Sinus Augmentation and Simultaneous Implant Placement Success: Pilot Study (2008–2011)

Melissa Tormos, DMD, MSD*; Jose Morales, DMD; Natalia Guevara, DMD;
Augusto R. Elías, DMD, MSD, DH; Lydia López, DMD, MPH; Omar García, DrPH, MS

Objective: 1) To describe implant success in the posterior maxillary when a sinus augmentation procedure was performed simultaneously with implant placement and then compare differences in success when sinus augmentation was delayed in patients attending the maxillofacial surgery clinic of the University of Puerto Rico, 2008 through 2011. 2) To determine sociodemographic characteristics, ASA classification, graft material, and final restoration and, using a questionnaire, determine as well patient satisfaction.

Methods: A retrospective cohort study was conducted (approved by IRB) with 172 patients, using medical records. A total of 102 implants were placed in grafted maxillary areas, 55 placed simultaneously and 47 delayed. Patients were contacted, invited to participate, and, upon agreement, instructed to sign an informed consent.

Results: A total of 45 implants were evaluated clinically (22 immediate and 23 delayed), all with 100% success (according to Buser and Weber criteria). In the sample group, 72.5% of the participants were women and 26.8% were men; their ages ranged from 42 to 87 years, with a mean age of 57 years. Patient participation was low (44%). The categories of appearance and esthetics and function were both rated at 86.2%; cost of restoration came in at 86.1%, and maintenance was rated at 71.2%.

Conclusion: Implant placement with simultaneous sinus augmentation was successful, and no differences were found between implants that were placed immediately and those that were delayed, which is similar to what has been found by previous studies. Patients reported being satisfied with the final cost of the implant restoration. [*P R Health Sci J 2016;35:197-202*]

Key words: Sinus augmentation, Endosseous implants, Implant success, Simultaneous implant, Sinus lift

The atrophy of the alveolar ridge crest combined with the pneumatization of the maxillary sinus after tooth loss in the posterior maxillae is a gradually increasing problem in rapidly aging population, often rendering only a few millimeters of bone height available for such implant placement as may be required (1). Endosseous dental implants have revolutionized the dental treatment of edentulous sites for this growing and aging society.

Implants have become the gold standard for the replacement of missing teeth in partially as well as completely edentulous sites, giving dental patients fixed prosthetic treatment modalities that were not available in the past (2). Long-term survival rates for endosseous dental implants in sinus-augmented areas have been found to be as high as 90%, as highlighted by the Sinus Consensus Conference (2–4).

There are several factors affecting the survival of endosseous dental implants. The first group of factors is host related and includes patient age and gender, the presence of systemic disease, having a history of cigarette smoking, and oral hygiene (5). The second group is related to the implant placement site: the position of the implant in the arch and bone quality and quantity (6). The third group is surgical-procedure related: initial stability, angulation, orientation, and operator skill. The fourth group is related to implant-fixture factors such as surface roughness, length, diameter, macrostructure, and microstructure. The fifth group is prosthetic related: (implant) type, retention method, and occlusal scheme (7). All of these factors must be carefully evaluated when placing dental implants in edentulous areas so that adequate treatment might be provided and a predictable (positive) outcome attained.

Frequently, implant placement is impaired because of poor bone quality and quantity secondary to the early loss of teeth

School of Dental Medicine, University of Puerto Rico Medical Sciences Campus, San Juan, Puerto Rico; *Deceased

The authors have no conflict of interest to disclose.

Address correspondence to: Omar García, DrPH, MS, Adjunct Professor, Medical Science Campus, School of Dental Medicine, University of Puerto Rico, PO Box 365067, San Juan, PR 00936. Email: omar.garcia@upr.edu

(8). Advances in implant dentistry have led to the development of new procedures allowing bone-deficient areas to be restored with endosseous dental implants. To allow proper implant placement in posterior maxillary areas, the sinus augmentation procedure was proposed by Tatum (9) 1977, with a description of the procedure first being published by Boyne and James (10) in 1980. Boyne and James proposed placing autogenous marrow and cancellous bone from the iliac crest into the pneumatized maxillary sinus to increase the amount of bone available for implant placement. Various surgical techniques have been proposed and various graft materials used successfully since. The grafting materials include autogenous bone, allografts, xenografts, alloplasts, and a combination of any literature, which rates for autogenous bone range from 88.9% to 90%; for combined grafts, the rates of success range from 94.7% to 98%; the success rates for bone substitution alone range from 97% to 96.1%. Several studies report no statistically significant difference in implant survival when comparing various graft materials (3, 11). Autogenous grafts are still considered the gold standard, although some studies report that they are prone to higher rates of resorption, up to 49.5% after 6 months; in addition, they require a donor site and increase patient risk (1, 12).

Surgical implant placement is usually delayed about 6 to 8 months after a sinus-lift procedure has been completed, in order to allow the graft to mature (13–14). The primary stability of the implants during placement has been found to be of the utmost importance for the success of those implants (15–16). One alternative treatment allows implants to be placed simultaneously with the performance of a sinus augmentation procedure (so long as a minimum of 5mm of bone is present to provide the required primary stability) (1, 11). Studies have demonstrated excellent short- and long-term survival rates for simultaneous implant placement; such rates range from 89.7% to 100% (4, 13) and are comparable to those of delayed implants. Recent studies have also proposed that with adequate primary stability, implants can be placed in areas with less than 5mm of residual alveolar ridge bone (96.3%) (8, 11).

Sinus augmentation with simultaneous dental-implant placement benefits patients by shortening treatment time, reducing the need for surgical, and more quickly accomplishing the final restoration (17). In a progressively aging population, a significant number of patients can benefit from implant treatment options that were not available previously. And in an academic healthcare setting such as the one in which the participants of this study were found, the number of potential patients increases greatly, as many of them would not otherwise be able to afford the cost of the treatment as offered in private dental practices. At the time of this writing, few evaluating the success of implants placed in academic settings have been conducted (18–20).

The primary aim of this pilot study was to evaluate the success of dental implants placed in the posterior maxillary when a sinus augmentation procedure was performed simultaneously with implant placement, and compare any differences in terms of success when the sinus augmentation procedure was delayed in patients attending the maxillofacial surgery clinic of the University of Puerto Rico, from 2008 through 2011. Our secondary aim was to determine the sociodemographic characteristics and ASA classification of each patient, the graft material used in his or her procedure, and the type of restoration performed; in addition, as part of fulfilling that aim, we used a questionnaire to determine patient satisfaction.

Material and Methods

A retrospective cohort study was carried out to evaluate the success of dental implants placed simultaneously with sinus augmentation in maxillary posterior areas, as performed at the oral and maxillofacial surgery clinic of the School of Dental Medicine, Medical Sciences Campus of the University of Puerto Rico (this was a pilot study). The Institutional Review Board (IRB) approved the study.

Retrospective sample selection

The sample frame was the statistical database of the maxillofacial surgery clinic, which included all surgical procedures completed by 3rd-year residents from June 2008 through November 2011. For this database, all the patients with implants in the maxillary posterior areas were selected for the study. Each patient's initials, age, sex, and record number were documented, as were the surgeon and attending who performed the placement of the implant and the dentist who implemented the final restoration. A total of 172 patient records were requested from the School of Dental Medicine, Medical Sciences Campus, University of Puerto Rico, and then reviewed upon their receipt (Figure 1).

The inclusion criteria were that a potential participant have implants that were placed (from 2008 through 2011) in the maxillary posterior area at the oral and maxillofacial surgery

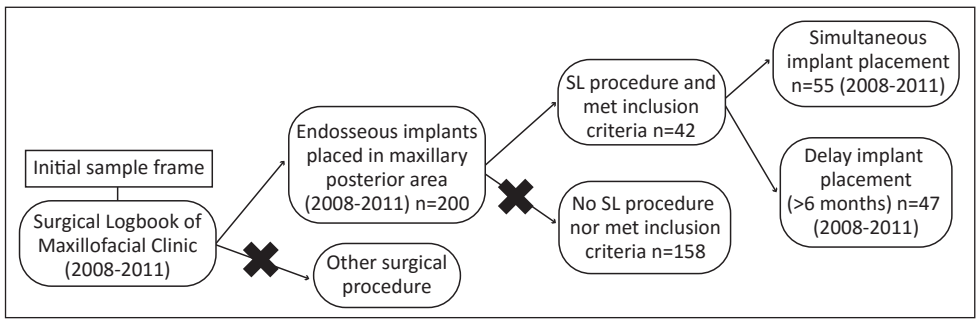

Figure 1. Flowchart of sample selection in the study

clinic, have an ASA classification of I or II, and have had a minimum of 1 year of prosthetic loading. The exclusion criteria prohibited the participation of patients with implants placed in the maxillary anterior or mandibular areas, having an ASA III classification, who smoked, or who took bisphosphonates.

The records were reviewed; panoramic radiographs taken prior to sinus augmentation surgery or implant placement were evaluated. Patient age, gender, contact information, and ASA classification were retrieved from the available records, as were each patient's history of previous medical conditions, record of medication being taken, and status with regard to smoking. Information regarding a given implant's time of insertion, location, size, and diameter; the prosthesis type; whether the patient in question underwent sinus augmentation; the operator; the type of graft material used; and whether the implants had been removed were gathered from the progress notes and surgical record. Those patients who did not meet inclusion criteria were removed from the study. The total number of records (patients) that met the inclusion criteria was 41; a total of 102 implants were placed in the posterior maxillary areas, of which 55 were placed simultaneously with the performance of a sinus augmentation procedure, and 47 were delayed implants placed after 6 to 8 months of healing.

Standardization and calibration with the reference examiner "gold standard" were completed to evaluate the radiographic data. A third party selected 10 panoramic films (5 with implants and 5 without) and 10 periapical radiographs (5 with peri-implant radiolucency and 5 without) from the digital record archive in the prosthodontics clinic at the University of Puerto Rico, Medical Sciences Campus; these radiographs were randomized. Independently of the reference examiner, the radiographs were evaluated, as well, by the principal investigator and the 2 sets of evaluations compared. Both individuals evaluated implants placed in maxillary posterior areas as well as the absence or presence of peri-implant radiolucency. Calculations of percent agreement and kappas for intra (100%, kappa = 1.0) and inter (97%, kappa = 0.90) values ($p<0.05$) were performed.

Clinical assessment

All patients were contacted by telephone up to 3 times and a telephone script read to them. The evaluation consisted of a medical history update, clinical evaluation, and panoramic radiograph. The evaluations were conducted after patients signed informed consents. Data collection consisted of a digital panoramic radiograph taken at the time of the evaluation by a single investigator. The clinical evaluation included a patient-satisfaction survey and an oral evaluation of the implants and restoration (conducted by the PI and the reference examiner, independently). The success criteria used to evaluate the implants were proposed by Buser and Weber and include the following:

A. Absence of persistent subjective complaints such as pain, foreign body sensation, and/or dysesthesia
B. Absence of a recurrent peri-implant disease with suppuration
C. Absence of mobility
D. Absence of a continuous radiolucency around the implant
E. Possibility of restoration

Implants that were never restored are not accounted for because they were never loaded and, therefore, did not meet the inclusion criteria. Implants that did not meet all of the above criteria (excluding mobility for those implants restored with fixed partial dentures) or implants that were removed are defined as implant failures.

A patient-satisfaction questionnaire was administered to evaluate gingival appearance and esthetics, function, maintenance, and the cost of the final restoration.

Statistical analysis

The descriptive analysis consisted of central tendency (mean, median, and mode) and dispersion measures (standard deviation; minimum and maximum) for the continuous variables. Absolute and relative frequencies were computed for the categorical variables. A simple linear regression model was also be used to calculate a projection for a future study ($y = \beta 0 + \beta 1X1$).

Results

A total of forty-one patients underwent maxillary sinus augmentation at the oral and maxillofacial surgery clinic of the School of Dental Medicine from 2008 through 2011. The sexes of the patients were divided into as follows: women comprised 72.5% of the group and men, 26.8%. The subjects' ages ranged from 42 to 87 years, with a mean age of 57 years. A total of 32 patients were ASA II (78.05%), and 9 were ASA 1 (21.95%). Of these, 70% of the patients were married and 12% were single. The patients' incomes ranged from less than $5,000 to more than $80,000, with the greatest percentage (27%) of patients being in the $10,000 to $30,000 range; most of the patients had at least some college education (Table 1).

A total of 102 implants were placed in sinus-augmented areas: 55 endosseous implants were placed simultaneously with sinus augmentation, and 47 were delayed (Table 2). Implants by tooth number and percentage are presented in Table 3; the maxillary posterior 1st molar was the most commonly replaced tooth (tooth #3 = 58%, #14 = 48%), followed by the 2nd premolar (#4 = 36% and #13 = 31%). Fifty-one percent of the patients treated had at least 2 implants placed at the time of surgery. In the study, rehabilitations consisted of fixed partial dentures (67%) and overdentures (32%).

As can be seen in Table 3, the number of immediate implants per surgeon ranged from 1 to 15, with a mean of 5 implants, and the highest number of implants were placed in 2011 (39%). The number of delayed implants per surgeon ranged from 1 to 12, with a mean of 5 implants, and the highest number of implants were placed in 2011 (45%).

A total of 62 sinus augmentation procedures were carried out from 2008 through 2011, and consisted of bilateral (51%),

Table 1. Description of sociodemographic characteristics

	n (%)
Sex	
Male	11 (26.83)
Female	30 (72.50)
ASA	
I	9 (21.95)
II	32 (78.05)
Annual Income (USD)	
Less than 5,000	3 (8.33)
5,000–10,000	7 (19.44)
10,000–30,000	10 (27.78)
30,00–40,000	7 (19.44)
40,000–80,000	4 (11.11)
More than 80,000	5 (13.89)
Civil Status	
Single	12 (30.00)
Married	28 (70)
Education	
High school	21 (52.50)
Some college (no degree)	11 (27.50)
Bachelor's degree	3 (7.50)
Master's degree	2 (5.00)
Doctorate	2 (5.00)
Other	1 (2.50)

right sinus only (21%), and left sinus only (26%) lifts. The highest number of sinus augmentation procedures per year was found in 2011. The material most utilized was xenografts, with 45%, followed by allografts and a combination of allografts/xenografts, these being 25% and 27%, respectively; and 1 case combined allografts/xenografts and autogenous material (Table 4). A total of 10 maxillofacial resident surgeons had treated the patients in the study during the years of 2008 through 2011.

Table 2. Number and % of immediate and delayed implants in SL areas, by year

Implants N = 102	n (%)
Immediate Implants	
n = 55	
2008	13 (24.52)*
2009	13 (24.52)
2010	6 (11.32)
2011	21 (39.62)
Delayed Implants	
n = 47	
2008	5 (10.86)
2009	20 (43.47)
2010	0
2011	21 (45.65)

*12 missing implants

Patient willingness to participate was calculated to be 44%, which is a total of 18 participants; 32% were unable to be reached and 24% did not wish to participate. Of the 24% who did not wish to participate, 54% stated they were uninterested, and 46% were not in Puerto Rico at the time of the survey and could not participate.

Table 3. Description of location, number, and restoration of dental implants of the sample

	n (%)
The number of the tooth replaced by an implant	
2	2 (4.88)
3	24 (58.54)
4	15 (36.59)
5	11 (26.83)
12	13 (31.71)
13	13 (31.71)
14	20 (48.78)
15	4 (9.76)
Implants per patient	
1	5 (12.20)
2	21 (51.22)
3	5 (12.20)
4	9(21.95)
5	1(2.44)
Type of restoration	
FPD	27 (67.50)
Overdenture	13 (32.50)

A total of 45 endosseous dental implants were evaluated in the pilot study in a total of 18 participants, 22 placed simultaneously with sinus augmentation and 23 delayed. The 45 implants evaluated were found to have a 100% success rate, per the Buser and Weber criteria discussed previously. Thus, there were no differences between implants simultaneously placed with sinus augmentation and those that were delayed.

The overall patient satisfaction was found to be 82%. Appearance and esthetics, function, and cost of restoration all received ratings of just over 86%, and maintenance received a rating of 71.2% (Figure 2).

Table 4. Description of the different sinus augmentation procedures of the sample

	n (%)
Sinus lift by quadrant	
Right	9 (21.95)
Left	11 (26.83)
Bilateral	21 (51.22)
Type of graft material	
Allograft	10 (25.00)
Xenograft	18 (45.00)
Allograft + xenograft	11 (27.50)
Allograft + xenograft + autogenous	1 (2.50)
SL per person-year	
2005	1 (2.56)
2006	0(0)
2007	1 (2.56)
2008	10 (25.64)
2009	8 (20.51)
2010	6 (15.38)
2011	13 (33.33)

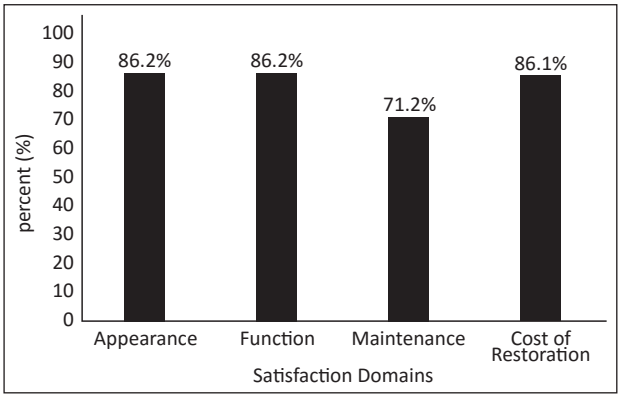

Figure 2. Description of patient satisfaction of implant

Discussion

The main objective of this study was to evaluate the success of implants placed simultaneously with the performance of a sinus augmentation procedure in the oral and maxillofacial surgery clinic of the School of Dental Medicine, Medical Sciences Campus, University of Puerto Rico, from 2008 to 2011. The retrospective analysis reported a total of 41 patients who had undergone sinus augmentation, with a total of 102 dental endosseous implants placed. A total of 45 endosseous implants were evaluated—22 immediate implants and 23 delayed—all with a 100% success rate. This seems to be in accordance with the survival rates published in the literature (90%–98%) (11, 13, 21). Although there is limited literature on the survival of implants that are placed in academic healthcare settings (18), Kohavi, in 2004, found cumulative implant survival rates as high as 96% in surgeries carried out by faculty–resident teams (21), in contrast to the studies reported by Lambert (22), who reported that implants placed by inexperienced surgeons failed twice as often (it is important to note, however, that Lambert and his team evaluated 2-stage surgeries, only). Our findings are similar to those reported by Kohavi, in terms of survival rates, and comparable to those found in the literature, suggesting good outcomes are achievable by surgeons in training who are under the supervision of an experienced faculty member.

Adequate success rates have been reported for implants both placed immediately and delayed in sinus-augmented areas (3–4), if sufficient primary stability was obtained prior to implantation. In the current study, no difference was found between implants placed immediately and those that were delayed (100%). Similarly, a recent 15-year retrospective study conducted in 2014 that evaluated 589 implants in grafted sinuses found that the survival rates of the immediate and the delayed implants were 98% and 98.4%, respectively (21). However, because of the low participation rate, our survival rate is not representative of the population, which failing can be overcome with a larger sample size. For most studies the decision for immediate placement is determined by the amount of available bone; and most authors report that a minimum of 4mm of remaining residual ridge bone is necessary for adequate primary stability (4). Recent literature reports a cumulative survival rate of 97.9% (after 9 years) in implants placed in areas in which only 1 to 2mm of alveolar bone remains (23). Although in our academic setting a minimum of 4mm is required for the placement of immediate implants, this 1-stage technique reduces the number of surgical interventions necessary, thereby promoting the faster delivery of the final prosthesis.

A total of 62 sinus augmentation procedures were carried out, with different graft materials utilized; xenografts were the most common (45%), followed by the combination of xenografts/allografts (27.5%). Although it was not the aim of this study to compare implant survival based on graft material (because of the low number of participants), the 100% survival obtained suggests that the various grafting materials are adequate for most sinus augmentation procedures. A review conducted by Del Fabbro reported that 100% autogenous grafts yielded lower survival rates (88.9%) compared to those of implants placed in combined grafts (94.7%) or bone substitutes (96.1%), and stated that higher success rated were found when textured implants were utilized in grafted areas (94.9%–96.7%). The implants used in the study described herein were formed using the MTX™ (microtextured titanium surface) process; according to the study conducted by Del Fabbro et al., this surface better promotes the osseointegration of the grafted material than do machined surfaces (11).

The overall patient satisfaction with implant-supported rehabilitation was found to be 82.4%, which is comparable to that of a study conducted by Kim in 2014, which received a mean score of 8.26 on an 11-point scale (24). Appearance and esthetics, function, and cost of restoration were all rated at just over 86%; maintenance received a 71.2% rating. An interesting conclusion drawn from Kim's study is that 50% of the 93 patients taking part in that study averred that the treatment period was too long; this period could be shortened by placing the implants simultaneously with sinus augmentation.

There are several evident limitations to the present study, including its retrospective design and small sample size, which included only 44% of all the implants placed from 2008 through 2011, of which only 40% were placed immediately. A larger sample size is needed in order to evaluate success, considering predictors and adjusting for confounders. The possibility of offering incentives could help patient compliance and aid in the validity of the study. A projection was made in order to aid in further research, the goal of which was to calculate the approximate number of years a study would need to run in order to reach a significant sample size. The estimated sample size of 198 was calculated using a power analysis. Using a simple linear regression model, we determined that a study length of approximately 10 years would enable a given study to reach an estimated 223 implants. A major limitation of the retrospective study is that the investigator has no control over the quality of the measurements made or data collected in the past; this information may be incomplete or incorrectly recorded. The unavailability of baseline radiographs limited the success criteria that could be utilized, making bone-height comparisons impossible.

An important potential bias in this study is attributed to nonresponse and losses during follow-up (56%), which last is a key factor in retrospective studies since a given patient might move, change to a private practice, or cease participating in the study. Some of the potential study participants were unwilling to take part in the study, possibly because of their implants having failed. Whatever the cause, the small sample size may have resulted in participation bias. The satisfaction questionnaire is subjective and could be standardized.

Any future study should be conducted prospectively in order to reduce information bias. In this way, baseline radiographs can be taken to allow bone height measurement and comparison. Further studies could compare the success of different grafting materials, implant surfaces, and implants placed in atrophied alveolar ridges of greater than 4mm, as well as compare such results as are attained in private-practice settings. The patient satisfaction questionnaire could be improved and other widely validated scales utilized.

Resumen

Objetivos: 1) Evaluar el éxito de implantes en áreas maxilar posteriores con aumento de seno maxilar simultáneo y comparar este con el de los implantes tardíos en pacientes de la Clínica de Cirugía Maxilofacial de la Universidad de Puerto Rico, 2008-2011. 2) Describir las características sociodemográficas, clasificación ASA, injerto, restauración final; y evaluar la satisfacción de los pacientes a través de un cuestionario. Métodos: Un estudio de cohorte retrospectivo (aprobado por IRB) fue llevado a cabo con 172 pacientes, usando sus expedientes médicos. Un total de 102 implantes se colocaron en zonas maxilares injertadas: 55 simultáneos y 47 tardíos. Los pacientes fueron contactados, invitados a participar y firmaron un consentimiento informado. Resultados: Un total de 45 implantes fue evaluado clínicamente, 22 inmediatos y 23 tardíos, con un 100% de éxito utilizando el criterio de Buser y Weber. Los pacientes consistieron en 72.5% mujeres y 26.8% hombres; las edades oscilaban entre 42 y 87 con una edad media de 57 años. La participación de pacientes fue baja (44%). La satisfacción general, evaluada a través de un cuestionario, fue de 82.4%, el mantenimiento estético, y costo obtuvieron un 86.2% y el mantenimiento un 71.2%. Conclusión: La colocación de implantes con elevación de seno simultánea fue exitosa, y no se encontró diferencias entre los implantes inmediatos versus los tardíos, similar a estudios previos. Los pacientes informaron estar satisfechos con las restauraciones de implantes finales.

References

1. Duttenhoefer F, Souren C, Menne D, Emmerich D, Schön R, Sauerbier S. Long-Term Survival of Dental Implants Placed in the Grafted Maxillary Sinus: Systematic Review and Meta-Analysis of Treatment Modalities. PloS One 2013;8:e75357.
2. Beretta M, Poli PP, Grossi GB, Pieroni S, Maiorana C. Long-term survival rate of implants placed in conjunction with 246 sinus floor elevation procedures: Results of a 15-year retrospective study. J Dent 2015;43:78–86.
3. Tong D, Rioux K, Drangsholt M, Beirne OR. A review of survival rates for implants placed in grafted maxillary sinuses using meta-analysis. Int J Oral Maxillofac Implants 1998;13:175–182.
4. Wallace S, Froum S. Effect of Maxillary Sinus Augmentation on the Survival of Endosseous Dental Implants. A Systematic Review. Ann Priodontol 2003;8:328–343.
5. Jang H, Kang J, Lee K, Lee YS, Park PK. A retrospective study on related factors affecting the survival rate of dental implants. J Adv Prosthodont 2011;3: 204–215.
6. Lundgren S, Cricchio G, Palma VC, Salata LA, Sennerby L. Sinus membrane elevation and simultaneous insertion of dental implants: a new surgical technique in maxillary sinus floor augmentation. Periodontol 2008;47:193–205.
7. Cibirka R, Razzoog M, Lang B. Critical evaluation of patient responses to dental implant therapy. J Prosthet Dent 1997;78:574–581.
8. Bernardello F, Righi D, Cosci F, Bozzoli P, Soardi CM, Spinato S. Crestal sinus lift with sequential drills and simultaneous implant placement in sites with <5 mm of native bone: a multicenter retrospective study. Implant Dent 2011;20:439–444.
9. Tatum H Jr. Maxillary and sinus implant reconstructions. Dent Clin North Am 1986;30:207–229.
10. Boyne PJ, James RA. Grafting of the maxillary sinus floor with autogenous marrow and bone. J Oral Surg 1980;38:613–616.
11. Del Fabbro M, Rosano G, Taschieri S. Implant survival rates after maxillary sinus augmentation. Eur J Oral Sci 2008;116:497–506.
12. Block M, Kent JN. Sinus augmentation for dental implants: the use of autogenous bone. J Oral Maxillofac Surg 1997;55:1281–1286.
13. Rapani R, Papani C. Sinus floor lift and simultaneous implant placement: A retrospective evaluation of implant success rate. Indian J Dent 2012;3:132–138.
14. Fugazzotto P, Vlassis J. Report of 1633 implants in 814 augmented sinus areas in function for up to 180 months. Implant Dent 2007;16:369–378.
15. Kher U, Mazor Z, Stanitsas P, Kotsakis GA. Implants placed simultaneously with lateral window sinus augmentation using a putty alloplastic bone substitute for increased primary implant stability: A retrospective study. Implant Dent 2014;23:496–501.
16. Cha HS, Kim A, Nowzari H, Chang HS, Ahn KM. Simultaneous sinus lift and implant installation: Prospective study of consecutive two hundred seventeen sinus lift and four hundred sixty-two implants. Clin Implant Dent Relat Res 2014;16:337–347.
17. Annibali S, Vestri AR, Pilotto A, La Monaca G, Di Carlo S, Cristalli MP. Patient satisfaction with oral implant rehabilitation: evaluation of responses to a questionnaire. Ann Stomatol (Roma) 2010;1:2–8.
18. Melo M, Shafie H, Obeid G. Implant survival rates for oral and maxillofacial surgery residents: A retrospective clinical review with analysis of resident level of training on implant survival. J Oral Maxillofac Surg 2006;64:1185–1189.
19. Barber HD, Betts NJ, Edwards ML. The status of implant training in oral and maxillofacial surgery residency programs. J Oral Maxillofac Surg 1994;52:1058–1060.
20. Sakka S, Krenkel C. Simultaneous maxillary sinus lifting and implant placement with autogenous parietal bone graft: outcome of 17 cases. Journal of Craniomaxillofac Surg 2011;39:187–191.
21. Kohavi D, Azran G, Shapira L, Casap N. Retrospective clinical review of dental implants placed in a university training program. J Oral Implantol 2004;30:23–29.
22. Lambert P, Morris H, Ochi S. Positive effect of surgical experience with implants on second stage implant survival. J Oral Maxillofac Surg 1997;55(12 Suppl 5):12–8.
23. Peleg M, Garg AK, Mazor Z. Predictability of simultaneous implant placement in the severely atrophic posterior maxilla: A 9-year longitudinal experience study of 2132 implants placed into 731 human sinus grafts. Int J Oral Maxillofac Implants 2006;21:94–102.
24. Kim Y, Kim H, Yi Y, Yun P. Evaluation of subjective satisfaction of dental implant patients. J Korean Assoc Oral Maxillofac Surg 2014;40:130–134.