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Prevalence of complications of maxillary sinus grafts

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Abstract

Objective*:* Prevalence of complications of maxillary sinus grafts by reviewing medical records (2010-2020) in Implantology Oral.

Method: Retrospective analytical research. Approved by the Ethics Committee as risk-free research. Clinical patients undergoing dental implant surgery, with any type of maxillary sinus graft (2010 – 2020), radiographic or tomographic controls of the maxillary sinus and clinical controls 8 -30 days post-surgery, sample 65. Variables: age, gender, systemic status, habits, date and type of surgery, type of graft, use of fibrin-rich (PRF) or platelet-rich (PRP) plasma, surgical technique (side window), simultaneous implant placement, periodontal status. complications: rupture of sinus membrane, displacement of the implant (sinus cavity), hemorrhage, hematoma, pain, edema, flushing, dehiscence suture, membrane exposure.

Results: Sample 65: Women 39 (60%), average age 57.49 years, men 26 (40%) average age 57.85 years, non-smokers 58 (89%), absence of cardiovascular diseases 57 (87.7%), reduced periodontium 50 (76.9%). Used surgical technique "Side window" 56 patients (86.15%), rupture of the sinus membrane 17 (26.15%); did not need growth factor46 (73.85%), use of alloplastic graft (29.23%). At 30 days absence of: pain (96.92%), edema (95.38%), hematoma (96.92), tissue dehiscence (96.92), no displacement of the implants (100%) There was no significant association between the surgical technique and the presence of each of the complications (Chi square p= 0.606), (Pearson p=0.332), with no significant association between growth factor use and complications (Chi square p=2.131), (Pearson p=4.9996).

Conclusion*:* Rupture of the sinus membrane is the intraoperative complication with the highest prevalence (26.15%) in maxillary sinus graft surgeries, with the lateral window technique.

Keywords: Side window surgery; Sinus membrane perforation; Complications; Maxillary sinus grafts

1. Introduction

Oral implantology is a branch of dentistry that is responsible for diagnosing, predicting and treating patients with dental absences, reestablishing function and esthetics; therefore it is essential to know the biological component, to regenerate bone defects, due to tooth extractions, trauma, or periodontal disease, the pneumatization of the maxillary sinuses and the resorption of residual bone in the posterior maxilla after tooth extraction often requires bone augmentation procedures before implantation (1).

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The initial stability of the implant is the key factor for osseointegration and should be the main criterion for indicating simultaneous or delayed implants in the maxillary sinus. Therefore, it is important before the placement of dental implants to assess the bone regeneration of the grafts in the maxillary sinus, with the lateral window technique performed in two phases (2,3).

The elevation of the maxillary sinus is a surgical technique that allows the graft to be positioned to create bone volume. The fundamental objective when performing a sinus bone graft is the formation of vital bone in the maxillary sinus, to achieve the long-term survival of dental implants after their prosthetic load. To do this, the technique and the treatment sequence must be oriented to achieve predictable and stable results over time, even if this means a longer waiting time until the placement of the prosthesis. There are different techniques to perform the maxillary sinus lift, in addition to the technique, there are also different materials with which the graft is performed in the maxillary sinus (2-4).

The types of grafts are classified into: autogenous, which are those in which the donor and the recipient are the same individual, allogeneic grafts are used between two individuals of the same species, heterogeneous grafts between individuals of different species and the plastic halo when graft material is of mineral or synthetic origin (5) . Autogenous bone (AB) has been considered the gold standard for maxillary sinus augmentation due to its osteo- inductive and osteoconductive properties. However, the use of several other bone substitutes has been reported as alternatives to autogenous bone, autografts present several problems or disadvantages such as their scarcity, reabsorption and morbidity of the donor site, so more and more biomaterials with osteoconductive properties are used, being the deproteinized bovine bone mineral matrix one of the most used (5,6).

Bone obtained from a maxillary sinus graft provides sufficient primary stability and osseointegration has been shown to be achieved predictably with a high implant survival rate ranging from 61.7% to 100%, with an average survival rate of all interventions of 92.6%. However, breast augmentation procedures are not only sensitive to the technique: but are also prone to complications if a thorough preoperative evaluation is not performed (7).

One of the most frequently reported complications in maxillary sinus graft surgery is rupture of the sinus membrane with a frequency of 13% (8). Other research has also reported that this is the most frequent surgical complication with mean rates of occurrence between 10.0% to 19.5% and up to 58% (Chiapasco *et al.,* 2013(6); Nkenke E, Stelzle F, 2009(5); Pjetursson et al, 2008(7). Perforations can be repaired in the same surgical act using membranes, usually of resorbable collagen or fibrin-rich plasma (PRF) or by means of sutures (8), in order to reduce the risk that the particulate biomaterial migrates into the cavity of the maxillary sinus itself and obstructs the osteomeatal complex. Membrane perforation may also represent a source for bacterial penetration and invasion into the grafted area, the authors found no correlation between treatment outcome and implant failure rate (8-11).

The careful preparation of the window is essential to prevent perforation of the sinus membrane. They were often associated with the use of high-speed, air-driven rotary instruments. However, it has been shown that there is a lower incidence of membrane perforation with the use of piezoelectric devices (12).

A rare complication in a sinus floor lift procedure is the displacement of a dental implant into the maxillary sinus. Displacement of dental implants can occur both during and after procedures. More cases have been reported in which displacement in the maxillary sinus occurred not during but after implant placement. The reasons for moving an implant from its initial position to the maxillary sinus are not always clear. The thickness and density of the edentulous maxillary segment have been proposed as a possible explanation for the inadequate anchoring of the implant and the subsequent lack of primary stability (13-15). In the literature, other mechanisms have been mentioned to explain the migration of an implant to the maxillary sinus: changes in intra-sinus and nasal pressures resulting in a suction effect, inflammatory/infectious processes around the implant, imprecise distribution of occlusal forces and implants that penetrate the floor of the maxillary sinus and show a lack of osseointegration, therefore they run the risk of migrating to the bosom without apparent force (16). All of the above has led to the conduct of several investigations:

Barone *et al* 2005 (11), in a clinical study whose objective was to evaluate the complications associated with the increase of maxillary sinus under general anesthesia. with autogenous grafting or mixture with bone of animal origin in 70 patients with severe bone atrophy. Complicación más frecuente perforación de la membrana sinusal (25%), seguido por infección y supuración (5,6%), los pacientes que se infectaron eran fumadores. Concluding that drilling of the membrane was not a significant factor for the complication of implant placement, however, cigarette smoking is associated with postoperative infection after maxillary sinus grafts

Lee *et al*, 2013, (12), in retrospective study of complications of maxillary sinus grafting by side window; evaluated 100 maxillary sinus procedures performed from March 2008 to February 2011. They concluded that sinus floor elevation

using the side window approach is a predictable procedure for managing bone volume deficiency in the posterior jaw for patients seeking treatment with dental implants. However, complications can include membrane perforation, infection, wound dehiscence, graft loss, and implant failure. The fundamental objective when performing a sinus bone graft is the formation of vital bone in the maxillary sinus, to achieve the long-term survival of the implants after their prosthetic loading. To do this, the technique and the treatment sequence must be oriented to achieve stable results over time, even if this means a longer waiting time until the placement of the prosthesis (13-17).

Ghasemi et al. (18) 2017, in systematic review and meta-analysis on intra- and postoperative complications in lateral window maxillary sinus graft surgeries in smokers vs non-smokers. Eleven articles were included in the review and revealed that the most frequent complication was rupture of the sinus membrane. They also observed that it increased significantly the risk of suture dehiscence and infection in smoking patients.

Previous studies have revealed that success in osteogenic induction of maxillary sinus grafts depends on many variables, such as: asepsis and antisepsis, patient health and habits; correct prophylaxis, type of bone graft, surgical techniques used in a single procedure and surgical time (16 -18). In the literature there are several studies that assess the use of bone grafts in maxillary sinus atrophy, using the lateral window technique and the presence or not of complications (19–21).

Previous studies have shown the importance of assessing the presence of complications in surgeries with bone grafts of the maxillary sinus in order to make associations between local and systemic related factors, which may lead to the prevention of such complications, at the UniCIEO University Foundation of 2009-2019. Rupture of the sinus membrane is the intraoperative complication with the highest prevalence (26.15%) in maxillary sinus graft surgeries, with the lateral window technique.

Objective

Identify the Prevalence of complications of maxillary sinus grafts by reviewing medical records (2010-2020) in Implantology Oral.

2. Methods

With approval by the Institutional Ethics Committee as research without risk (Annex 1), the medical records that met the inclusion criteria were selected**:** clinical laboratories of patients of the two genders, to the any type of maxillary sinus graft was performed, from January 2009 to December 2019, which had at least one clinical control after surgery and controls radiographic or tomographic maxillary sinus. We excluded stories of patients who have not completed the complete treatment in UniCIEO or dropout patients. From the selected medical records, the following variables are taken: age, gender, systemic status, report of habits, date of maxillary sinus surgery, controls at 8 and 30 days post-surgery, date of presence of the complication, type of complication: rupture of the sinus membrane, displacement of the implant to the sinus cavity, signs of infection: hemorrhage, hematoma, pain, edema, flushing, tissue dehiscence, absence of bone graft integration, membrane exposure, graft type: homologous, autograft, xenograft, synthetic, mixing, use of fibrin-rich plasma (PRF), use of platelet-rich plasma (PRP), surgical technique (side window, crestal route), simultaneous placement of implants, reporting of habits, predominant mood and periodontal status. The results are recorded in the databases (Annex 2). Descriptive and inferential statistics were applied to all these variables to describe the generalities of all the mean por variables of frequency tables and cross tables. *Inferential statistics* to establish associations between complications and the different variables (Chi cuadrado) (Person).

3. Results

Medical records reviewed during the 10 years of 375 medical records only 65 met the inclusion criteria, of which 39 (60%) belonged to the female gender and 26 (40%) were male. Non-smoking 58 (89%), absence of cardiovascular disease 57 (87.7%), reduced periodontium 50 (76%). Most commonly used surgical technique "Side window" in 56 patients (86.15%) with rupture of the sinus membrane 17 patients (26.15%) (Table 1).

The most commonly used type of graft was plastic halo (29.23%) followed by allograft (26.15%) and most patients did not need growth factor in 46 patients (70.77%) (Table 2).

Table 1 Surgical technique Vs sinus membrane rupture

Surgical technique	Count	Percentage	RUPTUREMEMBRANASINUSAL	Count	Percentage
Trans crestal	8	12.307	NO	48	73.84
Side window	56	86.15	YES	17	26.15
Via crestal	1	1.538	N=	65	
N=	65	99.995			99.99

Table 2 Graft type and use of growth factor

GRAFT TYPE	Count	Percentage	FACTORGROWTH	Count	Percentage
All Graft	2	3.076	NO	46	70.77
Alo Graft. Autologo	1	1.54	YES	19	29.23
Plastic Alo	1	1.54	N=	65	
Allograft	17	26.15			
Allograft	1	1.54			
Alloplastic	19	29.23			
Autologo Aloplastico	2	3.08			
Spongy Cortic Homolo	1	1.54			
Analogue Alloplastic	1	1.54			
Xeno Graft	13	20.00			
Xeno Graft. All Graft	1	1.54			
Xenograft	1	1.54			
Xenograft	4	6.15			
Xenograft. Alloplastic	1	1.54			
N=	65				

Table 3 Biological Complications 8 and 30 Days Post-Surgery Implants Oral

	8Days No	8Days Yes %	30 D No	30 D Yes %
Pain	26 40%	39 60%	63 96.92%	2 3.08%
Oedema	22 34.38%	42 65.63%	0 9 63	0 1
Blush	2 3.08%	63 96.92%	63 96.92	2 3.08%
Haematoma	0	0	63 96.92%	2 3.08
Dehiscence Suture	0	0	0	0
Desplazamiento Implante	0	0	0	0

The evaluation of the symptoms and clinical signs of early complications at 30 days showed in the total sample absence of: pain (96.92%), edema (95.38%), hematoma (96.92), tissue dehiscence (96.92), and no displacement of the implants (100%) (Table No 3).

The inferential statistics did not demonstrate a significant association (Chi square test) between the surgical technique and the presence of each of the biological complications at 8 and 30 days post-surgery (p=0.606 Pearson p=0.332), nor with the use of growth factor (p=2.131 Pearson).

4. Discussion

In the present research the lateral window surgical technique was the most used and the most frequent complication was the rupture of the sinus membrane which coincides with the research of Ghasemiet et al., 2017 (18) but differs with the habits of the population, in the present research most patients did not consume cigarette, and in the systematic review they compared the presence of rupture of the sinus membrane between smoking and non-smoking population, being more frequent the complication in smoking patients.

In the present research it was shown that the biological complications present at 8 days after surgery, decreased until disappearing in the control at 30 days where only two patients presented mild pain and there was no tissue dehiscence or displacement of the implant, nor loss of the implant, which does not coincide with the study of (Lee et al., 2013) (12) where tissue infection, graft loss and implant failure were present.

In the present study, there was no significant association between the lateral window technique and the infrequency of each of the biological complications in the controls at 8 and 30 days. The rupture of the sinus membrane was only 13% without signs of infection which differs with the study of Viña-AlmuniaJ *et al*., 2009 (21) where the most frequent complications were perforation of the sinus membrane and suppuration of the wound.

5. Conclusion

Rupture of the sinus membrane is the intraoperative complication with the highest prevalence (26.15%) in maxillary sinus graft surgeries, with the lateral window technique.

Compliance with ethical standards

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Disclosure of conflict of interest

All authors declare that they have no conflicts of interest.

Statement of ethical approval

The ethics committee of the UniCIEO Uniiversity Foundation conferred the endorsement number 105 to the research Prevalence of complications of maxillary sinus grafts, classifying “risk no” number 105 of August 21, 2020. The foregoing in compliance informed consent with current national regulations.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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