional computed tomography. CBCT is characterized by good imaging, and additionally the dose absorbed is from several to 10 times smaller [19]. Before the planned surgery, patients should be referred for CBCT to assess the technical aspects of sinus lift.

It seems that with positive responses to the above-mentioned questions for rhinosinusitis symptoms, the patient will obtain a greater benefit from planning treatment with CBCT than with a traditional pantomographic picture (despite a 2-4 times lower dose absorbed with CBCT) [19]. As per the authors' knowledge, no consensus was established as to the procedural algorithm until publication. In 2008, Pignataro et al. proposed a procedure for planned sinus lift upon suspicion of sinus disease. (Fig. 1) [20].

## LARYNGOLOGICAL ASSESSMENT

During ENT consultation, it is necessary to determine the patency of the ostiomeatal complex and to search for potential causes of deterioration of its patency in the postoperative period. We suggest to divide patients into groups on the basis of ENT examination with endoscopic assessment of nasal cavities and CBCT of the paranasal sinuses.

1. Without laryngological factors impairing patency of the complex;
2. With temporary contraindication to the procedure (patients with potentially reversible factors);
3. Absolute contraindication to the procedure (patients with irreversible factors).

As far as temporary contraindications are concerned, it is worth considering anatomical elements, which impair the patency of the ostiomeatal complex, such as a curved nasal septum impeding its patency on the side of the planned surgery, concha bullosa or paradoxical middle turbinate on the side of the procedure, Haller cells. Another group of temporary contraindications includes paranasal sinusitis - conditions where remission can be achieved, oro-antral communication (completely healed without a large bone loss), benign tumors that impede drainage of the maxillary sinus (after removal, proper drainage and no signs of mucociliary transport trauma must be ensured).

Absolute contraindications are anatomical conditions that cannot be corrected, the consequences of radiotherapy, permanent post-traumatic/post-surgical changes, inflammatory processes that cannot be cured due to impaired mucociliary transport, aspirin triad, immune disorders, systemic granulomatosis, which locate in nasal cavities and paranasal sinuses (e.g., sarcoidosis, Wegener's granulomatosis), benign and malignant neoplasms that impair the patency of the ostiomeatal complex despite completed treatment.

## DISCUSSION

During CBCT assessment, mucous membrane thickening in the maxillary sinus is often observed in patients who are plan-

ned to undergo a sinus lift [21]. However, till now, no consensus has been reached as to determining the exact value that should be considered as pathological [21]. Therefore, there are no clear guidelines for the management of sinus lift in patients with thickening of the sinus mucosa [21]. It is commonly believed that the coexistence of chronic sinus disease, obstruction of the ostiomeatal complex on the side of the planned sinus lift is associated with a higher incidence of acute sinusitis after surgery, which increases the risk of complications [16, 22, 23]. Apart from assessment of the bone of the alveolar process in terms of the possibility of implant insertion, pre-surgical planning in patients should include analysis for paranasal sinus disease. [24] In the case of mucous membrane thickening in the maxillary sinus and suspected obstruction of the ostiomeatal complex, especially in the case of a positive history of paranasal sinusitis, fiberoptic/endoscopic examination of the nasal cavities is indicated. Surgical correction of the cause of ostiomeatal complex obstruction seems to be the relevant procedure to reduce the risk of postoperative complications [21]. Previous standard procedure in patients with sinus disease included two treatments. The first is functional endoscopic sinus surgery (FESS), then after 4-6 months and laryngologic reassessment, a sinus lift is performed [24]. Due to the multitude of treatments and the extension of treatment process over time, many patients do not accept such a procedure, and therefore, there is no optimal prosthetic rehabilitation provided [24]. It has been proven that in patients with reversible contraindications for nasoantral reasons, the combination of functional endoscopic sinus surgery with sinus lift is predictable and safe [25, 26].

## CONCLUSION

The frequency of performing sinus lift has increase with the spread of patients' prosthetic rehabilitation using dental implants. For this reason, an ENT doctor will be more likely to come across postoperative complications in patients after sinus lift [27]. It seems that a bi-disciplinary approach allows to reduce the risk of possible postoperative complications, and in the case of their occurrence, their quick management. For this reason, the authors believe that, for the benefit of patients and better cooperation between the dentist and ENT specialist, the sinus lift procedure and possible complications after surgery should be well known.

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