



ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2017; 3(4): 01-04
© 2017 IJADS
www.oraljournal.com
Received: 01-08-2017
Accepted: 02-09-2017

Elias Boutros

Prof, PhD in Oral and Maxillofacial Surgery, Faculty of Dentistry, Al Andalus University, Al Andalus University For Medical Sciences Qadmous, Tartous, Syria

Mohamed Sabe-Alarab

Prof, PhD in Oral and Maxillofacial Surgery, Faculty of Dentistry, Hama University Hama, Hama, Syria

Fawaz Jaber

Master in Oral and Maxillofacial Surgery, Faculty of Dentistry, Hama University, Hama, Hama, Syria

Ali Hammoud

Student, Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Al Andalus University, Qadmous, Tartous, Syria

Leen Sabe-Alarab

Student, Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Al Andalus University, Qadmous, Tartous, Syria

Correspondence

Elias Boutros

Prof, PhD in Oral and Maxillofacial Surgery, Faculty of Dentistry, Al Andalus University, Al Andalus University For Medical Sciences Qadmous, Tartous, Syria

Evaluate the use of peripheral venous blood alone in formation new bone under the maxillary sinus membrane: A literature review

Elias Boutros, Mohamed Sabe-Alarab, Fawaz Jaber, Ali Hammoud and Leen Sabe-Alarab

Abstract

Purpose: To review the literature associated with new bone formation in the maxillary sinus elevation using peripheral venous blood alone.

Materials and Methods: A review of the literature was performed to record the study reference, design study, sinus lift method, number of patients, number of implants, follow up, bone gain and Perforation of sinus. A PubMed search was made from 2007 to 2017 with keywords: “sinus lift”, “Peripheral Venous Blood”, “new bone” and “maxillary sinus elevation”.

Results: 11 articles were identified and reviewed. The Lateral Window method was followed in all the studied publications. The survival rate of implants was high in all cases. A new bone is formed in most cases.

Conclusion: According to our review, the application of bone graft material may not be a requirement for maxillary sinus augmentation and new bone formation with peripheral venous blood as a filler material could be an alternative treatment modality for the implant treatment.

Keywords: Sinus lift, Peripheral Venous Blood, new bone, maxillary sinus elevation

1. Introduction

Tooth loss leads to resorption of the alveolar bone which, together with expansion of the sinus, may limit the possibilities of using endosseous implants for prosthetic rehabilitation of the posterior maxilla^[1, 2].

The placement of dental implants on edentulous posterior maxilla could present difficulties because of a horizontal or vertical alveolar ridge deficiency, unfavorable bone quality, or increased pneumatization of the maxillary sinus. Increased implant failure rates in the posterior maxilla are related to insufficient residual height, ridge width, and poor bone quality. Such problems have been overcome by increasing the alveolar height through maxillary sinus augmentation^[3].

The most commonly used technique to overcome these problems is sinus membrane lift procedure and augmentation of maxillary sinus floor, which was first introduced by Tatum^[4] and further modified by Boyne and James^[5].

Although the classical sinus augmentation by creating an antrostomy, lifting the maxillary sinus membrane, and grafting bone graft material is a well-established treatment, there is a growing trend of successful bone formation and osseointegration in cases of sinus membrane elevation without bone grafts^[3].

The aim of this study is to evaluate the amount of bone formation under the sinus tented with implants and filled with venous blood as a graft material.

2. Materials and methods

Using a PubMed literature search, we identified and reviewed papers using these key words: “sinus lift”, “Peripheral Venous Blood”, “new bone” and “maxillary sinus elevation”. Papers were retrieved from 2007 to 2017 and we recorded the reference study, design study, sinus lift method, number of patients, number of implants, follow up, bone gain and Perforation of sinus (Table1)

Table 1: Case Analysis From Literature Reviewed of sinus lift with blood only.

Study reference	Study design	Number of patients	Number of implants	Sinus lift method	Follow up (months)	Bone gain (mm)	Perforation of sinus (%)	Implant survival (%)
Hatano, Senner & Lundgre (2007) ^[6]	Case series	6	14	Lateral window (one stage)	12-34	Not specified	0	92.9
Sohn <i>et al</i> (2008) ^[7]	Case series	10	21	Lateral window (two stage)	8.5 (rang 6-12)	Bone gain in all cases	Not specified	100
Kim <i>et all</i> (2010) ^[8]	Experimental study	6 (dogs)	Not specified	Lateral window (one stage)	6	2.7 _ 0.7 buccal side. 0.6 _ 0.3 palatal side.	0	Not specified
Moon <i>et al</i> (2011) ^[3]	Case series clinical prospective study	14 (17 sinus augmentations)	31	Lateral window (one stage)	6-8	Bone gain in all cases	2	93.5
Lin <i>et al</i> (2011) ^[9]	Case series	44	80	Both (one and two stage)	60	7.4 (range 5.7-9.1)	Not specified	100
Cricchio <i>et al</i> (2011) ^[10]	Case series	84	179	Lateral window (two stage)	12-72	5.2 (range 3-7.4)	11	99
Dikicier (2012) ^[11]	Case Letters	1	2	Lateral window (one stage)	6	New bone gain	0	Not specified
Kaneko <i>et al</i> (2012) ^[12]	Case series	11	21	Not specified	32 ± 8.4 (range 24-46)	Bone gain in all cases	4	95.2
De Oliveira <i>et al</i> (2013) ^[13]	Case series	10	Not specified	Lateral window (two stage)	13-14	2.37	Not specified	Not specified
Bassi <i>et al</i> (2015) ¹⁴	Prospective study	17 (22 sinus augmentations)	25	Lateral window (one stage)	51	Not specified	0	96
Falah <i>et al</i> (2016) ¹⁵	Case series	18 (30 sinus augmentations)	72	Lateral window (one stage)	6	6.14 ± 1.34	0	94

2.1 Observational studies

A case series presented by Hatano *et al.* on six patients requiring a sinus membrane elevation procedure. A standard one-stage surgical protocol was followed, and the membrane was elevated up to 10 mm to accommodate the implants. The elevated sinus space was then filled with venous blood, and the bone window was replaced using tissue glue to stabilize it. One out of the 14 implants failed to integrate in a follow-up period of 6 months. New bone formation was observed in all patients.

In a study by Sohn *et al.* from 2008, 21 implants inserted in 10 patients were evaluated after 6 months. All implants remained stable during the study period, and bone formation was found in both radiographic and histologic evaluations [7].

Kim *et al.* used a dog model to study the bone formation around implants under the sinus membrane protruding 8 mm into the maxillary sinus. The authors found extensive collapse of the clot and membrane resulting in rather minimal formation of new bone. They recommended that this method be used in cases when only a small amount of new bone was needed around implants placed simultaneously in the maxillary sinus floor [8].

Moon *et al.* placed 31 implants in the maxillary sinus in 14 patients, with an average of 6.8 months follow-up. The lateral window was created using a piezoelectric saw, and after sinus membrane elevation and implant placement, venous blood was injected into the secluded sinus space. New bone formation was seen radiographically, and 38.7% vital bone formation was seen histologically [3].

Lin *et al.*, in 2011, presented a study in 44 patients with eighty implants in the maxillary sinus which was followed for a period of 5 years postloading. All implants were clinically stable during the follow-up period, and a mean bone height gain at the end of 5 years was 7.44 mm [9].

Also, in 2011, Cricchio *et al.* presented a study where 179 implants had been installed in the maxillary sinus in 84 patients. A two-stage technique was used in the majority of the cases. The range of the follow up was 1–6 years. The survival rate was 98.7%, and the average new bone formation was 5.3 mm after 6 months of healing. Resonance Frequency Analyses showed adequate primary stability and small changes over time [10].

In a case letter by Dikicier *et al.*, placement of two implants in the maxillary sinus was studied. After the sinus membrane elevation, venous blood was injected into the cavity. Results showed new bone formation around the implants and clinical stability of the implants [11].

In 2012, Kaneko *et al.* placed 21 implants in 11 patients in the maxillary sinus, with an additional titanium bone fixation device. New bone formation was seen in all cases with a 95.2% survival rate of the implants [12].

de Oliveira *et al.*, in 2013, presented a study on ten patients where the unilateral sinus lift procedure was performed. In the first-stage surgery, the membrane was lifted and stabilized using a 12 or 14 mm osteosynthesis screw. During the second-stage surgery, implants were placed if adequate bone formation was observed. In 7 out of the 10 patients, it was not possible to place the implants due to the lack of bone quantity or quality. An average bone gain of 2.37 mm was obtained. It was noted that patients who had teeth present close to the sinus lift area showed higher bone formation compared to completely edentulous patients [13].

Bassi *et al.*, in 2015, performed a study involving the installation of implants in regions of sinus lift with no graft material and observed a statistically significant difference in

height between 3 and 51 months of follow-up, with an average loss of bone height of 1.57 mm [14].

Falah *et al.*, in 2016, where Thirty graftless sinus lifting procedures were performed and 72 dental implants placed in 18 consecutive patients, using the lateral window approach. The elevated sinus space was then filled with a blood clot from surrounding bleeding. Clinical and radiological follow-up was conducted throughout the 6-month healing period. Biopsies of 30 cases were collected at 6 months post-treatment: 15 biopsies were taken from the newly formed bone near the basal floor and 15 from the newly formed bone near the elevated membrane. New bone consolidation in the maxillary sinus was apparent radiologically and histologically at 6 months after sinus augmentation, providing an average 6.14 -1.34 mm of bone-gain [15].

3. Results

Of 11 papers published on this topic between 2007 and 2017, we were able to retrieve and interpret all of them (Table 1). The Lateral Window method was followed in all the studied publications. The survival rate of implants was high in all cases. A new bone is formed in most cases.

4. Discussion

Ferrigno and colleagues reported that new bone was generated in the maxillary sinus from both the lateral wall and the floor of the sinus after membrane elevation using an osteotome technique [16]. Although the mechanisms are not fully understood, it is obvious that the controlled trauma when lifting the sinus membrane results in the formation of a blood clot and subsequent bone formation. The displacement of the membrane probably triggers a series of events, including blood and fibrin clot formation, cellular migration and differentiation, angiogenesis, and osteogenesis [6]. The increased thrombin generation on the surfaces of titanium implants may also stimulate proliferation and inhibit apoptosis of osteoblasts [11].

Using a patient's own venous blood to treat posterior maxillary atrophy has various theoretical advantages, including ease of procurement and application, lack of adjunctive grafting materials, and the presence of growth factors in blood platelets [8].

According to the previous study about this technique, Lundgren *et al.* demonstrated that wherein the maxillary sinus membrane was elevated and bone was spontaneously formed in the blood clot around implants which had been placed in the residual alveolar bone [17].

Kim and colleagues, reported that specimens showed a tent-like bone formation around the implants. This suggests that a tent-like figure is created by the sinus membrane from the apical surface of the implant, and new bone formation is achieved in the space created by the sinus membrane tent. The maxillary sinus membrane drooped more on the palatal side than on the buccal side, thereby leading to greater bone formation on the buccal side than on the palatal side. To enhance bone formation in the maxillary sinus floor using sinus membrane elevation, graft materials or techniques that enable the membrane to remain in the elevated position are necessary [7].

The results of Kim *et al.* (2010) [8] study were different from the findings of Hatano *et al.* (2007) [6], who stated that the mean bone height gained was 10 mm 6 months following the procedure. The inconsistency of these results may have resulted from the use of different methods of evaluating endo-sinus bone gain. Hatano *et al.* (2007) evaluated bone

formation around the implants using intraoral radiographs. It is nearly impossible to assess endo-sinus bone gain using dental X-rays, which may be one reason why the estimates of post-operative bone height were high in Hatano *et al* ^[16] report.

Dikicier and colleagues suggested that placement of additional venous blood collected from the patient during surgery may further facilitate and improve the results from new bone formation due to the presence of growth factors in blood platelets ^[11].

As described in the literature, one factor that could have influenced the implant failure was insufficient primary stability. Primary stability depends on adequate preparation of the bone site to receive the implant. Implants with deficient initial stability are susceptible to micromotion at the bone-to-implant interface and increased stresses at the sinus membrane-to implant interface, which may affect the bone healing process and result in fibrous encapsulation ^[18].

A broad and firm consensus has been established regarding the importance of blood clot formation, which serves as autogenous graft filler material for bone regeneration during graftless maxillary sinus lifting ^[15].

The results of Bassi study, after a 51-month follow-up, show that the maxillary sinus lift technique with immediate implant placement, without the use of biomaterials, may be performed with a high success rate, reducing the surgical morbidity of autogenous grafts and some of the limitations of other osteoconductive grafting materials ^[14].

The Silva review shows that maxillary sinus lift surgery is a safe procedure with a low complication rate and with predictable results. Although the successful use of graft materials is reported in the literature, this procedure is feasible without graft material and very similar results can be seen with and without the use of graft material. Furthermore, maxillary sinus lift surgery without the use of graft material results in a reduced surgical time and lower total costs compared to surgery with the use of grafts ^[19].

According to our review, the application of bone graft material may not be a requirement for maxillary sinus augmentation and new bone formation with peripheral venous blood as a filler material could be an alternative treatment modality for the implant treatment. Further long-term studies are needed to evaluate the predictability of this maxillary sinus floor augmentation protocol using membrane elevation and peripheral blood.

5. References

- Misch CE. Maxillary sinus augmentation for endosteal implants: Organized alternative treatment plans. *Int J Oral Implantol.* 1987; 4:49.
- Smiler DG, Johnson PW, Lozada JL *et al*: Sinus lift grafts and endosseous implants. *Treatment of the atrophic posterior maxilla.* *Dent Clin North Am.* 1992; 36:151.
- Moon JW, Sohn DS, Heo JU, Shin HI, Jung JK. New bone formation in the maxillary sinus using peripheral venous blood alone. *J Oral Maxillofac Surg.* 2011; 69:2357-67.
- Tatum H. Maxillary sinus elevation and subantral augmentation. Birmingham, AL: Lecture, Alabama Implant Study Group. 1977.
- Boyne PJ, James RA. Grafting of the maxillary sinus floor with autogenous marrow and bone. *J Oral Surg.* 1980; 38:613-6.
- Hatano N, Sennerby L, Lundgren S. Maxillary sinus augmentation using sinus membrane elevation and peripheral venous blood for implant-supported rehabilitation of the atrophic posterior maxilla: case series. *Clinical Implant Dentistry & Related Research.* 2007; 9:150-155.
- Sohn DS, Lee JS, Ahn MR, Shin HI. New bone formation in the maxillary sinus without bone grafts. *Implant Dent.* 2008; 17:321-31.
- Kim H-R, Choi B-H, Xuan F, Jeong S-M. The use of autologous venous blood for maxillary sinus floor augmentation in conjunction with sinus membrane elevation: an experimental study. *Clin. Oral Impl. Res.* 2010; 21:346-349.
- Lin IC, Gonzalez AM, Chang HJ, Kao SY, Chen TW. A 5-year follow-up of 80 implants in 44 patients placed immediately after the lateral trap-door window procedure to accomplish maxillary sinus elevation without bone grafting. *Int J Oral Maxillofac Implants.* 2011; 26:1079-86.
- Cricchio G, Sennerby L, Lundgren S. Sinus bone formation and implant survival after sinus membrane elevation and implant placement: A 1- to 6-year follow-up study. *Clin Oral Implants Res.* 2011; 22:1200-12.
- Dikicier S. maxillary sinus augmentation and implant placement using venous blood without graft material: a case letter. aaid-joi-2012-00125R2.
- Kaneko T, Masuda I, Horie N, Shimoyama T. New bone formation in nongrafted sinus lifting with space-maintaining management: A novel technique using a titanium bone fixation device. *J Oral Maxillofac Surg.* 2012; 70:e217-24.
- de Oliveira GR, Olate S, Cavalieri-Pereira L, Pozzer L, Asprino L, de Moraes M *et al*. Maxillary sinus floor augmentation using blood without graft material. Preliminary results in 10 patients. *J Oral Maxillofac Surg.* 2013; 71:1670-5.
- Bassi AP, Pioto R, Faverani LP, Canestraro D, Fontaño FG. Maxillary sinus lift without grafting, and simultaneous implant placement: a prospective clinical study with a 51-month follow-up. *Int J Oral Maxillofac Surg.* 2015; 44:902-7.
- Falah M, Sohn DS, Srouji S. Graftless sinus augmentation with simultaneous dental implant placement: clinical results and biological perspectives. *Int. J. Oral Maxillofac. Surg.* 2016; 45:1147-1153.
- Ferrigno N, Laureti M, Fanali S. Dental implants placement in conjunction with osteotome sinus floor elevation: a 12- year life-table analysis from a prospective study on 585 ITI implants. *Clin Oral Implants Res.* 2006; 17:194-205.
- Lundgren S, Andersson S, Gualini F, Sennerby L. Bone reformation with sinus membrane elevation: a new surgical technique for maxillary sinus floor augmentation. *Clin Implant Dent Relat Res.* 2004; 6:165-173.
- Piattelli M, Scarano A, Paolantonio M, Lezzi G, Petrone G, Piattelli A. Bone response to machined and resorbable blast material titanium implants: an experimental study in rabbits. *J Oral Implantol.* 2002; 28:2-8.
- Silva LD, Lima VN, Faverani LP, Mendonca MR, Okamoto R, Pellizzer EP. Maxillary sinus lift surgery— with or without graft material? A systematic review. *Int. J. Oral Maxillofac. Surg.* 2016; 45:1570-1576.