



Abstract

Objective: To elucidate potential risk factors that lead to postoperative morbidity and poor hearing outcomes in patients with otosclerosis who undergo stapedotomy.

Methods: A retrospective study was conducted of 107 patients with otosclerosis who underwent stapedotomy between 2013 and 2020. All patients underwent stapedotomy with perichondrial graft and Bucket Handle Prosthesis for ossicular chain reconstruction with temporalis fascia graft. Demographics, comorbidities, and smoking history were obtained. Preoperative and postoperative audiogram data, including air-bone gap (ABG), and complications were collected.

Results: The two comparison groups included smokers (30%) and non-smokers (70%). Across all patients, intraoperative and postoperative complications were 3.64% and 13.1%, respectively, with no significant difference in complication rates between smokers and non-smokers. The average ABG gain at 3-months postoperatively for all patients was 20.2 dB; however, this was not significantly different between those with and without smoking history.

Conclusion: Although a history of smoking has been implicated in poor hearing outcomes in middle ear surgery, our results suggest that smoking may not impact the incidence of postoperative complications and poorer hearing outcomes compared to non-smokers among patients undergoing stapedotomy for otosclerosis.

Introduction

Otosclerosis is primarily a disease of the otic capsule and remains the most common cause of conductive hearing loss (CHL) in the adult population.¹ The most common treatment option is stapedectomy, but there has been a recent trend toward stapedotomy. Stapes surgery is typically considered successful when the ABG is closed to less than 10 dB, and stapedotomy has demonstrated better than 95% change of air-bone gap closure and lower incidence of complications compared to stapedectomy.²

Risk factors associated with poor outcomes following some otologic procedures have been evaluated but have not been well-studied in stapedotomy.³ Perhaps the most thoroughly studied risk factor is smoking. Regarding stapedotomy, smoking may lead to poorer surgical outcomes due to the risk of incus necrosis as a result of vasoconstriction secondary to nicotine; however, there is very little data in the literature assessing smoking as a risk factor for poorer stapedotomy outcomes in the treatment of otosclerosis. This study may provide otologists useful evidence to both plan stapedotomy surgery with the appropriate patients and counsel patients on the likelihood of success of this procedure.

Methods

A retrospective study was conducted of 107 patients with otosclerosis who underwent stapedotomy between 2013 and 2020. All patients underwent stapedotomy with perichondrial graft and Bucket Handle Prosthesis for ossicular chain reconstruction with temporalis fascia graft. Demographics, comorbidities, and smoking history were obtained. Preoperative and postoperative audiogram data, including air-bone gap (ABG), and complications were collected. Data was analyzed using *t*-test and Fischer's exact test for continuous and categorical variables, respectively.

Results

A total of 107 patients were included, 30% of which were smokers and 70% were non-smokers. There was no significant difference between smokers and non-smokers for average ABG gain at 3-months postoperative, and no difference between the two groups for intraoperative and postoperative complications. Age was the only significant predictor of ABG gain at 3-months in this model ($P=0.027$).

Table 1. Baseline patient demographics

Characteristics	Non-smokers (n=75)	Smokers (n=32)	P-value*
Age	40.8	50.2	0.003*
BMI	28.1	31.5	0.038*
Preop ABG	33.1	30.7	0.28
Male	26 (34.7%)	14 (43.8%)	0.39
COPD	0 (0%)	3 (9.4%)	0.027*
Alcohol use	5 (7%)	3 (9%)	0.69
Cardiovascular disease	34 (45%)	16 (50%)	0.68
Diabetes	6 (8%)	6 (19%)	0.18
Chronic kidney disease	2 (3%)	1 (3%)	1.00
Liver disease	5 (7%)	4 (13%)	0.45
Immunocompromised	3 (4%)	3 (9%)	0.36
Allergies	12 (16%)	4 (13%)	0.77
Obstructive sleep apnea	10 (13%)	5 (16%)	0.77
CPAP	7 (9%)	2 (6%)	0.72
History of hearing loss	12 (16%)	3 (9%)	0.55
History of otitis media	12 (16%)	3 (9%)	0.54
History of TM perforation	8 (11%)	0 (0%)	0.10
History of TM revision	6 (8%)	2 (6%)	1.00
Preop tinnitus/vertigo			
No	54 (72%)	27 (84%)	0.34
Tinnitus	18 (24%)	4 (13%)	
Vertigo	3 (4%)	1 (3%)	
Bilateral ear involved	37 (49%)	10 (31%)	0.09*

Table 1. Baseline patient demographic characteristics. TM – tympanic membrane

Table 2. Average change in ABG by smoking status

	Non-smokers (n=75)	Smokers (n=32)	P-value*
Mean Preop ABG (std)	33.1 (9.9)	30.7 (10.3)	0.28
Delta ABG pre-op to 3-months post-op	23.9 (15.9 - 31.9)	19.7 (12.1 - 27.2)	0.1315
Delta ABG 3-6 months post-op	24.3 (16.2 - 32.4)	20.6 (12.5 - 28.0)	0.1573

Table 2. Pre- and postoperative ABG and average change in ABG preoperative to 3-months postoperative by smoking status

Table 3. P-values for change in ABG by risk factor

Risk factor	Delta ABG pre-op to 3 months post-op	Delta ABG 3-6 months post-op
	P-value*	P-value*
Smoking	0.1315	0.1573
Age	0.0273*	0.0057*
BMI	0.3198	0.2163
Ear involved	0.3938	0.6771
History of COPD	0.4815	0.3406

Table 3. Significance values by risk factor for average change in ABG preoperatively to 3-months postoperative and from 3-months postoperative to additional follow-up within 6-month postoperative period

Table 4. Complications by smoking status

	Non-smokers (n=75)	Smokers (n=32)	P-value*
Intraoperative complications			
Yes	3 (4%)	1 (3%)	1.000
No	72 (96%)	31 (97%)	
Postoperative complications			
Yes	8 (11%)	6 (19%)	0.3472
No	67 (89%)	26 (81%)	

Table 4. Intraoperative complications included TM perforation, floating footplate, and perilymph leakage. Postoperative complications included TM perforation, infection, and persistent vertigo.

Table 5. P-values for complications by risk factor

Risk factor	Intraoperative complications	Postoperative complications
	P-value*	P-value*
Smoking	0.9645	0.3287
Age	0.3943	0.3677
BMI	0.6117	0.1660

Table 5. Intraoperative and postoperative complications by risk factor

Conclusion

Smoking may not impact the incidence of postoperative complications and poorer hearing outcomes compared to non-smokers among patients undergoing stapedotomy for otosclerosis.

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References

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