Development of Sinusitis After Sinus Floor Elevation Surgery: A Systematic Review

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ABSTRACT

Background: Maxillary sinusitis can arise after sinus floor elevation surgery and should be treated immediately to prevent further complications which included dental implants failure, graft lost, and oro-antral fistula. This is the first systematic review to assess the incidence, causes, and treatment of sinusitis after sinus lift surgery.

Materials and methods: An electronic search included MEDLINE (PUBMED) data base site was carried out for articles involving development of sinusitis after sinus lift surgery from September 1997 up to April, 8, 2017. The search was done and reviewed by two independent authors.

Results: The total results of electronic search were (182) abstracts and articles, the extracted articles which involved development of sinusitis after sinus lift surgery were (25) studies. Of the 25 articles only (8) articles fit the inclusion criteria. Maxillary sinusitis was calculated for all selected studies and it was ranged from 2.12% to 12.7% with average of 5.4 %.

Conclusion: Maxillary sinusitis could be developed after sinus lift surgery with average of 5.4 % and the patients with previous maxillary sinus disease showed to be at increased risk of sinusitis after sinus lift surgery.

Keywords: Sinusitis after sinus lift; sinus lift complication; systematic review. **(Received: 26/7/2017; Accepted: 23/8/2017)**

INTRODUCTION

One of the major postoperative complications after sinus floor elevation surgery is sinusitis. The post-surgical sinusitis etiology can arise from two origins; either from earlier chronic infection of the maxillary sinus which is triggered by post-surgical inflammatory changes or from communication with bacteria of oral cavity via perforation of Schneiderian membrane (1). It is very important to treat sinusitis after maxillary sinus lift surgery as soon as possible because the infection may spread to other paranasal sinuses. In addition to that sinus infection may cause oro-antral fistula, loss of graft material and failure of dental implants (2-6).

The aims of this study were to present the results of the previous studies which involved development of sinusitis after sinus lift surgery and to assess the incidence of the maxillary sinusitis after sinus floor elevation surgery.

MATERIALS AND METHODS

An electronic search was carried out in MEDLINE (PubMed) data base site for articles published in the literature from September 1997 up to April, 8, 2017 and limited to studies on human trials. The following keywords were used in the search: sinusitis after sinus lift, sinus lift infection, sinus lift complication and sinusitis after sinus floor elevation surgery.

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The search process is demonstrated in diagram 1.

Inclusion criteria:

1. Researches involving RCT (randomized clinical trials, prospective and retrospective studies.
2. Studies involving sinusitis development after sinus lift surgery.
3. Studies with at least 6 months of follow-up after sinus lift surgery.
4. Studies on humans only.
5. Articles in English language only.
6. Healthy patients with no systemic diseases that may influence on the maxillary sinus health.

Exclusion criteria:

1- Case reports and case series with less than 10 patients.
2- Studies published in other languages than English.
3- Experimental studies (on animals).
4- Studies involving complications after sinus lift other than maxillary sinusitis.
5- Studies with less than 6 months follow-up period.
6- Patient with systemic diseases that may had an effect on maxillary sinus health.

Selection of studies

Titles and abstracts of the articles were examined initially by two independent reviewers (authors) for the chance of inclusion in this systematic review.

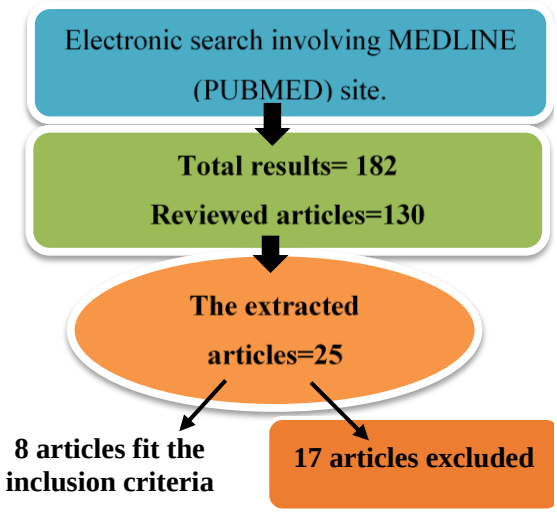

Diagram 1: The search process.

RESULTS

The total results of electronic search were 182 abstracts and articles. The reviewed abstracts were 130, the extracted articles which involved development of sinusitis after sinus lift surgery were 25 studies. Of the 25 articles 17 studies were excluded and only 8 articles which fit the inclusion criteria were involved in this research. The characteristic data for each study was summarized in table 1. The average of sinusitis was calculated for all studies and it was 5.4 %.

Seventeen articles were excluded from this research because of the following points:

1- Five articles were excluded because they were case reports.
2- One study excluded because it was involving various types of localized lateral alveolar ridge and/or sinus floor augmentation procedures performed before implant placement.
3- Seven articles were excluded because of missing data and not standardized criteria.
4- Three articles were excluded because they written in German language.
5- One article was excluded because the sinusitis complication was not related only to sinus lift surgery but to other causes like odontogenic causes.

DISCUSSION

Development of sinusitis after sinus lift surgery among the selected studies in this research ranged from 2.12% to 12.7% [10,14].

Causes of sinusitis (according to the authors in the selected studies) were as follow:

1- Sinusitis due to sinus membrane perforation as mentioned in two studies [10,12]. Nolan et al. [10] reported Sinusitis with percentage of (12.7%) in his study. Of the sinuses presented with sinusitis, 85% have Schneiderian membrane perforation. In contrary three other studies reported that the most common intraoperative complication was Schneiderian membrane perforation, which did not show any relation to postoperative sinusitis [7,9,14].
2- Sinusitis due to assumed long implant 10-16 mm as reported in one study [8].
3- The risk of postoperative sinusitis was increased in patients who had previous chronic sinusitis and in cases in which a large amount of graft was used for sinus augmentation as reported in one study [11]
4- Risk of postoperative sinusitis was associated with sinus elevation width, smoking and sinus membrane perforation [12].

CONCLUSION

According to this research, sinusitis can developed after sinus lift surgery with average of 5.4 %. Patients with previous maxillary sinus diseases appeared to be at increased risk of sinusitis development after sinus lift surgery.

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Table 1: Summery of the percentage, causes, and treatment of maxillary sinusitis after sinus lift surgery in the selected studies.

Study	Year	N of patients	Types of sinus lift procedure	N of sinus Augment-ation	Type of Bone substitute	N of Sinusitis and ratio	Diagnosis of sinusitis Clinically and/or Radio- graphically	Total N of membrane perforations	Causes of sinusitis	Treatment
Timmenga *et.al* [7]	1997	45	NM	85	Autogenous bone grafts	N:2 R:4.4%	*Questionnaire *Conventional radiographic examination *Nasoendoscopy	N: 29 Only 1 case developed sinusitis	Patients with a predisposition for this condition	Sinusitis symptoms disappear after treatment with decongestants and antibiotics
Cannizzaro et al [8]	2013	40	lateral and crestal approach	NM	Organic bovine & autogenous bone	N:1 R: 2.5%	NM	NM	Assumed long implant 10-16mm	NM
Vazquez Moreno et al [9]	2014	127	NM	202	NM	N:6 R:4.7%	NM	N:52 No relation to Postoperative complications	NM	NM
Nolan et al [10]	2014	208	NM	359	NM	R: 12.7%	NM	N: 150 17 of them developed sinusitis (11.3%)	Sinus membrane perforation	Antibiotics
Kayabasoglu et al[11]	2014	94	Lateral approach	(145) 51 bilateral 43 unilateral	Cortico-cancellous mineralized allograft bone	N:4 R:4.2%	*Questionnaire *Satisfaction * radiographic examination, and nasal endoscopic 3 of the 4 patients presented with purulent exudative leakage from an intraoral fistula, and 1 patient had symptoms of mild acute sinusitis.	N: 8 No one developed sinusitis	*Patients who suffer from chronic sinusitis * large amount of graft	Patients who had an intraoral fistula, the infected graft materials were removed from sinus cavity and they were placed on a 10-day course of clindamycin.
Schwarz Linda et al [12]	2015	300	Lateral approach	407	A mixture of autologous bone and deproteinized bovine bone substitute (Bio-Oss(	N:34 R:8.4%	Clinical symptoms and patient compliance	N: 35 11 of them developed sinusitis	* Sinus membrane perforation * Smoking *Sinus elevation width	NM
Chirilă et al [13]	2016	116	Lateral window technique	151	*Xenograft *Allograft *Xenograft and allograft mix *Alloplastic *Xenograft and alloplastic mix	N:5 R:4.3%	"The clinical signs of infection: headache, locoregional pain, cacosmia, inflammation of the oral buccal mucosa and rhinorrhea or unilateral nasal discharge".	NM	Patients developed infections received *xenografts (3 cases) *xenograft + allograft mix (1 case) *alloplastic grafts (1 case)	Removal of the graft material and implants. The sinus cavity was irrigated with metronidazole solution and an antibiotic therapy was prescribed for the patient which include clindamycin and metronidazole for 10 days
Sakkas et al [14]	2016	99	Lateral wall approach	105	Autogenous bone	N:2 R:2.12%	(Clinical signs of infection) headache nasal congestion , pain on the operated facial site, fever or redness	N: 11 No one developed sinusitis	Sinusitis developed in patient with no membrane perforation and with no history of maxillary sinus diseases	Antibiotics prescribed for the patients and the graft had to be removed. The patients were not treated with implants anymore

Abbreviations: N: Number; NM: Not mentioned; R: ratio.