

Analysis of Predictors of Implant Failure in the Maxillary Posterior Sector after Sinus Lift

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Abstract

The factors of implant failures after a sinus lift are many and varied. Having enumerated all these factors, the author of the analysis has become more interested here in one of them (the perforation of Schneider's membrane), which appears to be an essential cause. Failure of sinus implant surgery to implant.

Keywords: Implant Failure; Maxillary Posterior Sector; Sinus Lift

Introduction

The placement of implants at the level of posterior maxillary sectors presents a certain number of obstacles. Long edentulous patients with low bone height (< 5 mm) cannot benefit from "conventional" surgical placement techniques for endosseous implants in this area. Otherwise, we would be forced to resort to "heavy" surgical methods involving, in particular, sinus filling [1]. This procedure must be performed prior to implant placement or at the same time.

Nevertheless, this technique is not without risk and should be considered only if the long-term benefit to the patient is superior to other existing therapies. A perfect mastery of the technique on the part of the practitioner and a rigorous aseptic environment is obviously necessary as the post-operative complications and the therapeutic failures are strongly feared.

Position of the problem

In the current state of knowledge regarding implant-based sinus fillers, it seems that since the 1996 conference [4] (Table 1) establishing a "consensus" on the clinical efficacy of this procedure. Many studies have since highlighted a number of therapeutic failure factors of implant after sinus lift. As an indication: the patient's advanced age and metabolic activity (Preoperative blood

test recommended to try to know the type of patient on which we will work); the angiogenic potential of the patient [14,15] (the body's ability to repair itself); the migration of the filling material into the sinus; early loading of implants (healing time of the bone graft not respected); the poor primary stability of the implant; non-adapted implant design (surface condition, length); graft infection (especially in case of perforation of Schneider's membrane and non-hermetic gingival sutures); patients who have been smoking for a long time (bone healing that may be disturbed), the presence of a sinus septum (risk of perforation of the membrane); the repositioning and the situation of the side window... etc.

It is also worth recalling briefly here some complications that can occur during a sinus lift, such as:

- **Intraoperative complications:** Excessive bleeding during bone milling if an alveolar artery has been affected; more or less extensive membrane perforation (the most common complication).
- **Postoperative complications:** Appearance of bruises and hematomas; hemorrhages; hemosinus; paresthesia of the suborbital nerve; opening of the mucosal wound; graft infection; edema acute or chronic sinusitis; a disturbance of sinus physiology; loss of the transplant; loss of implants.

Immediate or delayed implantation in filled sinuses with different materials, three-year results (Jensen., et al. 1998)

Technique	Number of Implants	Lost Implants	Success rate (%)
Immediate Implantation	918	133	85.5
Delayed Implantation	596	96	83.9

Immediate or delayed implantation in sinus grafts with autogenous bone, results at three years (Jensen., et al. 1998)

Technique	Number of Implants	Lost Implants	Success rate (%)
Immediate Implantation	196	41	79
Delayed Implantation	166	21	87

Table 1

As can be seen, all these complications must be rigorously apprehended by the practitioner before setting the therapeutic indication and the corresponding surgical technique.

Work hypothesis

Given the wide variety of failure factors that have just been listed together with their pre and postoperative complications, is it possible to consider, that the perforation of Schneider's membrane plays a more vital role in these failures? [5,6].

Discussion

In an attempt to verify this hypothesis, we have chosen to refer to two studies relating to the incidence of Schneider's membrane perforation: that of F Khoury (1999) [5] (7.9% of implant failures for 216 sinus lift) and of SC. Cho (2001) [6] (7.25% implant failures on 236 sinus elevations).

It is known that the elevation of the sinus floor now offers us the possibility of performing an implant-prosthetic rehabilitation in the posterior maxillary areas presenting a bone deficit. However, in order to carry out this procedure, we know that there are certain rules to be respected and precautions to be taken into account [1,16].

The major perioperative complication is perforation of the sinus membrane between 18.22% and 23.6% according to the authors studied. The most common reasons are the overly vigorous reflection of Schneider's membrane with inadequate material, the poor appreciation of the thickness of the diaphragm, and a mal-treated (imprecise) osteotomy.

In a study of 216 raised sinuses, Fouad Khoury (1999) observed that there could be a correlation between the increased risk of failure of the osteo-integration of implants (14 failures out of the 19 counted), and the perforation of the sinus membrane.

For its part, SC. Cho (2001) conducted a study of a population of 236 sinus patients. The results recorded indicate a perforation rate of 18.2% (43 perforations) over the entire sample studied. The author of the study concludes, at the end of his work, that there is no proven correlation between the failures observed and a perforation of the Schneider membrane. However, he recommends, in the presence of a narrow sinus, to perform an osteotomy as close as possible to the inferior and anterior wall of the sinus to reduce the risk of perforation of the membrane.

These two studies were conducted on roughly equivalent samples (216 cases for the first and 236 cases for the second). The results from both seem to contradict each other since one establishes a clear correlation between implant failure and perforation of Schneider's membrane while the other refutes this correlation. From there, the problem remains whole and particularly complex.

To solve the equation, should not we imagine other measures to take in this type of surgery? At least those we suggest in the following.

In case of perforation of the Schneider membrane, a number of precautions should be taken to avoid the risk of post-operative complications such as those just mentioned above.

If the perforation is minute, the sinus filling is not questioned. On the other hand, if it is of medium size, various solutions are possible: obturation of the perforation by the establishment of a resorbable membrane; sealing the perforation by suturing with a resorbable thread; or by the establishment of a membrane obtained by platelet centrifugation which has the advantage of adhering immediately to the sinus membrane [7] in order to delay the implantation of implants in the case of several perforations of the membrane, leaving time for the mucosa to heal in order to intervene later.

Moreover, the two-step surgical approach seems preferable, because it gives better results with delayed implant placement, on a stable bone according to certain authors, for example Jensen (1990) [8] and Triplett (1996) [9], who found that the stability

of the implants was better when they were placed 6 to 9 months after the bone graft (respectively 90.4% and 93% success) than if they were at the same time (respectively 83.6% and 81% success). Otherwise, primary stability of the implant in the residual bone (between 4 and 5 mm) becomes essential if one wants to put the implants in the same surgical time.

We also know that before any surgery of this type, it is necessary to establish a pre-operative planning which will determine the type of bone and its volume in the three planes of the space. Different classifications have been established to help the practitioner choose the surgical technique to perform and the graft materials (Table 2) [11] that he will use. It should be noted that the occluso-prosthetic concept must be defined (length, width of the implants, and their number) before any surgical procedure.

Material	Contents	Osteogenic	Osteo-inducing	Osteo conductive
Autogenous bone	Bone matrix Osteogenic cells Growth factors	+/-	+	+
Allograft	Bone matrix de specified Absence of cells Growth factors	-	+	+
Xenograft	Inorganic mineralized matrix specified Absence of cells Absence of growth factors	-	-	+
Synthetic materials	Absence of cells Absence of growth factors	-	-	+

Table 2: Main properties of materials used in bone grafting.

Just as a panoramic and a scanner will be asked to the patient. The Beam Cone has all its indication for this type of intervention because it represents nowadays the examination of choice for the hard tissues (less radiating than the conventional scanner). The interest of radiography was therefore essential both before the surgery and during and after the surgical procedure to confirm the good positioning of the graft and/or implant placement.

The various sinus pathologies (chronic sinusitis, acute, polyps, aspergillosis, etc...) can represent an absolute contraindication for any transplant in the posterior maxillary area. It is therefore important that the practitioner can establish a good interview in order to analyze and eliminate additional risk factors due to contraindications, whether relative or absolute.

Finally, the different therapeutic alternatives as well as the different stages of the treatment, the financial aspects and the time constraints will have to be clearly exposed to the patient.

In any case, and regardless of the reliability of the sinus filling therapy, the risks of complications and failures must always remain in the mind of the practitioner [12]. Only an objective analysis of the patient's living conditions determined by a thorough interrogation: (socio-professional conditions, financial situation, level of psychological motivation, etc.) and by a clinical examination (anamnesis) will make it possible to assess his general condition and to good surgical indication.



Figure 1: Technique of the crestal approach [13]. After several impacts by mallet on the handle of the osteotome, the edges of it scrape the bone walls by condensing alloplastic material and bone lamellae towards the sinus floor



Figure 3A: Widening of the osteotomy site of the sinus lateral wall to visualize the perforation of the Schneider membrane [13].

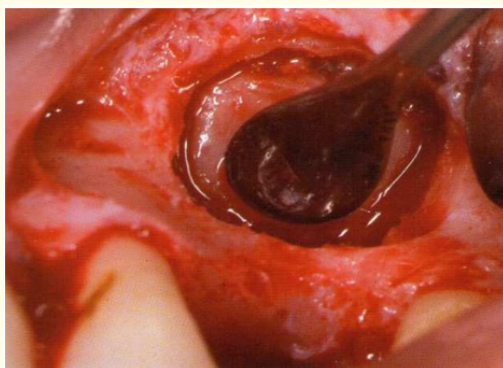


Figure 2A: Technique of the lateral approach. Lateral shutter realized with the diamond cutter [13].



Figure 3B: Installation of a resorbable membrane to repair the perforation of the Schneider membrane [13].

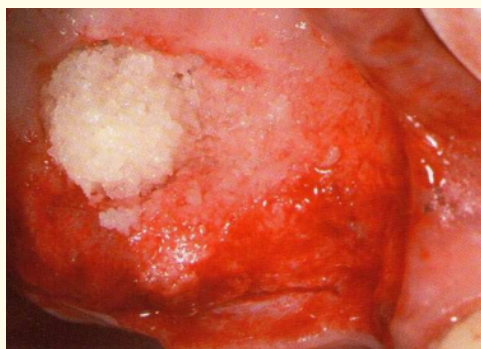


Figure 2C: The bone flap removed, sinus filling done with an allograft [13].

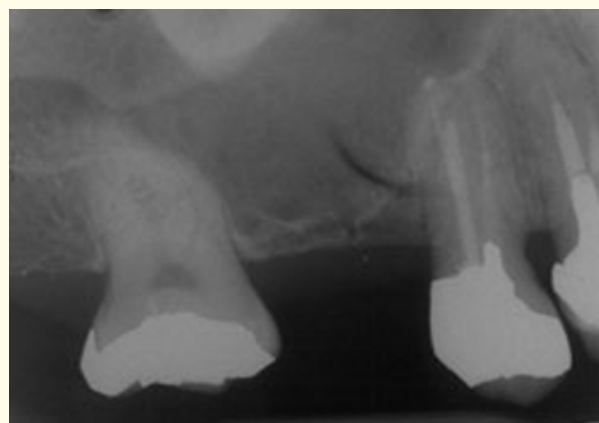


Figure 4A: Preoperative retro-alveolar radiograph showing minimal bone height at site 16. Lateral graft augmentation should be performed prior to implant placement [13].



Figure 4B: On this post-operative retro-alveolar radiograph, the round and contained shape of the bone graft demonstrates the success of the restoration [13].

Conclusion

No doubt it was risky to discuss in such a short time such a controversial subject as the chess factors in sinus surgery referred to as implant. Although the perforation of Schneider's membrane may indeed represent a major factor in these failures, it must be considered, however, that intra-sinus bone grafting techniques in pre-implant surgery now make it possible to increase the indications of pose in patients with bone deficiency in the posterior maxillary areas as long as these patients are motivated by strong motivation.

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