

The relation of schneiderian membrane thickness and membrane perforation in sinus lift procedure: a systematic review



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Abstract

Objective: To evaluate the recent scientific evidence about the relation of schneiderian membrane thickness and sinus lift complications.

Methods: A systematic search at PubMed and Wiley Online Library was conducted to identify articles published between January 2013 to December 2017 about schneiderian membrane thickness relation with sinus lift complications. Manual selection of the full text articles was performed and from 133 articles found in initial searches, there were only 3 articles that compatible with the inclusion criteria.

Results: The initial search resulted in 133 articles. All the full text articles were reviewed and selected based on inclusion criteria. There were 3 studies that compatible with inclusion criteria with 395 patients as subjects and 466 sinus lift or sinus augmentation procedures performed.

Conclusion: The schneiderian membrane thickness might affects complications in sinus lift or sinus augmentation procedures, especially perforation of schneiderian membrane.

Keywords: Complications, Maxillary sinus floor augmentation, Schneiderian membrane, Sinus augmentation therapy

Cite this Article: Oktawati S, Neormansyah I, Supiaty. 2018. The relation of schneiderian membrane thickness and membrane perforation in sinus lift procedure: a systematic review. *Journal of Dentomaxillofacial Science* 3(2): 67-69. DOI: [10.15562/jdmfs.v3i2.737](https://doi.org/10.15562/jdmfs.v3i2.737)

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Introduction

Implants treatment in atrophic posterior maxilla is one of the most challenging cases for an implantologist.¹ Dr. O. Hilt Tatum (US) pioneered in developing the first sinus lift operation in 1974 and sinus graft operation in 1975. Recently, sinus augmentation has been widely performed to augment vertical deficient ridge.² The bone height deficiency in maxillary posterior caused by sinus maxillary expansion or atrophy process.³ Sinus maxillary membrane, known as schneiderian membrane is the membrane that lines on the inner part of the maxillary sinus cavities.⁴ Schneiderian membrane was 1.32 +/- 0.87 mm. Perforation rate was lowest 7.14% Schneiderian Membrane Thickness (SMT) has been considered as a key factor that influence sinus lift complications.⁵ Nonetheless, sinus augmentation has been proven to be a safe procedure with high success rate.^{6,7}

A major complication in sinus lift and augmentation procedure is schneiderian membrane perforation. Schneiderian membrane's elastic feature and quality affect the possibility of perforation. This complication increases the possibility of side effect for graft loss, an infection that will cause an interference in sinus function, implant survival and the clinical outcome of sinus augmentation.⁵ Several studies about sinus lift concluded that there is a relation between SMT and sinus lift complications.^{4,6} The aims of this systematic review is to

evaluate the recent scientific evidence about the SMT relation with sinus lift possibility of complications.

Methods

This article was written and conducted according to Preferred Reporting Items for Systematic Reviews and Meta Analysis (PRISMA) guidelines to report studies that compare SMT with sinus lift complications.⁸ The Population Interventio Comparison Outcome (PICO) questions for this article were the patients who are going to undergo an implant treatment on posterior maxilla and sinus lift procedure.⁹

A systematic search was made to identify articles published between January 2013 and December 2017 with the keywords used were "Schneiderian membrane thickness" and "sinus lift complications". The article search was limited to English articles and full-text availability. The title and full-text were then reviewed to find the relevant studies. After searching with those keywords, there were 133 initial articles found but only 3 studies met the inclusion criteria.

The inclusion criteria used for this article were full text articles in English that were published between January 2013 and December 2017 and the studies subject were human. Those articles were classifying schneiderian membrane thickness and also including informations about complication of

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sinus lift. While the exclusion criteria used for this systematic review were any articles that discuss about systematic review and meta analysis and the studies were in animal or in vitro or cadaver.

The authors (SO, IN and S) were using specific keywords to review and select the articles independently by screening the title. The full texts of the article that compatible with the topic of this systematic review was obtained and analyzed with the inclusion criteria that has been determined to set the final list of articles. The reviewers (SO, IN and S) independently extracted the data that is compatible with the inclusion criteria. After that, the final articles were discussed until there were no disagreement. The data that were extracted from the selected articles were author(s), year of publication, number of patients, age range (or mean range), SMT classification and complications.

Results

Figure 1 the initial search resulted in 133 articles. After screening the title and reviewing the full text articles, 128 articles were excluded with the

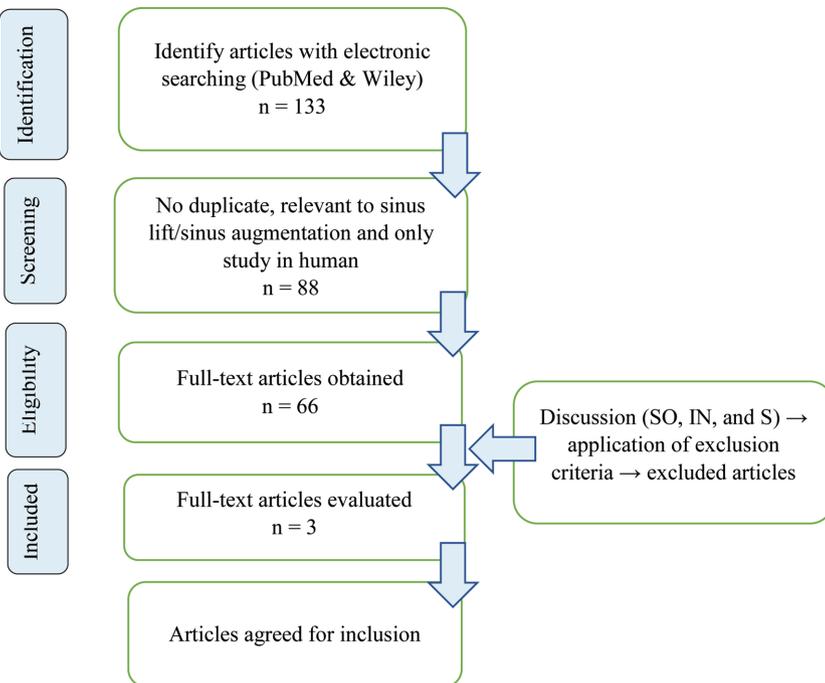


Figure 1 PRISMA flow chart

Table 1 Description data from the 3 included studies that reported on schneiderian membrane perforation

	Age (years)	Patients/Sinus Lift (n)	SMT < 1 mm perforation (n%)	SMT 1 - < 2 mm perforation (n%)	SMT > 2 mm perforation (n%)	SMT > 4 mm perforation (n%)	Number of perforation (n%)
Wen et al.	40 - 64	122/185	13/72 (18)	9/65 (13.8)	10/48 (20.8)	N/A*	22/185 (11.9)
Lin et al.	29 - 78	73/81	7/34 (20.6)	1/25 (4)	6/22 (27)	N/A*	14/81(17.3)
Rapani et al.	20 - 79	200/200	12/52 (23.1)	4/35 (11.4)	0/67 (0)	0/46 (0)	16/200 (8)

*Not Available

following specification: 2 articles were duplicate, 13 articles were not relevant to sinus lift or sinus augmentation procedure, 13 articles were literature review or systematic review and meta analysis, 12 full text articles cannot be obtained, 17 articles studied about animal or cadaver or models, 10 articles were part of textbook, 61 articles did not study about SMT or complications or both and 2 articles did not classify SMT. After screening, reviewing and selecting those articles, only 3 articles met the inclusion criteria.

Table 1 showed that all of the studies were a retrospective type. The studies were done in 2014, 2015 and 2016. The patient’s age was range between 20-79 years. Total patients that undergo sinus lift were 395, with 466 sinus lift cases. The schneiderian membrane thickness was range between 0 to more than 11.8 mm. The most perforated membrane compared with all class in these studies is the schneiderian membrane with > 2 mm thickness which has 6 perforated membranes in 22 cases.

Discussion

All the studies included were conducted in the past 5 years and were a retrospective study. A total of 395 patients were included in these studies with 466 sinus lift cases. These studies only reported about perforation of schneiderian membrane as sinus lift complication and no other else.

Wen et al.⁶ and Lin et al.⁴ measured and divided the schneiderian membrane thickness into 3 groups less than 1 mm, 1 mm to less than 2 mm and more than 2 mm with mean thickness 1.78 ± 1.99 mm in first study and 1.32 ± 0.87 mm in the second study. It was using crestal approach technique and using lateral window technique. The complication of sinus lift reported in both studies is perforated of Schneiderian membrane, with the most perforated one is in the more than 2 mm group in study about 20.83% and 27.27%. The studies also reported that the less perforated group is the 1 to less than 2 mm about 13.85% study.

The methods and results in Rajani et al.¹⁰ study divided the schneiderian membrane into 4 groups:

0 mm or too thin to record (type I), less than 2 mm (type II), 3 and 4 mm (type III), and more than 4 mm (type IV). The subject of this study also treated with 2 different techniques; lateral window technique in 100 patients and crestal approach technique in 100 patients. Type I group was the most perforated group with 5 perforations in lateral window technique and 7 perforations in crestal approach technique. The type I group total perforation for both techniques is 12 out of 52 sinus lift which is 23.08%, while type III and type IV had no perforation for both techniques.¹⁰

Some studies reported that there were certain schneiderian membrane thickness that shown to be vulnerable to intra operative membrane perforation, but thick membrane is not preventing membrane perforation as the resistance under elastic forces is not better than the thinner one.^{11,12} Complex sinus wall morphology, the presence of sinus septa and force applied to the membrane might also increase the chance of membrane perforation. The prevalence and morphology of sinus septa were first described in 1910.¹³ Schneiderian membrane perforation might occur at force more than 7.3 N/cm.¹²

Conclusion

From the results of those studies, conclusions can be made within the limitation of this review is the schneiderian membrane thickness might affect complications in sinus lift or sinus augmentation procedures, especially perforation of schneiderian membrane. This study found a positive relation between schneiderian membrane thickness with perforation of schneiderian membrane. There are many limitations in this article, therefore more research with larger sample size and better methodology research are necessary to conclude a better an accurate results.

Acknowledgment

I would like to thank all the Lecturer Department of Periodontology, M. Ruslin, Acing and Adytha for guiding and helping me until the completion of this article.

Conflict of Interest

The authors report no conflict of interest.

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